Tankerhoosen River Watershed Management Plan

Friends of the Hockanum River Linear Park of Vernon, Inc.

In Association with:

Town of Vernon
North Central Conservation District
Rivers Alliance of Connecticut
Hockanum River Watershed Association
Belding Wildlife Management Area

March 2009



78 Interstate Drive West Springfield, MA 01089



Execu	utive S	ummaryE	S-1
	E.1 E.2	The Tankerhoosen —A Key Inland Watershed E Potential Threats to Water Quality	ES-1
	E.3	The Need for a Comprehensive Watershed Plan	
	E.4	Plan Development Process	
	E.5	Watershed Management Goals	
	E.6	Plan Recommendations	ES-4
1	Introd	uction	
	1.1	The Call for a Comprehensive Watershed-Based Plan	
	1.2	Plan Development Process	2
2	Basel	ine Watershed Conditions	5
	2.1	Watershed Description	
	2.2	Geologic and Historical Perspective	
		2.2.1 Geology	
		2.2.2 Population and Industry	
		2.2.3 Recreation Resources	
		2.2.4 Watershed Restoration Efforts	
	2.3	Natural Resources	11
		2.3.1 Hydrology	
	2.4	Water Quality	
		2.4.1 Classifications and Impairments	
		2.4.2 Tankerhoosen River Watershed Water Quality Monitoring Study	
	2.5	Wetlands	
	2.6	Fish and Wildlife Resources	
		2.6.1 Fisheries	
		2.6.2 Birds	
		2.6.3 Amphibians & Reptiles	
		2.6.4 Threatened and Endangered Species	
	2.7	Watershed Modifications	
		2.7.1 Dams, Impoundments, & Water Supply	
		2.7.2 Wastewater Discharges	
	2.8	Land Use and Land Cover	
		2.8.1 Current Conditions	33
		2.8.2 Future Conditions	
	2.9	Pollutant Loading	
	2.10	Comparative Subwatershed Analysis	
	-	2.10.1 Priority Subwatersheds for Conservation	
3	Water	shed Field Inventories	58
	3.1	Summary of Findings	
	3.2	Stream Corridor Assessment	
	5.2	otrodin Johnson / 199093inont	02



	3.3	Uplai	nd Assessments	
		3.3.1	3.1	
		3.3.2	J	
		3.3.3	Streets and Storm Drain Assessment	72
4	Land		Regulatory Review	
	4.1		duction	
	4.2		mary of Land Use Planning Entities	
	4.3		mary of Existing Regulations	
		4.3.1	Town of Vernon	
		4.3.2	Town of Tolland	82
5	Wate		Goals and Objectives	
	5.1		rshed Management Goals	
	5.2	Wate	rshed Management Objectives and Strategies	84
6	Wate	ershed	Management Recommendations	91
	6.1	Wate	rshed-Wide Recommendations	94
		6.1.1	Build a Foundation for Implementing the Plan	94
		6.1.2	Municipal Regulations and Design Guidance	95
		6.1.3	Illicit Discharge Detection and Elimination	
		6.1.4	Residential Practices	
		6.1.5	Municipal and Business Practices	
		6.1.6	Education and Outreach	
		6.1.7	Water Quality Monitoring Program	
	6.2		eted Recommendations	
		6.2.1	Priority Parcels for Open Space Protection	
		6.2.2	Invasive Plant Species Management	109
		6.2.3	Targeted Stormwater Outfall Retrofits	
		6.2.4	Watershed Fish Passage Assessments	
		6.2.5	Targeted Illicit Discharge Investigations	
		6.2.6	Additional Subwatershed Field Assessments	
	6.3		Specific Recommendations	
		6.3.1	Stormwater Retrofit Opportunities	
		6.3.2	Riparian Buffer Restoration Opportunities	
		6.3.3	Stream Restoration Opportunities	
		6.3.4	Dams and Impoundments	
		6.3.5	Aquatic Invasive Species Study	
		6.3.6	Priority Stream Cleanups	
	6.4		nated Costs and Load Reductions	
		6.4.1	Estimated Costs	
		6.4.2	Load Reductions	128



	6.5	6.5.1	Implementation	132
			Funding Sources	
7	Refe	rences	S	138
Table	es			Page
ES-1			anagement Plan Recommendations Summary	ES-6
2-1			of Municipalities in the Tankerhoosen River Watershed	5
2-2			Tankerhoosen River Watershed	5
2-3			n River Subwatersheds	13
2-4			nland Surface Water Quality Classifications	15
2-5			n River Watershed Impaired Waters	17
2-6			Coverage in the Tankerhoosen River Watershed	22
2-7			ng Habitat for Valuable or Unique Natural Resources	24
2-8		Species	TI	25
2-9			Threatened, and Special Concern Species	27
2-10			ng Water Supplies	28
2-11			ulated Facilities	31
2-12			Regulated Sites	33
2-13			Use — Tankerhoosen River Watershed	36
2-14			-Tankerhoosen River Watershed	38
2-15			—Tankerhoosen River Watershed	41
2-16			in Riparian Corridors	42
2-17			rvious Cover — Tankerhoosen Watershed	44
2-18			Land — Tankerhoosen Watershed	47 47
2-19 2-20	- 0		ure Land Use Category	47 49
2-20 2-21			dout Analysis Results	50
2-21			rvious Cover — Existing and Future Conditions over/Riparian Zone Metric	50
2-22			over/Riparian Zone Metric — Existing and Future Conditions	51
2-23			lutant Loading Rate and Load Increases	52
2-24	Sumn	nary of S	Subwatershed Vulnerability Metrics	54
2-26			owatershed Vulnerability Analysis	55
2-27			Subwatershed Restoration Potential Metrics	56
2-28			owatershed Restoration Potential Analysis	57
3-1			ry Nomenclature	58
3-1			each Level Assessments Performed and Impact Conditions	30
J 2	Ident		out 2010 / 100000 minute i or or mou and impact outfultions	63
3-3			Classifications	63



Tables (continued) 3-4 Stream Reach Assessment Scores and Classifications 3-5 Hotspot Site Investigation Summary 3-6 Neighborhood Source Assessments Conducted in the Tankerhoosen River Watershed 3-7 Streets and Storm Drain Assessment Photographs 4-1 Tankerhoosen River Watershed Land Use Commissions 4-2 Municipal Land Use Regulations 4-3 Inland Wetlands and Watercourses Regulations 4-4 Status of Municipal Open Space Plans in the Tankerhoosen River Watershed 4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 126 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 7-1 Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources 7-1 Tankerhoosen River Watershed 7-2 Population Trends in the Tankerhoosen River Watershed 7-3 Tankerhoosen River Watershed 7-4 Population Trends in the Tankerhoosen River Watershed 7-5 Page
3-6 Neighborhood Source Assessments Conducted in the Tankerhoosen River Watershed 3-7 Streets and Storm Drain Assessment Photographs 4-1 Tankerhoosen River Watershed Land Use Commissions 4-2 Municipal Land Use Regulations 4-3 Inland Wetlands and Watercourses Regulations 4-4 Status of Municipal Open Space Plans in the Tankerhoosen River Watershed 4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Restoration Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 7-7 7-7 7-7 7-7 7-7 7-7 7-7 7-7 7-7 7-
Watershed 3-7 Streets and Storm Drain Assessment Photographs 4-1 Tankerhoosen River Watershed Land Use Commissions 4-2 Municipal Land Use Regulations 4-3 Inland Wetlands and Watercourses Regulations 4-4 Status of Municipal Open Space Plans in the Tankerhoosen River Watershed 4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 126 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 7- 7- 7- 7- 7- 7- 7- 7- 7- 7
3-7 Streets and Storm Drain Assessment Photographs 4-1 Tankerhoosen River Watershed Land Use Commissions 4-2 Municipal Land Use Regulations 4-3 Inland Wetlands and Watercourses Regulations 4-4 Status of Municipal Open Space Plans in the Tankerhoosen River Watershed 4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 7-1 Tankerhoosen River Watershed 7-2 Population Trends in the Tankerhoosen River Watershed 7-3 Tankerhoosen River Watershed 7-4 Population Trends in the Tankerhoosen River Watershed 7-5 Priority Stream Cleanup Street Watershed 7-6 Priority Stream Cleanup Street Watershed 7-7 Priority Street Watershed 7-7 Priority Cleanup Street Watershed
4-1 Tankerhoosen River Watershed Land Use Commissions 4-2 Municipal Land Use Regulations 4-3 Inland Wetlands and Watercourses Regulations 4-4 Status of Municipal Open Space Plans in the Tankerhoosen River Watershed 4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page Figures 2-1 Tankerhoosen River Watershed 7-7 7-7 7-7 7-7 7-7 7-7 7-7 7-7 7-7 7-
 4-2 Municipal Land Use Regulations 4-3 Inland Wetlands and Watercourses Regulations 4-4 Status of Municipal Open Space Plans in the Tankerhoosen River Watershed 4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources 7 77 76 76 77 76 77 77 76 77 77 76 77 77 78 79 79 70 70 70 71 72 72 73 74 75 75 76 77 78 79 79 70 70 70 70 71 72 72 74 75 75 75 76 77 78 79 70 70 70 71 71 72 72 73 74 75 75 75 76 77 78 79 70 70 70 71 71 72 73 74 75 75 76 77
4-3 Inland Wetlands and Watercourses Regulations 4-4 Status of Municipal Open Space Plans in the Tankerhoosen River Watershed 4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 7-7 Page
4-4 Status of Municipal Open Space Plans in the Tankerhoosen River Watershed 4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 7-7 Figures 7-7 Page 7-7 P
4-5 Open Space Regulations 6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 111 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 114 6-4 Priority Riparian Buffer Restoration Sites 119 6-5 Priority Stream Restoration Sites 119 6-6 Priority Stream Cleanup Sites 120 6-6 Priority Stream Cleanup Sites 121 6-7 Typical Unit Costs for Management Plan Recommendations 126 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 127 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 128 6-10 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 129 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 120 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain 121 6-13 Proposed Implementation Schedule 131 6-14 Potential Funding Sources Page 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 100 110 111 111 112 113 114 115 115 116 117 117 118 119 119 119 119 119 119 119 119 119
6-1 Watershed Management Plan Recommendations Summary 6-2 Priority Outfall Retrofit Sites 111 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 114 6-4 Priority Riparian Buffer Restoration Sites 119 6-5 Priority Stream Restoration Sites 119 6-6 Priority Stream Cleanup Sites 120 6-7 Typical Unit Costs for Management Plan Recommendations 120 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 127 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 128 6-10 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 129 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed 129 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain 130 6-13 Proposed Implementation Schedule 131 6-14 Potential Funding Sources Page 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 100 110 111 110 110 110 110 110 110 11
6-2 Priority Outfall Retrofit Sites 6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 7 Page 2-1 Tankerhoosen River Watershed 7 2-2 Population Trends in the Tankerhoosen River Watershed 110
6-3 Additional Subwatersheds and Stream Reaches to be Assessed 6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 7 Page 2-1 Tankerhoosen River Watershed 7 2-2 Population Trends in the Tankerhoosen River Watershed
6-4 Priority Riparian Buffer Restoration Sites 6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 2-1 Tankerhoosen River Watershed 7 2-2 Population Trends in the Tankerhoosen River Watershed 1129
6-5 Priority Stream Restoration Sites 6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 2-1 Tankerhoosen River Watershed 7 2-2 Population Trends in the Tankerhoosen River Watershed 122
6-6 Priority Stream Cleanup Sites 6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
6-7 Typical Unit Costs for Management Plan Recommendations 6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of LID in Reducing Sediment Loads 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Page 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 126 127 128 129 129 129 129 129 129 129 129 129 129
6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of L1D in Reducing Sediment Loads 6-10 Anticipated Effectiveness of L1D in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 127 128 129 129 129 129 129 129 129
6-8 Planning Level Cost Estimates for Site-Specific Stormwater Retrofits 6-9 Anticipated Effectiveness of L1D in Reducing Sediment Loads 6-10 Anticipated Effectiveness of L1D in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 127 128 129 129 129 129 129 129 129
 6-10 Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads 6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed
6-11 Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area 129 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 130 6-13 Proposed Implementation Schedule 131 6-14 Potential Funding Sources 133 Figures 2-1 Tankerhoosen River Watershed 7 2-2 Population Trends in the Tankerhoosen River Watershed 100
Treatment Area 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 129 129 129 129 129 129 129 12
 6-12 Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed
Existing Pollutant Loads 6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 130 130 130 130 130 130 130 130 130 13
6-13 Proposed Implementation Schedule 6-14 Potential Funding Sources Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 131 2-2 Population Trends in the Tankerhoosen River Watershed 131 332 3333 33333 333333 3333333 33333333
Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 133
Figures 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 10
 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 10 11 12 13 14 15 16 16 17 18 19 19 10 10
 2-1 Tankerhoosen River Watershed 2-2 Population Trends in the Tankerhoosen River Watershed 10 11 12 13 14 15 16 16 17 18 19 19 10 10
2-2 Population Trends in the Tankerhoosen River Watershed 10
2-4 Water Quality Classifications 16
2-5 Turbidity — Tankerhoosen River Watershed 18
2-6 Dissolved Copper — Tankerhoosen River Watershed 19
2-7 Lead — Tankerhoosen River Watershed 19
2-8 Nitrogen Species — Tankerhoosen River Watershed 20
2-9 Phosphorus – Tankerhoosen River Watershed 21
2-10 Wetland Soils — Tankerhoosen River Watershed 23
2-11 DEP Natural Diversity Database Areas — Tankerhoosen River Watershed 29



Tankerhoosen River Watershed Management Plan

Figur	es (continued)	Page
2-14	Sewer Service Areas — Tankerhoosen River Watershed	34
2-15	Current Land Use — Tankerhoosen River Watershed	35
2-16	Committed Open Space — Tankerhoosen River Watershed	37
2-17	Watershed Zoning as Defined by CRCOG — Tankerhoosen River Watershed	39
2-18	Land Cover — Tankerhoosen River Watershed	40
2-19	Conceptual Model Illustrating Relationship Between Watershed Impervious	
	Cover and Stream Quality	44
2-20	Current Impervious Cover — Tankerhoosen River Watershed	45
2-21	Developable Land — Tankerhoosen River Watershed	48
3-1	Examples of Stream Reaches in Various Classification Categories	64
6-1	Residential and Commercial Rooftop Disconnection Retrofit Strategies	102
6-2	Priority Parcels for Open Space Protection	108
6-3	Example Constructed Wetland Outfall Retrofit	110

Appendices End of Report

- A Baseline Watershed Assessment; Watershed Field Inventories and Land Use Regulatory Review (CD-ROM)
- B Vernon Regulatory Review Memorandum
- C Targeted Stream Corridor Recommendations
- D Stormwater Retrofit Concept Designs
- E Site-Specific Stormwater Retrofit Cost Estimates



Executive Summary

E.1 The Tankerhoosen – A Key Inland Watershed

The Tankerhoosen River watershed is an approximately 12.9 square-mile subregional basin within the larger Hockanum River and Connecticut River watersheds in north-central Connecticut. Approximately 70% of the watershed is located within the Town of Vernon, with the remaining portions within the Towns of Tolland, Bolton, and Manchester.

The Tankerhoosen River has long been recognized as an important natural resource and a key inland watershed



The upper Tankerhoosen River is a cold water stream supporting self-sustaining native trout populations that rank among the best of their kind in the state.

critical to the health of Long Island Sound. The high water quality (classified as A) in the upper regions of the Tankerhoosen River sustains a significant natural resource of the State of Connecticut —the Belding Wild Trout Management Area, one of only two Class I wild trout areas east of the Connecticut River. The importance of these small, high-quality watersheds to the downstream health of the larger river basins, and therefore to Long Island Sound, is well recognized. Of utmost importance to these high quality watersheds is protection of the headwaters regions.

The importance of protecting the Tankerhoosen is recognized by both local and state agencies. The State Plan of Conservation and Development identifies the riverway as a proposed preservation and conservation area. The Vernon Open Space Plan proposes a greenway plan of 2000 preserved acres along the Tankerhoosen. Most recently, The Nature Conservancy has identified several key watersheds in the state that it considers particularly important to the future protection of Long Island Sound, including the Tankerhoosen River watershed.

E.2 Potential Threats to Water Quality

The headwaters region of the Tankerhoosen River is bisected by Interstate 84. Development pressure in this headwaters region at the Exit 67 interchange in Vernon poses a major threat to the long-term health of the watershed. Further stresses on the headwaters have been created by development of an industrial park in Tolland through which a key headwater stream flows, as well as the presence of the highway itself, which continues to generate increasing traffic loads from development along the I-84 corridor. There has also been declining water quality in the lower reaches of the Tankerhoosen River in recent years. The lower region of the watershed is classified as "B", and was cited as impaired in the Connecticut Department of Environmental



Protection's (DEP) most recent list of water bodies not meeting water quality standards.

E.3 The Need for a Comprehensive Watershed Plan

The need for local decision-makers to consider the environmental consequences of development proposals that would impact the Tankerhoosen River has been expressed by the watershed towns, local advocacy groups including the Friends of the Hockanum River Linear Park and the Hockanum River Watershed Association, The Nature Conservancy, and the DEP.

An informal partnership was formed in 2005 to build upon the successful community-based river monitoring and assessment program of the Connecticut River Watch Program and the Hockanum River Watch Program. Led by the Friends of the Hockanum River Linear Park, this group also included representatives of the Hockanum River Watershed Association, the Belding Wildlife Management Area, the North Central Conservation District, the Town of Vernon, and other local volunteers. Their objective was to address the immediate and long-term threats to water quality and natural resources in the Tankerhoosen River watershed by developing and implementing a comprehensive, scientifically-based watershed management plan.

In 2007, the Friends of the Hockanum River Linear Park retained Fuss & O'Neill, Inc. to develop a management plan for the Tankerhoosen River watershed. The goal of the watershed management plan is to identify recommendations that will help maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries. Funding for the project has been provided by the National Fish and Wildlife Foundation, Long Island Sound Futures Fund, Rivers Alliance of Connecticut, and the Town of Vernon. A Technical Advisory Committee was also formed to guide the development of the plan, including representatives of the previously mentioned groups. This plan reflects the combined efforts of Fuss & O'Neill, the Technical Advisory Committee, stakeholders, and state and local resource agencies.

E.4 Plan Development Process

The Tankerhoosen River Watershed Management Plan is the culmination of desktop analyses and field assessments performed by the project team under the direction of the Technical Advisory Committee. The plan synthesizes information from earlier studies and reports on the watershed, Geographical Information System (GIS) mapping and analyses, review of land use regulations, and detailed field assessments to document baseline watershed conditions, the potential impacts of future development in the watershed, and recommended actions to protect and restore water quality and natural resources.

The plan has also been developed consistent with EPA's guidance for the development of watershed-based plans, which includes nine key elements that establish the structure of the plan. These nine elements include specific goals, objectives, and strategies to



protect and restore water quality; methods to build and strengthen working partnerships; a dual focus on addressing existing problems and preventing new ones; a strategy for implementing the plan; and a feedback loop to evaluate progress and revise the plan as necessary. Following this approach will enable implementation projects under this plan to be considered for funding under Section 319 of the Clean Water Act

Development of the watershed management plan consisted of the following five major tasks:

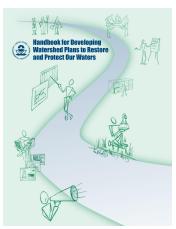
- 1. Assessment of baseline and potential future watershed conditions,
- 2. Review of land use regulations in the watershed,
- 3. Field inventories of stream corridors and upland areas in the watershed.
- 4. Identification of watershed management goals, objectives, and potential management strategies to address watershed issues,
- 5. Development of watershed-wide, targeted, and site-specific watershed management recommendations.

The initial task was to develop an understanding of the current conditions of the Tankerhoosen River watershed. To accomplish this, the project team reviewed existing watershed data, studies, and reports; compiled and analyzed GIS mapping of the watershed and various subwatersheds; and developed pollutant loading and impervious cover models to evaluate areas in the watershed that are most at-risk from future development.

A comparative subwatershed analysis was also performed to identify the Tankerhoosen River subwatersheds that 1) are more sensitive to future development and should be the focus of watershed conservation efforts to maintain existing high-quality resources and conditions and 2) are likely to have been impacted and have greater potential for restoration to improve or enhance existing conditions. The results of the baseline assessment were documented in the report, *Baseline Watershed Assessment, Tankerhoosen River Watershed*, dated May 28, 2008 (Fuss & O'Neill, Inc.).

The results of the comparative subwatershed analysis were used to target individual subwatersheds for detailed field inventories. Using screening-level assessment procedures developed by the Center for Watershed Protection and EPA, field crews assessed approximately 8.7 miles of stream corridors, potential hotspot land uses, and representative residential neighborhoods, streets, and storm drainage systems. The field inventories identified a number of common issues and problems, as well as potential candidate sites for stormwater retrofits, stream restoration, and other targeted projects.

The project team also reviewed municipal land use regulations and planning documents within the watershed towns, focusing on Vernon and Tolland, which comprise the majority of the land area in the Tankerhoosen River watershed and have the greatest



The management plan was developed to satisfy EPA's criteria for watershed-based plans.



potential for future development. The land use regulatory review identified a number of recommendations to improve stormwater management, encourage or require the use of Low Impact Development (LID), reduce the amount of impervious cover generated by future development, and better protect watercourses, wetlands, and riparian areas.

The combined results of the watershed field inventories and land use regulatory review are described in the report, *Watershed Field Inventories and Land Use Regulatory Review, Tankerhoosen River Watershed*, dated October 2008 (Fuss & O'Neill, Inc.).

The project team then developed a series of goals, objectives, and potential management strategies for the watershed based upon the results of the watershed inventory and evaluation phases of the project. Potential management strategies were further refined with input from the Technical Advisory Committee, culminating in the plan recommendations that are presented in this document.

E.5 Watershed Management Goals

The Tankerhoosen River Watershed Management Plan is intended to be an affordable and effective plan that can be implemented by the watershed municipalities, residents, and other stakeholders. The overall goal of the plan is to maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries, which is essential to the economic well-being, environmental and public health, recreational opportunities, and quality of life for the residents, local governments, and visitors of the Tankerhoosen River watershed. This can be achieved by:

- Protecting the upper region of the Tankerhoosen River watershed, including high-quality headwater streams that sustain significant natural resources such as the Belding Wild Trout Management Area, from existing pollutant sources and future threats related to new development and redevelopment.
- Restoring and enhancing the water quality and ecological health of impacted portions of the Tankerhoosen River and its tributaries to support designated uses for fish and wildlife habitat and recreational uses.

E.6 Plan Recommendations

A set of specific objectives and recommended actions were developed to satisfy the management goals for the watershed. The plan recommendations include watershed-wide recommendations that can be implemented throughout the Tankerhoosen River watershed, targeted recommendations that are tailored to issues within specific subwatersheds or areas, and site-specific recommendations to address issues at selected sites that were identified during the watershed field inventories. Recommendations can be viewed as short-term, mid-term, and long-term according to their implementation priority.

• Short-Term Recommendations are initial actions to be accomplished within the first one to two years of plan implementation. These actions establish the



framework for implementing subsequent plan recommendations. Such actions include development of local regulations and stormwater design guidance, discharge investigations, education program planning, and field inventories within previously unassessed subwatersheds. Small demonstration restoration projects could be completed during this phase, however construction of larger retrofit practices and stream restoration projects requiring extensive design, engineering, and permitting should be planned for later implementation.

- Mid-Term Recommendations involve continued programmatic and operational measures, delivery of educational and outreach materials, and construction of one or two larger retrofit and/or stream restoration projects over the next two to four years. Progress on land conservation, LID implementation, and discharge investigation follow-up activities should be completed during this period, as well as project monitoring and tracking.
- Long-Term Recommendations consist of continued implementation of any additional projects necessary to meet watershed objectives, as well as an evaluation of progress, accounting of successes and lessons learned, and an update of the watershed management plan. Long-term recommendations are intended to be completed during the next 5- to 10-year timeframe and beyond.

Table ES-1 summarizes the management recommendations for the Tankerhoosen River watershed. The recommendations are organized by implementation priority (short-, mid-, and long-term) and scale/location (watershed, targeted, or site-specific). Successful implementation of this plan will require a cooperative effort and commitment from the key watershed stakeholders, including a recommended watershed coalition consisting of the Friends of the Hockanum River Linear Park and other members of the Technical Advisory Committee, the watershed municipalities and citizens, state and federal agencies, and other groups. The table also identifies the watershed stakeholders who should be involved in implementing the plan recommendations in either a lead or support role.

F:\P2005\0257\A20\Tank Watershed Plan Final.doc



Table ES-1. Watershed Management Plan Recommendations Summary

	1	1												
					Who :	Shoul	d be li	nvolve	ed (L =	₌ lead,	A = a	ıssist)		
Key Actions	Priority	Scale/Location	Watershed Towns	Friends of HRLP	Watershed Coalition	Landowners	NCCD	HRWA	Belding WMA	ConnDOT	СТДЕР	NRCS	USEPA	Citizens/Volunteers
Objective 1. Build a Foundation for Implementing the Plan														
Form sustainable partnership or coalition	S	W	Α	L			Α	Α	Α		Α			
Adopt watershed management plan	S	W	L		Α									
Identify potential funding sources and submit grant applications	S	W	L		L	Α	Α	Α	Α	Α	Α	Α		
Objective 2. Enhance In-Stream and Riparian Habitat														
Conduct fish passage assessments	S	T	Α		L		Α	Α						
Revise local stream crossing & stormwater design standards	S	W	L											
Belding Pond Dam removal feasibility evaluation	S	Т			Α						Α	L		
Conduct aquatic invasive species study	S	S	Α		L									
Priority stream restoration projects	M/L	S	Α		L							Α		
Objective 3. Protect/Restore Riparian Buffers	1	1									1		1	
Priority riparian buffer restoration projects	M/L	S	Α		L	Α			Α			Α		
Adopt stream buffer regulations, pending enabling legislation	M	W	L											
Revise riparian buffer recommendations (Tolland)	S	W	L											
Incorporate invasive species management measures	М	T			L			Α	Α		Α			
Objective 4. Identify and Eliminate Illicit Discharges	1	П		1		1	1			1				
Targeted illicit discharge investigations	S	T	L		Α		Α							
Implement municipal IDDE programs	M	W	L											
Priority stream cleanup efforts	S	S			L			Α						Α
Develop education/outreach materials	S	W			L		Α				Α			
Deliver education/outreach to the public	М	W	<u>L</u>				Α							
Objective 5. Residential Management Practices		ı		1	1	1	1		1	1	ı			
Increase watershed stewardship signage in residential areas	M	W	L		Α		Α	Α						Α
Encourage disconnection of rooftop runoff	M	W	L		A		Α							
Develop education/outreach materials	S	W	١.		L		Α							
Deliver education/outreach to the public	М	W	L L				Α							
Objective 6. Municipal and Business Management Practices		1 12		1		1	1		T T	1	l		ı	
Review municipal facility compliance	S	W	<u> </u>											
Improve municipal stormwater management programs	S/M	W	L							١,				
Implement street sweeping and catch basin cleaning	M S	W	L		,		Α			L				
Develop education/outreach materials	5	VV			L		А							

F:\P2005\0257\A20\Tank Watershed Plan Final.doc



Table ES-1. Watershed Management Plan Recommendations Summary

					Who :	Shoul	d be li	nvolve	ed (L =	= lead	, A = a	ıssist)		
Key Actions	Priority	Scale/Location	Watershed Towns	Friends of HRLP	Watershed Coalition	Landowners	NCCD	HRWA	Belding WMA	ConnDOT	СТВЕР	NRCS	USEPA	Citizens/Volunteers
Deliver education/outreach to the public	М	W	L				Α							
Increase watershed stewardship signage in commercial areas	M	W	L		Α		Α	Α						Α
Objective 7. Implement Water Quality Monitoring Program														
Develop and implement long-term monitoring program	S M	W			L		Α	Α			Α			Α
Field monitoring study of LID effectiveness			Α		L		Α							<u> </u>
Objective 8. Protect Open Space														
Priority land acquisitions	S/M	Т	L		Α	Α			Α		Α			İ
Continue to implement municipal open space plans	S	Т	L											1
Seek alternative funding sources for open space acquisition	S/M	Т	L		Α									1
Promote use of open space through trail maps and events	S/M	Т			L			Α	Α					1
Develop and implement invasive species management plan	M	Т			L			Α			Α			Α
Objective 9. Promote LID and Sustainable Site Design														
Monitor effectiveness of LID regulations (Tolland)	S/M	W	L											
Revise Inland Wetland regulations for consistency (Tolland)	S	W	L											1
Develop and implement new stormwater/LID regulations (Vernon)	S	W	L											1
Form advisory committee	S	W	L											1
Develop Town stormwater/LID manual and/or guidance	S	W	L											1
Update existing zoning, subdivision, wetlands regulations	S	W	L											1
Priority stormwater retrofits	M/L	S	Α		L		Α			Α				1
Incorporate LID into Town projects	M	W	L											1
LID demonstration projects (green roads, public works, schools)	S	S	L		Α		Α							1
Develop education/outreach materials	S	W			L		Α				Α			1
Deliver education/outreach to the public	M	W	L				Α							İ
Objective 10. Assess Additional Subwatersheds	•							•		•				
Perform stream and upland assessments	S	Т			L		Α	Α	Α					Α
Dispite Alphanisticas C. about town M. mid town I. long town					! . 4! .	·			! . l .				<u> </u>	

Priority Abbreviations: S = short-term, M = mid-term, L = long-term

Scale/Location Abbreviations: W = watershed-wide, T = targeted, S = site-specific

HRLP — Hockanum River Linear Park, NCCD — North Central Conservation District, HRWA — Hockanum River Watershed Association, ConnDOT — Connecticut

Department of Transportation, CTDEP — Connecticut Department of Environmental Protection, NRCS — Natural Resource Conservation Service, USGS — United

States Geological Survey, USEPA — U.S. Environmental Protection Agency, Belding WMA — Belding Wildlife Management Area

F:\P2005\0257\A20\Tank Watershed Plan Final.doc



1 Introduction

1.1 The Call for a Comprehensive Watershed-Based Plan

The Tankerhoosen - A Key Inland Watershed

The Tankerhoosen River watershed is an approximately 12.9 square-mile subregional basin within the larger Hockanum River and Connecticut River watersheds in north-central Connecticut. Approximately 70% of the watershed is located within the Town of Vernon, with the remaining portions within the Towns of Tolland, Bolton, and Manchester.

The Tankerhoosen River has long been recognized as an important natural resource and a key inland watershed critical to the health of Long Island



The upper Tankerhoosen River is a cold water stream supporting self-sustaining native trout populations that rank among the best of their kind in the state.

Sound. The high water quality (classified as A) in the upper regions of the Tankerhoosen River sustains a significant natural resource of the State of Connecticut — the Belding Wild Trout Management Area, one of only two Class I wild trout areas east of the Connecticut River. The importance of these small, high-quality watersheds to the downstream health of the larger river basins, and therefore to Long Island Sound, is well recognized. Of utmost importance to these high quality watersheds is protection of the headwaters regions.

The importance of protecting the Tankerhoosen is recognized by both local and state agencies. The State Plan of Conservation and Development identifies the riverway as a proposed preservation and conservation area. The Vernon Open Space Plan proposes a greenway plan of 2000 preserved acres along the Tankerhoosen. Most recently, The Nature Conservancy has identified several key watersheds in the state that it considers particularly important to the future protection of Long Island Sound, including the Tankerhoosen River watershed.

Potential Threats to Water Quality

The headwaters region of the Tankerhoosen River is bisected by Interstate 84. Development pressure in this headwaters region at the Exit 67 interchange in Vernon poses a major threat to the long-term health of the watershed. Further stresses on the headwaters have been created by development of an industrial park in Tolland through which a key headwater stream flows, as well as the presence of the highway itself, which continues to generate increasing traffic loads from development along the I-84 corridor. There has also been declining water quality in the lower reaches of the Tankerhoosen River in recent years. The lower region of the watershed is classified as "B", and was cited as impaired in the Connecticut Department of Environmental



Protection's (DEP) most recent list of water bodies not meeting water quality standards.

The Need for a Comprehensive Watershed Plan

The need for local decision-makers to consider the environmental consequences of development proposals that would impact the Tankerhoosen River has been expressed by the watershed towns, local advocacy groups including the Friends of the Hockanum River Linear Park and the Hockanum River Watershed Association, The Nature Conservancy, and the DEP.

An informal partnership was formed in 2005 to build upon the successful community-based river monitoring and assessment program of the Connecticut River Watch Program and the Hockanum River Watch Program. Led by the Friends of the Hockanum River Linear Park, this group also included representatives of the Hockanum River Watershed Association, the Belding Wildlife Management Area, the North Central Conservation District, the Town of Vernon, and other local volunteers. Their objective was to address the immediate and long-term threats to water quality and natural resources in the Tankerhoosen River watershed by developing and implementing a comprehensive, scientifically-based watershed management plan.

In 2007, the Friends of the Hockanum River Linear Park retained Fuss & O'Neill, Inc. to develop a management plan for the Tankerhoosen River watershed. Funding for the project has been provided by the National Fish and Wildlife Foundation, Long Island Sound Futures Fund, Rivers Alliance of Connecticut, and the Town of Vernon. A Technical Advisory Committee was also formed to guide the development of the plan, including representatives of the previously mentioned groups. This plan is the culmination of efforts between Fuss & O'Neill, the Technical Advisory Committee, stakeholders, and state and local resource agencies.

The goal of the watershed management plan is to identify recommendations that will maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries, including protection of high-quality natural resources and restoration or enhancement of the water quality and ecological health of impacted portions of the Tankerhoosen River. This plan also describes a replicable approach to watershed-based planning, which satisfies the guidance set forth by the U.S. Environmental Protection Agency (EPA) in Section 319 of the Clean Water Act for developing watershed-based plans, thus enabling implementation projects under this plan to be considered for Section 319 funds.

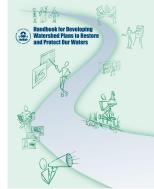
1.2 Plan Development Process

The Tankerhoosen River Watershed Management Plan is the culmination of desktop analyses and field assessments performed by the project team under the direction of the Technical Advisory Committee. The plan synthesizes information from earlier studies and reports on the watershed, Geographical Information System (GIS) mapping and analyses, review of land use regulations, and detailed field assessments to document baseline watershed conditions, the potential impacts of future development



in the watershed, and recommended actions to protect and restore water quality and natural resources.

The plan has also been developed consistent with EPA's guidance for the development of watershed-based plans, which includes nine key elements that establish the structure of the plan. These nine elements include specific goals, objectives, and strategies to protect and restore water quality; methods to build and strengthen working partnerships; a dual focus on addressing existing problems and preventing new ones; a strategy for implementing the plan; and a feedback loop to evaluate progress and revise the plan as necessary. Following this approach will enable implementation projects under this plan to be considered for funding under Section 319 of the Clean Water Act



The management plan was developed to satisfy EPA's criteria for watershed-based plans.

Development of the watershed management plan consisted of the following five major tasks:

- 1. Assessment of baseline and potential future watershed conditions,
- 2. Review of land use regulations in the watershed,
- 3. Field inventories of stream corridors and upland areas in the watershed,
- 4. Identification of watershed management goals, objectives, and potential management strategies to address watershed issues,
- 5. Development of watershed-wide, targeted, and site-specific watershed management recommendations.

The initial task was to develop an understanding of the current conditions of the Tankerhoosen River watershed. To accomplish this, the project team reviewed existing watershed data, studies, and reports; compiled and analyzed GIS mapping of the watershed and various subwatersheds; and developed pollutant loading and impervious cover models to evaluate areas in the watershed that are most at-risk from future development.

A comparative subwatershed analysis was also performed to identify the Tankerhoosen River subwatersheds that 1) are more sensitive to future development and should be the focus of watershed conservation efforts to maintain existing high-quality resources and conditions and 2) are likely to have been impacted and have greater potential for restoration to improve or enhance existing conditions. The results of the baseline assessment were documented in the report, *Baseline Watershed Assessment, Tankerhoosen River Watershed*, dated May 28, 2008 (Fuss & O'Neill, Inc.), a copy of which is provided on CD-ROM in Appendix A of this plan.

The results of the comparative subwatershed analysis were used to target individual subwatersheds for detailed field inventories. Using screening-level assessment procedures developed by the Center for Watershed Protection and EPA, field crews assessed approximately 8.7 miles of stream corridors, potential hotspot land uses, and representative residential neighborhoods, streets, and storm drainage systems. The field



inventories identified a number of common issues and problems, as well as potential candidate sites for stormwater retrofits, stream restoration, and other targeted projects.

The project team also reviewed municipal land use regulations and planning documents within the watershed towns, focusing on Vernon and Tolland, which comprise the majority of the land area in the Tankerhoosen River watershed and have the greatest potential for future development. The land use regulatory review identified a number of recommendations to improve stormwater management, encourage or require the use of Low Impact Development (LID), reduce the amount of impervious cover generated by future development, and better protect watercourses, wetlands, and riparian areas.

The combined results of the watershed field inventories and land use regulatory review are described in the report, *Watershed Field Inventories and Land Use Regulatory Review, Tankerhoosen River Watershed*, dated October 2008 (Fuss & O'Neill, Inc.), a copy of which is provided on CD-ROM in Appendix A of this plan.

The project team then developed a series of goals, objectives, and potential management strategies for the watershed based upon the results of the watershed inventory and evaluation phases of the project. Potential management strategies were further refined with input from the Technical Advisory Committee, culminating in the plan recommendations that are presented in this document.



2 Baseline Watershed Conditions

This section describes the current conditions in the Tankerhoosen River watershed. The information is based upon a review of existing watershed data, studies, and reports; preparation and analysis of watershed GIS mapping; and pollutant loading and impervious cover models to evaluate areas in the watershed that are most at-risk from future development. More detailed information on the baseline assessment is available in *Baseline Watershed Assessment, Tankerhoosen River Watershed* (Fuss & O'Neill, Inc., May 28, 2008), a copy of which is provided on CD-ROM in Appendix A of this watershed management plan.

2.1 Watershed Description

The Tankerhoosen River watershed is a small but very important 12.85 square-mile sub-regional basin within the Hockanum River watershed (Figure 2-1). Approximately 70% of the watershed is located within the Town of Vernon, with the remaining portions within the Towns of Tolland, Bolton, and Manchester (Table 2-1).

Table 2-1. Distribution of Municipalities in the Tankerhoosen River Watershed

Town Name	Town Acreage	Acreage in Watershed	% of Town in Watershed	% of Watershed
Manchester	17,408	461	2.7	5.6
Vernon	11,904	5,572	46.8	67.7
Tolland	25,856	1,547	5.9	18.8
Bolton	9,920	646	6.5	7.9
Totals	65,088	8,226		100.0

A basic profile of the watershed is provided in Table 2-2. Later sections of this document provide more detailed information on these watershed characteristics.

Table 2-2. Profile of the Tankerhoosen River Watershed

Area	12.85 square miles (8,226 acres)
Stream Length	approximately 17.2 miles
Subwatersheds	10 subwatersheds
Jurisdictions	4 towns
Water Quality	DEP Impaired Waters List for habitat for fish and other aquatic life
Current Impervious Cover	9.8%
Subwatersheds Selected for Detailed Assessment Based on Vulnerability Assessment	Clarks Brook Gages Brook Gages Brook South Tributary Lower Tankerhoosen River Walker Reservoir
Subwatersheds Selected for Detailed Assessment Based on Restoration Potential	Clarks Brook Gages Brook Lower Tankerhoosen River Middle Tankerhoosen River Tucker Brook
Major Transportation Routes	Interstates 84 and 384 U.S. Routes 6 and 44 State Routes 30 and 31



Table 2-2. Profile of the Tankerhoosen River Watershed

Significant Natural and Historic Features	Belding Wildlife Management Area Valley Falls Park Webster-Knapp Preserve Bolton Notch Pond Walker Reservoir Talcottville Historic District
--	---

The high water quality (classified as A) in the upper regions of the Tankerhoosen River sustains a significant natural resource of the State of Connecticut —the Belding Wild Trout Management Area, one of only two Class I wild trout areas east of the Connecticut River. The importance of these small, high quality watersheds to the downstream health of the larger river basins, and therefore to Long Island Sound, is well recognized. Of utmost importance to these high quality watersheds is protection of the headwaters regions.

The headwaters region of the Tankerhoosen River is bisected by Interstate 84. Development pressure in this headwaters region at the Exit 67 interchange in Vernon poses a major threat to the long-term health of the watershed. Further stresses on the headwaters have been created by development of an industrial park in Tolland through which a key headwater stream flows, as well as the presence of the highway itself, which continues to generate increasing traffic loads from development along the I-84 corridor. There has also been declining water quality in the lower reaches of the Tankerhoosen River in recent years. The lower region of the watershed is classified as "B", and was cited as impaired in the Connecticut Department of Environmental Protection's (DEP) 2006 List of Connecticut Waterbodies Not Meeting Water Quality Standards.

The importance of protecting the pristine upper region of the Tankerhoosen is recognized by both local and state agencies. The State Plan of Conservation and Development identifies the riverway as a proposed preservation and conservation area. The Vernon Open Space Plan proposes a greenway plan of 2000 preserved acres along the Tankerhoosen. Most recently, The Nature Conservancy (TNC) has identified several key watersheds in the state that it considers particularly important to the future protection of Long Island Sound, including the Tankerhoosen River watershed. The need for local decision-makers to give utmost consideration to the environmental consequences of development proposals that would impact the River, has been expressed by TNC and by the DEP.

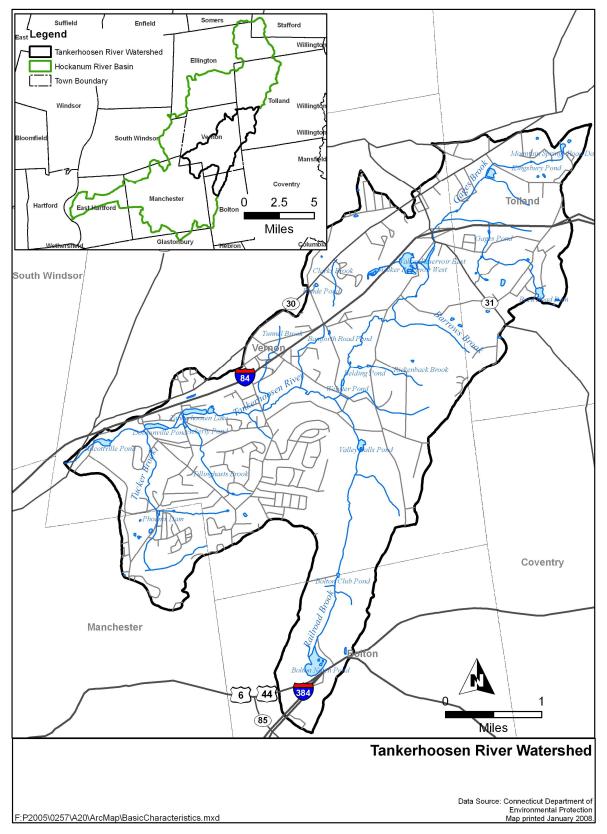


Figure 2-1. Tankerhoosen River Watershed



2.2 Geologic and Historical Perspective

2.2.1 Geology

The State of Connecticut is comprised of three distinct geologic units divided longitudinally across the state. These three units are known as the Western Uplands, the Central Valley, and the Eastern Uplands. The Western and Eastern Uplands are comprised of metamorphic rocks —rocks subjected to intense heat and pressure of the Earth's interior —while the Central Valley is a younger unit comprised of sedimentary rocks. The Central Valley began forming about 225 million years ago when the supercontinent Pangaea began to break apart. A large rift formed a long, narrow valley through the middle of the state, eventually filling with sediments from the eroding hills to the east and west (presently known as the Eastern and Western Uplands). The sediments were compacted into soft, easily eroded, red and brown sandstones through which the Connecticut Rivers flows.

The Tankerhoosen River watershed is almost entirely within the Eastern Uplands. The westernmost portion of the watershed is located within the Central Valley. The boundary between the Central Valley and the Eastern Uplands is located near the Vernon-Manchester town line and known as the Bolton Range. The Bolton Range was formed as a result of the different rates of erosion of the less resistant sediments of the Central Valley creating an abrupt rise into the resistant rocks of the Eastern Uplands.

Drastic changes in the surficial geology have occurred within Connecticut since the formation of these geologic regions. Above the sandstone of the Central Valley and the metamorphic bedrock of the Eastern Uplands lie extensive glacial deposits, or "glacial till," left as the large glaciers receded. Melting glacier ice formed rivers which sorted glacial till into layers of sand and gravel, or "stratified drift." The Tankerhoosen River flows through hills of glacial till in the steep Eastern Uplands and then drops into the stratified drift of the Central Valley (Bell, 1985).

2.2.2 Population and Industry

Beginning about 10,000 years ago, as the last glacial ice retreated from New England, Native American populations settled Connecticut and the areas along the Tankerhoosen River. The river was used by Native Americans as a source of fish and a travel route to the Connecticut River (Hockanum River Watershed Association, 1998). The Podunks of East Hartford and Manchester, the Nipmucks of Ellington and Tolland were among the tribes that farmed corn in the fertile river floodplains of the Tankerhoosen River. In addition to agriculture, the tribes used the land within the watershed for hunting, gathering, and fishing.

European settlers brought a marked change in land use to Connecticut. Land was cleared and agriculture was the primary use through the Revolutionary War era. However, the availability of more fertile lands in western New York, northern Ohio, and Pennsylvania led to the great migration of Connecticut farmers during the 1800s.



Those who stayed worked in the many factories that arose along the rivers and streams, and manufacturing became a major economic force (Gibbons et al., 1992).

The Tankerhoosen River was no exception to the development patterns across Connecticut. From the headwaters at Gages Brook, the elevation drop of the Tankerhoosen River was ideally suited to power a wide variety of mills. During the eighteenth and nineteenth centuries, several mills associated with the textile, cottonwool, energy, and paper industries were built near these waterfalls and in other areas in the watershed. The Talcottville Historical District is located in southwestern portion of the Tankerhoosen River watershed near the confluence with the Hockanum River. One of the first cotton mills in America was built by Peter Dobson in the early 1800's in Talcottville. The mill burned down in 1909, not to be rebuilt. Peter Dobson is also famous for early observations that ice may have played a role in the erosion and transport of rock in the region.

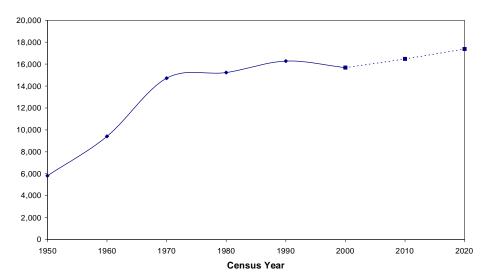
The Vernon Depot, located within the watershed on Church Street, was an active transportation center during the early part of the twentieth century. The Hartford, Providence and Fishkill Railroad ran seven times a day at the Depot, with connections to Rockville. The Keystone Arch on Tunnel Road (also known as the Keystone Tunnel) was constructed circa 1850 to allow trains to traverse Tunnel Road without disrupting street traffic toward Vernon Center. The 108-foot long tunnel is constructed of 30 arches, each of which consists of a center keystone with nine stones forming the curves on either side. The tunnel is considered by historians to be a fine piece of historic architecture and as a monument to the integrity and skilled workmanship of its builders.

Valley Falls was the site of the first industry in Vernon, a saw mill, in 1740. Valley Falls Park hosted a small mill complex for flaxseed oil and cotton between 1850 and 1877. Beginning in the mid-1800s until the mid-1900s the property was converted into farmland for producing corn, hay, oats, butter, and cheese. In 2001, the historic farmhouse and six outbuildings were purchased by the Friends of Valley Falls, Inc. to ensure preservation of the historical complex. Alternate forms of manufacturing power put most of the mills out of business by the late 1950s. Dozens of the mill buildings and their associated dams remain an integral component of the river.

Rapid population growth in the post-war era of the 1950s and 1960s slowed significantly as developable land became scare (see Figure 2-2). Today, the population of the Tankerhoosen River watershed is approximately 16,000, which is more than double the population of the watershed in the 1950s. Commercial and residential development has occurred in the watershed since the 1970s, with a continued decline in industrial uses. Significant commercial development along the major transportation corridors and residential development in the watershed has increased watershed impervious coverage and contributed to degraded water quality in portions of the Tankerhoosen River and its tributaries. Numerous historical impoundments within the watershed also continue to serve as barriers to fish passage along the Tankerhoosen River and its tributaries.



Watershed Population



Source: Connecticut Population Projections, Series 95.1, Office of Policy and Management, September 1995.

Figure 2-2. Population Trends in the Tankerhoosen River Watershed

2.2.3 Recreation Resources

The Tankerhoosen River provides many opportunities for recreational activities, such as fishing, swimming, and limited boating. Along the river, there are both town and state lands that are preserved for parks, wildlife sanctuaries and rail-trails. Recreational activities in these areas include hiking, biking, cross-country skiing, ice skating, nature observation, and aesthetic enjoyment.

Some of the prominent recreational centers in the watershed include the Walker Reservoir East, the Belding Wildlife Management Area, Valley Falls Park, Bolton Notch Pond, Freja Park, the Rails-to-Trails, and Phoenix Mill Park. Each of these areas provides parking, picnicking, and trails for walking and cross-country skiing. The Belding Wildlife Management Area was the location of the first Class I Trout Management Area in Connecticut. Recreational areas that also have historical significance include the Dobsonville Pond and Talcottville Pond. Additionally, the area associated with the confluence of the Tankerhoosen and Hockanum Rivers includes a privately owned recreational facility and is the starting point for the annual Manchester Canoe and Kayak Race.

2.2.4 Watershed Restoration Efforts

The Connecticut River Watch Program (CRWP), a volunteer water quality monitoring, protection, and improvement program for the Connecticut River and its tributaries, is working closely with the Hockanum River Watch Program (HRWA) and North Central Conservation District to develop and support a community-based river monitoring and assessment program in the Tankerhoosen River watershed. The CRWP monitoring



program has included stream walk surveys and rapid bioassessments (cost-effective biological survey techniques) along the Tankerhoosen River, as well as other areas of the larger Hockanum River watershed.

The Connecticut DEP also conducts routine ambient water quality and benthic monitoring at approximately twelve locations along the Hockanum and Tankerhoosen Rivers. The data assist in documenting the chemical and biological quality of surface waters within the watershed and will be used to support the development of a Total Maximum Daily Load (TMDL), which will address sources of water quality impairment in the Hockanum and Tankerhoosen Rivers.

Baystate Environmental Consultants, Inc. (BEC) conducted a feasibility study in 2002 for the dredging of Tankerhoosen Lake and subsequently prepared a Watershed Management Plan for Tankerhoosen Lake in 2004. The plan identified watershed factors that have directly affected or have the potential to affect the water quality and overall health of Tankerhoosen Lake. The project recommended a Town-wide approach for reducing the quantity of pollutants, specifically sediment and nutrients, reaching Tankerhoosen Lake. BEC personnel conducted field observations of the major contributing watercourses and impoundments in the Tankerhoosen Lake watershed to identify point sources of sediment and nutrients as well as nonpoint source pollutants. BEC recommended that the Town of Vernon require the implementation of stormwater best management practices (BMPs) that maximize to the extent practicable, the removal of total suspended solids and nutrients. In addition to the lake dredging project recommended in the feasibility study, BEC also recommended several structural and nonstructural elements, including a sediment trap at the inlet of Tankerhoosen Lake, installation of deep sump catch basins at key locations, maintenance of cross-culverts and drainage structures, and grass swales and vegetated filter strips. None of the BEC recommendations has been implemented to date.

2.3 Natural Resources

2.3.1 Hydrology

The Tankerhoosen River watershed is 12.85 square-miles, with the majority of the watershed (approximately 70 percent) located within the Town of Vernon (Figure 2-1). Gages Brook and its associated southern tributary comprise the headwaters region of the watershed, eventually flowing into Walker Reservoir East. Gages Brook is located in the northwest portion of the Town of Vernon and within the western portion of neighboring Tolland. A few small impoundments are located within the Gages Brook watershed. The brook receives drainage from the I-84 corridor near the Vernon-Tolland town boundary. In Tolland, Gages Brook flows through an industrial park and residential areas.

Walker Reservoir is no longer an active public water supply but rather a recreational resource that attracts hikers, fisherman, and ice skaters. The Tankerhoosen River, which is a moderately sized (16 feet wide) upland stream, originates at the outlet of Walker Reservoir East and bisects the Town of Vernon on the south side of Interstate



84. The river flows southwest for approximately five miles to the Hockanum River in the Talcottville section of Vernon.

Barrows Brook, Rickenback Brook, and several other small tributaries drain the eastern portion of the upper Tankerhoosen River watershed between Walker Reservoir and the confluence with Railroad Brook near Webster Pond. Barrows Brook is the furthest upstream tributary to the Tankerhoosen River and flows through undeveloped, privately owned land. Rickenback Brook flows east to west through a relatively undeveloped portion of Vernon and discharges to the Tankerhoosen River approximately 0.4 miles upstream of the river's confluence with Railroad Brook. Portions of this brook are within the Belding Wildlife Management Area and have been established for catch and release trout fishing (BEC, 2004).

Railroad Brook drains the southern portions of the watershed, beginning at Bolton Notch Pond in Bolton, and flows north through Valley Falls Park and the Belding Wildlife Management Area before joining the Tankerhoosen River. Valley Falls Pond is located along Railroad Brook within the confines of the Valley Falls Park property. Railroad Brook flows through primarily undeveloped land and discharges to the Tankerhoosen River approximately 1.6 miles upstream of Tankerhoosen Lake (BEC, 2004).

Clarks Brook and Tunnel Brook join the Tankerhoosen River in the middle portion of the watershed prior to the river's confluence with the DEP-owned Tankerhoosen Lake, the first of three DEP-owned run-of-river ponds. Clarks Brook originates north of I-84 and drains primarily industrial/commercial and undeveloped land within the Town of Vernon. Clarks Brook discharges to the Tankerhoosen River approximately 0.5 miles upstream of the river's confluence with Tunnel Brook. Tunnel Brook is located in the central portion of Vernon, flowing north to south and crossing the I-84 corridor. The brook empties into the Tankerhoosen River approximately 0.65 miles upstream of the inlet to Tankerhoosen Lake (BEC, 2004).

Dobsonville Pond is located just downstream of Tankerhoosen Lake. Tucker Brook, which drains the southeastern portion of the watershed and a residential section of the Town of Manchester, joins the Tankerhoosen River immediately upstream of Dobsonville Reservoir dam. Further downstream are Talcottville Pond and the confluence with the Hockanum River near the Vernon/Manchester town line.

Overall the Tankerhoosen River is comprised of a large percentage of first and second order (i.e., headwater) streams according to the Strahler Stream Order classification system. Stream hydrology and water quality in headwater streams are important components of ecosystem health because they are a critical food source for the entire river, influence downstream conditions, and support biodiversity.

Ten subwatersheds within the Tankerhoosen River watershed have been delineated for the purposes of this assessment. The subwatershed delineations are based on the CTDEP local basin delineations, modified slightly based on surface water hydrology and grouped accordingly to facilitate assessment and development of watershed management plan recommendations. Figure 2-3 depicts the subwatersheds identified in



this assessment, and Table 2-3 summarizes the basic characteristics of the subwatersheds.

Table 2-3. Tankerhoosen River Subwatersheds

Subwatershed	Acronym	Area (acres)	Area (square miles)
Bolton Notch Pond	BNP	344	0.54
Clarks Brook	СВ	647	1.01
Gages Brook	GB	695	1.09
Gages Brook South Tributary	GBST	680	1.06
Lower Tankerhoosen River	LTR	321	0.5
Middle Tankerhoosen River	MTR	1,578	2.46
Railroad Brook	RB	1,208	1.89
Tucker Brook	TB	934	1.46
Upper Tankerhoosen River	UTR	1472	2.3
Walker Reservoir	WR	347	0.54
Tankerhoosen River Watershed		8,226	12.85

The Tankerhoosen River Watershed is located in an area with a temperate and humid climate. Based on historical climate information available from the NOAA National Weather Service weather station in Harford/Bradley International Airport in Windsor Locks, Connecticut, precipitation is generally well-distributed throughout the year with the wettest conditions in August and November and driest in February (worldclimate.com for Hartford/Bradley International Airport, Hartford County). In Windsor Locks, the mean annual precipitation over a 41-year period of record is 44.4 inches, and the 24-hour average temperature ranges from a high of 73.6°F in July to a low of 24.6°F in January.

Generally, the designated 100-year floodplain of the Tankerhoosen River is confined along a narrow corridor (<500 feet wide) surrounding the river. The entire length of the Tankerhoosen River is within the Federal Emergency Management Agency (FEMA) designated 100-year floodplain, with the exception of a small reach near the river's headwaters, between Reservoir Road and Fish and Game Road. The lower reach of Railroad Brook (below Valley Falls Pond including the pond) is also within the 100-year floodplain. Walker Reservoir West and East and portions of Gages Brook also lie within the designated 100-year floodplain (BEC, 2004).

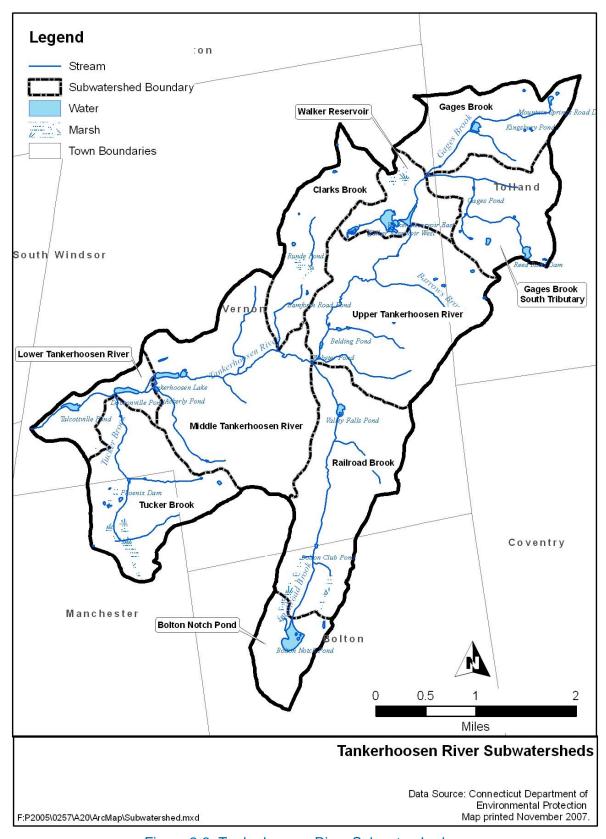


Figure 2-3. Tankerhoosen River Subwatersheds



2.4 Water Quality

2.4.1 Classifications and Impairments

The Federal Clean Water Act (CWA) was developed to protect the nation's surface waters. Through authorization of the CWA, the United States Congress declared as a national goal "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water wherever attainable". Connecticut Water Quality Standards are established in accordance with Section 22a-426 of the Connecticut General Statutes and Section 303 of the CWA. The Water Quality Standards are used to establish priorities for pollution abatement efforts. Based on the Water Quality Standards, Water Quality Classifications establish designated uses for surface and ground waters and identify the criteria necessary to support these uses. The Water Quality Classification system classifies inland surface waters into four different categories ranging from Class AA to D. Table 2-4 summarizes the Connecticut Surface Water Quality Classifications.

Table 2-4. Connecticut Inland Surface Water Quality Classifications

Designated Use	Class AA	Class A	Class B	Class C	Class D
Existing/proposed					
drinking water supply	•				
Potential drinking		_			
water supply	•	•			
Fish and wildlife					
habitat	•	•	•		
Recreational use	•	•	•	Class C and	D waters may
Agricultural and industrial use	•	•	•	be suitable for and wildlife have recreational a industrial use navigation	abitat, certain ictivities,

Source: DEP Surface Water Quality Standards, December 17, 2002

Figure 2-4 depicts the Water Quality Classifications of surface waters in the Tankerhoosen River watershed. Surface waters throughout the Tankerhoosen River watershed are classified as Class A with the exception of the Tankerhoosen Lake, Dobsonville Pond, and Talcottville Pond which are classified as Class B/A.

The CWA (Federal Clean Water Act) requires states to:

- 1. Adopt Water Quality Standards,
- 2. Assess surface waters to evaluate compliance with Water Quality Standards,
- 3. Identify those waters not currently meeting Water Quality Standards, and
- 4. Develop Total Maximum Daily Load (TMDL) analysis and other management plans to bring water bodies into compliance with Water Quality Standards.

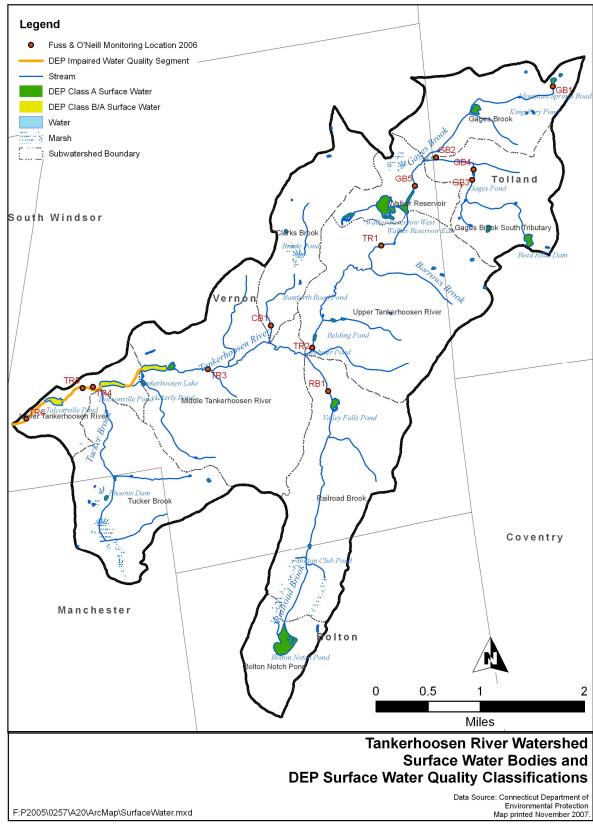


Figure 2-4. Water Quality Classifications



A portion of the Tankerhoosen River does not meet Water Quality Standards for at least one of the designated uses. The impaired segment consists of the lower 1.51 miles of the Tankerhoosen River from Tankerhoosen Lakes to its confluence with the Hockanum River. The impaired uses include habitat for fish, other aquatic life, and wildlife. The causes and sources of impairment in the lower reaches of the Tankerhoosen River have not been identified and are currently listed as "unknown." TMDLs provide the framework to restore impaired waters by establishing the maximum amount of a pollutant that a water body can assimilate without adverse impact to aquatic life, recreation, or other public uses. The 2006 List of Connecticut Waterbodies Not Meeting Water Quality Standards includes a priority ranking system for development of a TMDL specific to the contaminants in each impaired segment: high (H), medium (M), low (L), or under study (T). DEP has identified the impaired segment of the Tankerhoosen River as a high priority for development of a TMDL to restore the impairment. Table 2-5 summarizes the location and nature of the impairment.

Table 2-5. Tankerhoosen River Watershed Impaired Waters

Location Description	Waterbody Segment Length	Impaired Designated Use	Use Support	Cause	TMDL Priority	Potential Source
From mouth at Hockanum River, upstream to Tankerhoosen Lake	1.51 miles	Habitat for Fish, Other Aquatic Life and Wildlife	Р	Impairment Unknown	Н	Source Unknown

Source: DEP, 2006

H —high priority for which there is assessment information that suggests that a TMDL may be needed to restore the water quality impairment.

P – partially supporting

2.4.2 Tankerhoosen River Watershed Water Quality Monitoring Study

A water quality monitoring study was conducted in October and November 2006 to establish current baseline water quality conditions in the watershed, identify water quality impacts, and begin to develop a water quality database for the watershed (Fuss & O'Neill, 2007). Chemical water quality monitoring and biological assessments were conducted during dry and wet weather conditions. Samples were collected from fourteen locations throughout the watershed on four occasions (Figure 2-4). A variety of parameters were measured including pH, temperature, dissolved oxygen, and conductivity, which all reported values within normal ranges. These results indicate that the water quality of the watershed is generally good. However, some of the measured parameters including turbidity, metals, nitrogen, phosphorus, and bacteria highlighted some of water quality issues in the watershed. A brief discussion of the water quality parameters and identified issues is provided below:

Turbidity

Based on the wet weather monitoring results, excessive turbidity is a water quality issue in the Tankerhoosen River and its tributaries, particularly Gages Brook (Figure 2-5). Stream channel erosion and stormwater runoff from impervious surfaces and



construction sites are potential sources of the observed turbidity during large precipitation events such as the August 2006 wet weather monitoring event, although it is difficult to attribute the turbidity excursions to a particular source. During the August 2006 wet weather monitoring event, turbidity measurements generally exhibited a declining trend from upstream to downstream within the watershed. Elevated levels of indicator bacteria (total coliform and *E. coli*) were measured at all monitoring locations during the October 2006 wet weather monitoring event, suggesting stormwater runoff and other non-point sources (pet waste, waterfowl, septic systems, etc.) as likely contributors of elevated pathogen levels in the Tankerhoosen River and its tributaries.

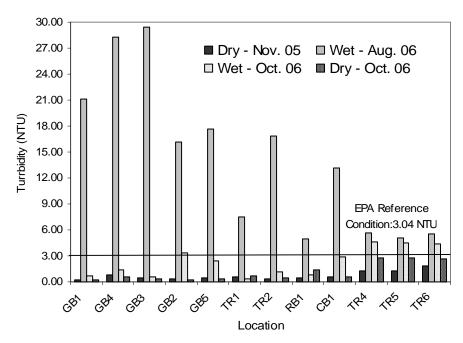


Figure 2-5. Turbidity - Tankerhoosen River Watershed

Metals

The monitoring data suggest a wet weather source of metals to Gages Brook (Figure 2-6 and Figure 2-7). Results from the August 2006 monitoring event indicate a wet weather source of metals close to the I-84 crossing of Gages Brook, as the dissolved copper concentration was consistently below detection limits at the Gages Brook headwaters monitoring location (GB1) and in excess of the chronic aquatic life criterion at several of the downstream Gages Brook locations. The highest wet weather lead concentration was measured in the Gages Brook monitoring location immediately downstream of I-84, which further suggests that highway runoff is a likely source of metals to Gages Brook. Exceedances of the CT WQS for lead were also measured along the Tankerhoosen River at the Fish and Game Road. (TR1) and Bolton Road (TR2) monitoring locations. Elevated dissolved copper and lead concentrations were also measured at the Clarks Brook monitoring location. The data suggest that metals are a potential source of impairment in Gages Brook, Clarks Brook, and the Tankerhoosen River during wet weather. The November 2005 results also indicate dry weather sources of dissolved copper to Gages Brook between the headwaters monitoring location (GB1) and the monitoring location behind the Tolland Agricultural Center (GB2).



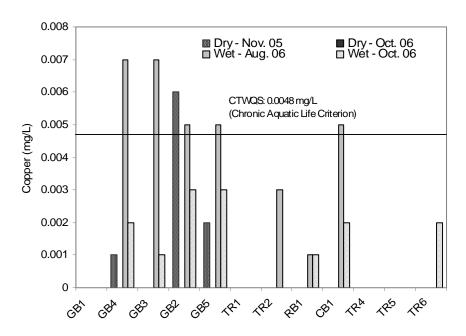


Figure 2-6. Dissolved Copper – Tankerhoosen River Watershed

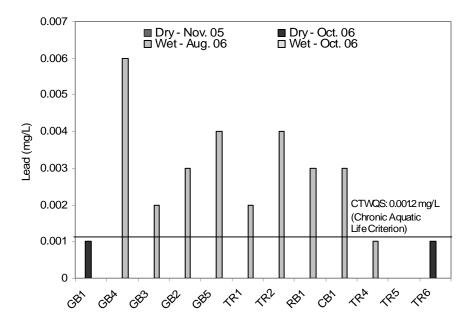


Figure 2-7. Lead – Tankerhoosen River Watershed

Nutrients

Many of the monitoring locations exceeded the EPA recommended Total Nitrogen criterion for rivers in Ecoregion XIV of 0.71 mg/L (Figure 2-8). Nitrogen concentrations were consistently higher at the Gages Brook monitoring locations than the other monitoring locations in both wet and dry weather.



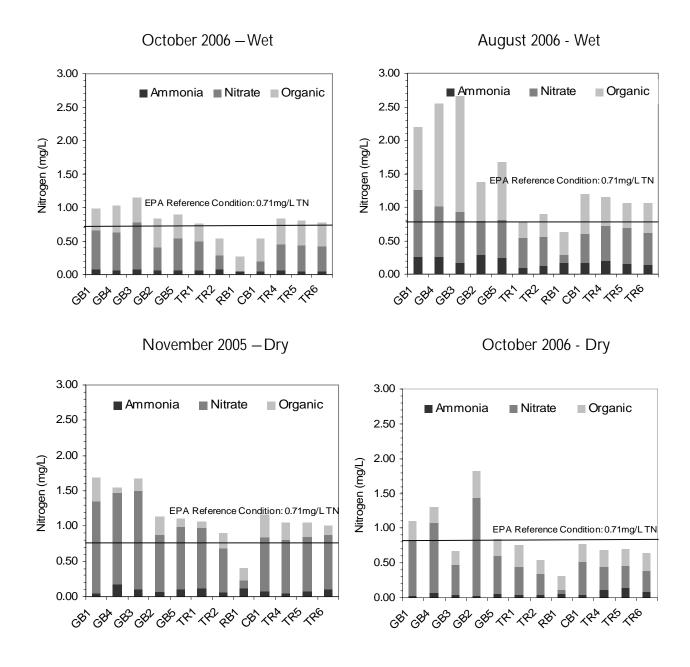


Figure 2-8. Nitrogen Species – Tankerhoosen River Watershed

Phosphorus concentrations measured during the wet and dry weather events significantly exceeded the CT WQS and EPA criterion at most locations (Figure 2-9). The elevated phosphorus levels are an indicator of potential organic enrichment and algal growth in water bodies along the Tankerhoosen River and its tributaries, which could impair aquatic life support and contact recreation under certain conditions.



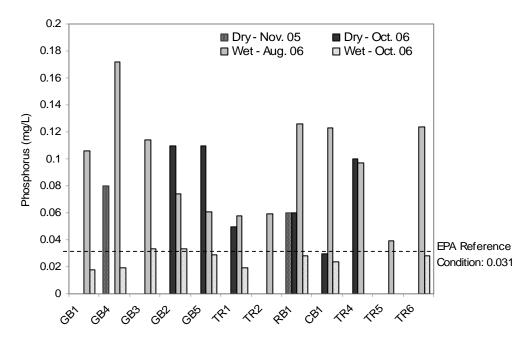


Figure 2-9. Phosphorus – Tankerhoosen River Watershed

Indicator Bacteria

Elevated levels of indicator bacteria (total coliform and *E. coli*) were measured at all monitoring locations during the October 2006 wet weather monitoring event, suggesting stormwater runoff and other non-point sources (pet waste, waterfowl, septic systems, etc.) as likely contributors of elevated pathogen levels in the Tankerhoosen River and its tributaries. Dry weather indicator bacteria concentrations were much lower than wet weather. Natural sources of indicator bacteria such as waterfowl or wildlife may have contributed to several dry weather exceedances of the CT WQS for total coliform at the Gages Brook monitoring location behind the Tolland Agricultural Center and at the Tankerhoosen River monitoring location just upstream of Fish and Game Road.

Bioassessments

The 2006 bioassessment data (RBV and Fuss & O'Neill data collectively) vary considerably by site, but generally indicate very good water quality at most of the monitoring locations, with the exception of the lower Tankerhoosen River near the confluence with the Hockanum River and downstream of Dobsonville Pond. This finding is consistent with previous impairments identified in the lower reaches of the

Tankerhoosen River by the CTDEP. Despite the water quality issues identified in Gages Brook, Clarks Brook, and in certain reaches of the Tankerhoosen River (i.e., heavy metals, turbidity and suspended solids, and potential nutrient enrichment), the 2006 bioassessment data indicate little or no impairment to the benthic communities at the monitored locations.



2.5 Wetlands

Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Wetlands and buffer zones between watercourses and developed areas help to preserve stream water quality by filtering pollutants, encouraging infiltration of stormwater runoff, and protecting against stream bank erosion.

Wetlands in Connecticut are designated by soil classification. Figure 2-10 depicts the extent and distribution of wetland soils in the Tankerhoosen River watershed based on Natural Resources Conservation Service soil classifications. Figure 2-10 also depicts wetland mapping available from the U.S. Fish & Wildlife Service National Wetlands Inventory. Wetlands soils comprise 11.3% of the overall watershed (approximately 926 acres), while 4% of the watershed area (approximately 320 acres) is mapped as freshwater emergent wetlands or freshwater forested/shrub wetlands. The concentration of wetland soils is generally higher in the undeveloped portions of the watershed. Mapped wetland soils are generally located in riparian and floodplain areas along the Tankerhoosen River and its major tributaries. Table 2-6 summarizes wetland soils coverage by subwatershed.

Table 2-6. Wetland Soils Coverage in the Tankerhoosen River Watershed

Subwatershed Name	Wetland Soils Area (ac)	% of Subwatershed	
Bolton Notch Pond	20	5.8 %	
Clarks Brook	101	15.5 %	
Gages Brook	111	15.9 %	
Gages Brook South Tributary	34	5.1 %	
Lower Tankerhoosen River	7	2.3 %	
Middle Tankerhoosen River	188	11.9 %	
Railroad Brook	136	11.3 %	
Tucker Brook	109	11.7 %	
Upper Tankerhoosen River	193	13.1 %	
Walker Reservoir	27	7.6 %	
Tankerhoosen River Watershed	926	11.3%	

At least twenty vernal pools have been identified within the Tankerhoosen watershed by certified scientists (see Figure 2-10). The majority of these were cited by Mr. Ed Pawluk of Connecticut Ecosystems, LLC in a study conducted for the Vernon Conservation Commission. Several of these pools are considered exemplary vernal pools, and as such merit the highest possible level of protection and conservation (Connecticut Ecosystems, LLC, 2005).

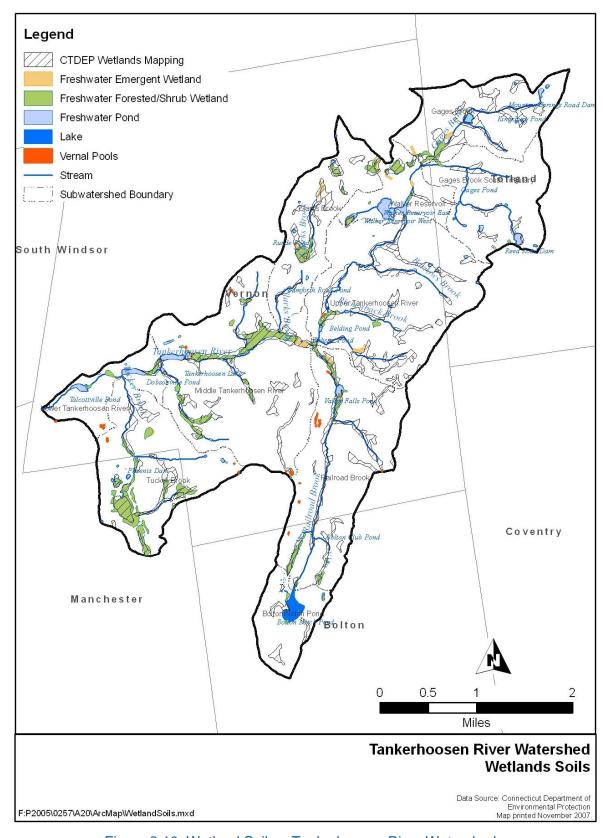


Figure 2-10. Wetland Soils – Tankerhoosen River Watershed



In 1993, a comprehensive survey of plant life was conducted in the 1,400-acre watershed from Valley Falls Park in Vernon to Bolton Notch State Park in Bolton (Sexton, 1993). The study was sponsored by the Town of Bolton Conservation Commission and the Town of Vernon Conservation Commission. A total of 345 species representing 82 families were identified. A small band of marble exists a short distance north and south of the cut at Bolton Notch. A plant species unique to this area includes the Yellow Lady's Slipper. Marble is rare east of the Connecticut River and supports additional plants preferring more basic soil including the purple cliff-brake and maidenhair fern (Sexton, 1993).

2.6 Fish and Wildlife Resources

Portions of the Tankerhoosen River have abundant habitats supportive of a variety of fish and wildlife. Various waterbodies, wetlands, and upland areas provide habitat to fish, mammals, amphibians, and birds.

Particularly notable is the 282-acre Belding Wildlife Management Area located in the central portion of the Tankerhoosen River watershed. The Belding Wildlife Management Area is a significant natural resource of undeveloped land owned by the State of Connecticut and managed by the DEP. A 1.4-mile section of the Tankerhoosen River within the Belding Wildlife Management Area is managed as a Class 1 Wild Trout Management Area and is one of only two such areas in eastern Connecticut. This section of stream is characterized by natural reproduction sufficient to produce robust populations of native brook trout (up to 8-10 inches) and wild brown trout (up to 10-11 inches) exhibiting above average growth rates (DEP correspondence, 2003).

Areas in the Tankerhoosen River watershed that provide significant habitat are summarized in Table 2-7. These areas provide habitat for some of the most valuable or unique natural resources or ecosystems in their respective communities. Other open space areas are described in the Land Use and Land Cover section of this report.

Table 2-7. Areas Providing Habitat for Valuable or Unique Natural Resources

Town	Areas
	 Vernal Pools on Box Mountain
	 Tancanhoosen LLC Parcel
	Talcottville Gorge
Vernon	Belding Wildlife Management Area
	 Belding Wild Trout Management Area
	 Valley Falls Park
	 Rambling Ridge Property
	Webster-Knapp Preserve
Tolland	 Tolland and Charter Marshes
Dolton	 Freja Park
Bolton	Bolton Notch State Park

Source: Hockanum River — State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

Freja Park is a 21-acre, wooded town-owned area located west of Bolton Notch Pond. Freja Park serves as a gateway for the 1,400-acre Bolton Notch/Valley Falls watershed



area. The town of Bolton originally acquired the property in 1968, but the park suffered from abuse and neglect. Beginning in March 1998, restoration efforts have been underway including numerous Earth Day Clean-up events with the help of volunteers, Boy Scouts, Conservation Commission members. A total of over two tons of litter have been removed from the park.

2.6.1 Fisheries

The Tankerhoosen River historically hosted large runs of many anadromous fish species. Development of the river with dams from 1700 to the 1920s created barriers to fish migration, which extirpated the salmon run and severely limited the upstream habitat for shad and river herring. Despite these obstacles, the Tankerhoosen River and its tributaries support a variety of fish species as detailed in Table 2-8.

The Tankerhoosen River is a cold water stream starting only a short distance below Walker Reservoir. The generally cold water temperatures in the Tankerhoosen are the result of extensive spring water inputs (DEP correspondence, 2008).

As indicated previously, the Belding Wild Trout Management Area in the upper portions of the Tankerhoosen River watershed is a Class 1 Wild Trout Management Area with self-sustaining native trout populations that rank among the best of their kind in the state. Portions of the remainder of the Tankerhoosen River are stocked annually by the DEP Inland Fisheries Division. Valley Falls Park Pond is stocked in the spring and winter with about 4,400 rainbow trout and generates between 7,500-8,000 angler hours of fishing annually. Walker Reservoir, upstream of the Belding Wildlife Management Area, is stocked each spring with over 1,800 adult brown and rainbow trout (DEP correspondence, 2003).

Table 2-8. Fish Species

	Bolton Notch Pond	Gages Brook	Lower Tank. River	Middle Tank. River	Upper Tank. River	Railroad Brook
American Eel				Х	Х	Х
Brown Bullhead	Х					X
Black Crappie	X				Χ	
Blacknose Dace		Χ		Χ	Χ	X
Brook Trout		Χ		Χ	Χ	X
Brown Trout			X	Χ	Χ	X
Bluegill	X		X	Χ	Χ	X
Chain Pickerel	X		X	Χ		
Common Shiner				Χ	Χ	X
Creek Chub				Χ	Χ	
Fallfish				Χ	Χ	
Fathead Minnow		Χ				
Golden Shiner	Χ			Χ	Χ	
Longnose Dace				Χ	Χ	
Largemouth Bass		Х	X	Χ	X	X
Pumpkinseed Sunfish	Х	Х	Х	X	X	Х
Rainbow Trout				Χ	Χ	Χ
Rockbass			Χ			
Smallmouth Bass			X			
Tessellated Darter			Χ	Χ	X	



Table 2-8. Fish Species

	Bolton Notch Pond	Gages Brook	Lower Tank. River	Middle Tank. River	Upper Tank. River	Railroad Brook
White Sucker		Χ		Χ	Х	Х
Yellow Perch	Χ			Χ		Χ
					Stocked	
Tiger Trout					in Pond	
					Stocked	
Golden Trout					in Pond	

2.6.2 Birds

Bird surveys were conducted in 2004 at the Tancanhoosen LLC property, within Valley Falls Park, and at various Town of Vernon properties, including areas around Walker Reservoir East and on the Connecticut Light & Power line site.

Eighty bird species were detected during the 2004 surveys. Seventy four species were counted during standardized bird counts at 24 count points, and 6 more were detected as incidental observations. The greatest number of species occurred at Walker Reservoir, while the former gravel pit on the Tancanhoosen LLC property contained the most uncommon birds. Prairie warbler, field sparrow, brown thrasher and eastern towhee were detected on the Tancanhoosen LLC property throughout the breeding season. Populations of these species are declining and brown thrasher is on Connecticut's list of Species of Special Concern. These birds are dependent on early successional habitats such as grassland and shrubland. These habitat types have been lost to reforestation and human development. The gravel pit is at an early successional stage with open, grassy habitat and short, scattered pine trees. This site will eventually revert to a forested habitat unless actively managed to maintain early successional habitat. Once the site is reforested, early successional species will disappear from this site (Seymour, 2004).

The Tankerhoosen River watershed also supports a wide range of bird of species. Surveys performed in 2003 and 2004 reported evidence of great blue heron, wood duck, willow flycatcher, hermit thrush, black-throated blue warbler, broad-winged hawk, hairy woodpecker, pileated woodpecker, olive-sided flycatcher, yellow-throated vireo, red-breasted nuthatch, blue-gray gnatcatcher, Nashville warbler, pine warbler, blackpoll warbler, blackburnian warbler, cerulean warbler, worm-eating warbler, and Canada warbler. European starling and house sparrow, two introduced invasive species, were also identified (Seymour, 2004). A complete species list is provided in the *Baseline Watershed Assessment* (Fuss & O'Neill, May 28, 2008).

During 1999, a bird survey was completed to determine the species diversity and the relative abundance of breeding landbirds within Freja Park and Bolton Notch State Park (Comins, 1999). Of the total 55 species were recorded, 51 were likely nesting species and four were probably non-nesting visitors or migrants. An additional fourteen species were not recorded on the survey, but were identified as likely to occur during the nesting season. Another twenty-nine species have reasonable possibility of occurring in the nesting season from time to time or could be attracted to the area.



Two Connecticut State Species of Special Concern were recorded; six species were listed as National Audubon Society Watch List High Conservation Priority species in Connecticut were recorded; an additional six species not listed as watch species were listed by Partners in Flight as High Conservation Priority Species in Connecticut; fourteen species that were uncommon nesters in the Hartford area were recorded (Comins, 1999). See report for additional listing of specific species.

2.6.3 Amphibians & Reptiles

Amphibian and reptile surveys were conducted in 2004 within the Tankerhoosen River watershed, including the Belding Wildlife Management Area, Barrows Brook, and Railroad Brook. Some of the species identified included Northern redback salamander, Northern two-lined salamander, Spotted salamander, American toad, Northern spring peeper, Gray treefrog, Wood frog, Green frog, Pickerel frog, Painted turtle, and Garter snake. The most abundant amphibian species detected during this study was the northern redback salamander. A complete list of the identified amphibian and reptile species is provided in the *Baseline Watershed Assessment* (Fuss & O'Neill, May 28, 2008). A previously undocumented vernal pool was discovered between Reservoir Road and Walker Reservoir West. Additional vernal pools were identified on Bolton Road and above Valley Falls Park (Seymour, 2004).

2.6.4 Threatened and Endangered Species

The DEP Natural Diversity Data Base (NDDB) maintains information on the location and status of endangered, threatened, and special concern species in Connecticut. Figure 2-11 displays the generalized areas of endangered, threatened, and special concern species in the Tankerhoosen River watershed. The areas represent a buffered zone around known species or community locations. The locations of species and natural community occurrences depicted on the NDDB mapping are based on data collected over the years by the Environmental and Geographic Information Center's Geologic and Natural History Survey, other units of the DEP, conservation groups, and the scientific community. Approximately ten such areas were identified throughout the watershed. Because new information is continually being added to the Natural Diversity Database and existing information updated, the areas are reviewed on an annual basis by the DEP. Areas can be removed or added based upon the results of the review.

Table 2-9. Endangered, Threatened, and Special Concern Species

Common Name	Scientific Name	Status				
	Flora					
Climbing fern	Lygodium palmatum	Special Concern				
Sphagnum	Sphagnum pulchrum					
Beaked sedge	Carex rostrata					
Leatherleaf	Chamaedaphne calyculata					
	Fauna					
Eastern pearlshell	Margaritifera margaritifera	Special Concern				
Brown thrasher	Toxostoma rufum	Special Concern				
Southern bog lemming	Synaptomys cooperi	Special Concern				
Wood turtle	Clemmys insculpta	Special Concern				
Purple martin	Progne subis	Threatened				



Table 2-9. Endangered, Threatened, and Special Concern Species

Common Name	Scientific Name	Status		
Eastern box turtle	Terrapene c. carolina	Special Concern		
Habitats				
Medium fen				
Subacidic rocky				
summit/outcrop				

Source: DEP Natural Diversity Data Base, 2008.

- "Endangered Species" means any native species documented by biological research and inventory to be in danger of extirpation (local extinction) throughout all or a significant portion of its range within Connecticut and to have no more than five occurrences in the state.
- "Threatened Species" means any native species documented by biological research and inventory
 to be likely to become an endangered species within the foreseeable future throughout all or a
 significant portion of its range within Connecticut and to have no more than nine occurrences in
 the state.
- "Species of Special Concern" means any native plant or any native nonharvested wildlife species
 documented to have a naturally restricted range or habitat in the state, to be at a low population
 level, to be in such high demand by man that its unregulated taking would be detrimental to the
 conservation of its population, or has become locally extinct in Connecticut.

2.7 Watershed Modifications

2.7.1 Dams, Impoundments, & Water Supply

The historical industrial use of the Tankerhoosen River and its major tributaries has left behind many small dams and impoundments. Most of this infrastructure is no longer used for power generation, and many of these impoundments currently provide aquatic and wildlife habitat and recreational opportunities. Many of the dams in the watershed are also an impediment to fish migration.

According to the DEP Dam Safety Regulations, the hazard classification of a dam is based on the damage potential from failure of the structure. Figure 2-12 shows the location and hazard classification of the identified dams within the watershed. Some of the dams which no longer serve an integral function to industry or public use have fallen into disrepair and pose a potential hazard to downstream properties.

Table 2-10 lists the major drinking water supplies within the Tankerhoosen River watershed that are regulated under the DEP Water Diversion program.

Table 2-10. Major Drinking Water Supplies

Name	Name of Diversion	MGD	Town
	Vernon Well #1	0.1728	Vernon
Connecticut Water	Vernon Well #2	0.1728	Vernon
Connecticut water	Vernon Well #3	0.1440	Vernon
	Vernon Well #4	0.1728	Vernon
	Vernon Well #5	0.4320	Vernon
Manchester Water Department	New Bolton Well Field, Well #1,2,3	Various	Bolton

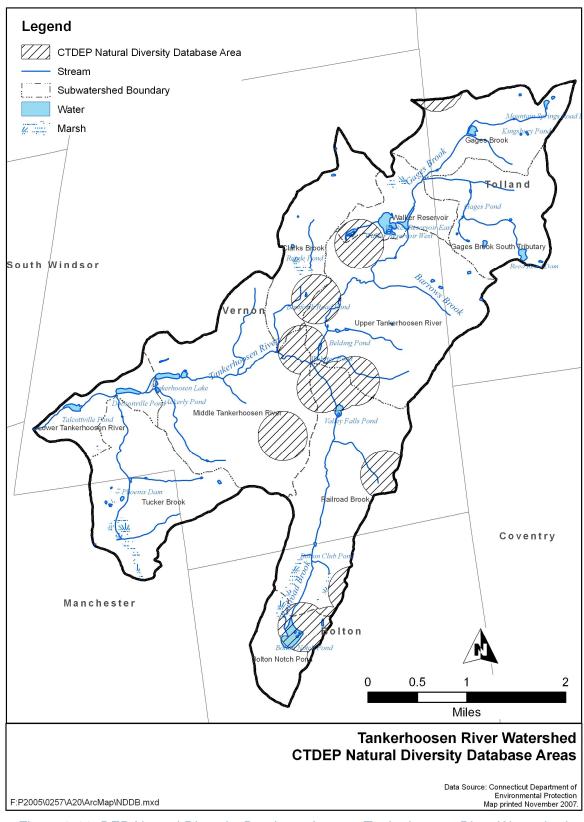


Figure 2-11. DEP Natural Diversity Database Areas – Tankerhoosen River Watershed

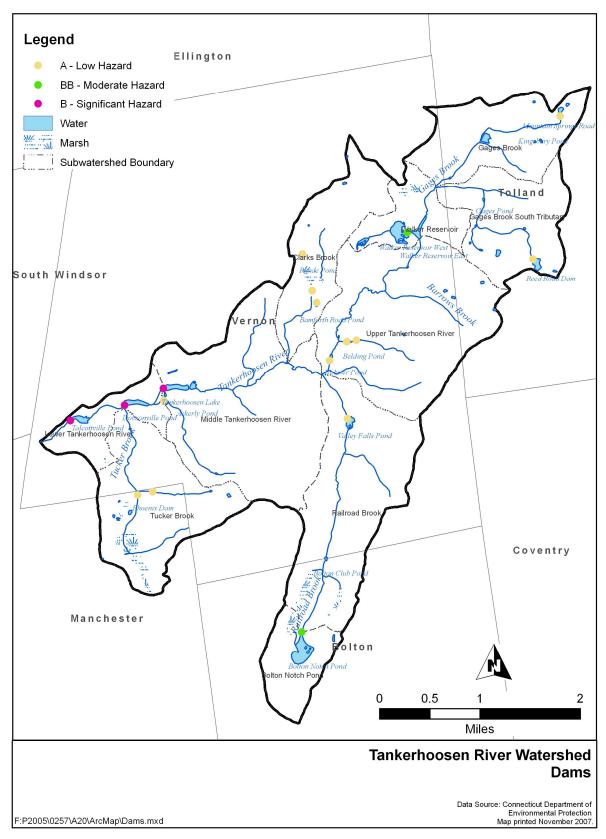


Figure 2-12. DEP Regulated Dams – Tankerhoosen River Watershed



The DEP, with Cooperation from the Connecticut Water Company, has identified two preliminary (Level B) Aquifer Protection Areas associated with these wells within the Tankerhoosen River watershed, as shown in Figure 2-13. Aquifer Protection Areas are designated around active well fields in sand and gravel aquifers that serve more than 1,000 people. Level B mapping identifies the general area of aquifer recharge based primarily on topography. The watershed communities are required to establish land use regulations for these areas to limit potential contamination to public groundwater supplies. Private groundwater supply wells are also prevalent throughout areas of the watershed that are not served by public water supplies.

2.7.2 Wastewater Discharges

As summarized in Table 2-11, there are number of industrial, commercial, and municipal facilities in the Tankerhoosen River Watershed with surface water discharges regulated under the National Pollutant Discharge Elimination System (NPDES) permit program, which is administered by the Connecticut DEP. The facilities listed in Table 2-5 have either permitted wastewater or stormwater discharges to surface waters. The majority of these facilities are located in Vernon. There are no municipal wastewater treatment plants located within the Tankerhoosen River watershed.

Table 2-11. NPDES Regulated Facilities

Town	Facility	Location	Permit Number
	Carpenter's Mobil	447 Hartford Turnpike	GVS000915
	Company 1 Firehouse	724 Hartford Turnpike	GVM000592
	Connecticut Golfland	95 Hartford Turnpike	GPL000108
	First Student	25 Whitney Ferguson Road	GSI001217
	Motiva Enterprises LLC	444 Hartford Turnpike	GGR001404
	Moore's Automotive	1245 Hartford Turnpike	GVM000806
Vernon	Mount Vernon Apartments	1120 Hartford Turnpike	GVS000863
	Oakland Meadows	1158 Hartford Turnpike	GSN001098
	Tighitco, Inc.	101-77 Industrial Park Road	GSI001599
	Vernon Maintenance	37 Campbell Avenue	GVS000988
	Verriori Mairiteriarice	37 Campbell Avenue	GSI000074
	VMS Construction Company	120 Bolton Road	GVM000980
Bolton	Transportation Facility	326 Boston Turnpike	GSI001179
BOILOIT	Hull's Autobody	299-301 Boston Turnpike	GVM000800
	Dari Farms	Gerber Drive	GSN000814
	Mr. Sparkle Car Wash	157 Hartford Turnpike	GVM000646
	Connecticut Light & Power Co.	45 Tolland Stage Road	GVS001027
Talland	Gerber Scientific Inc.	24 Industrial Park Road West	GSI000914
Tolland	Standard Dogistor Co	250 Hartford Turppiko	GPP000152
	Standard Register Co.	259 Hartford Turnpike	GPH000345
	CNC Software Inc.	671 Old Post Road	GSN000070
	Belvedere Ridge	601 Old Post Road	GSN001308

Source: DEP, December 2007

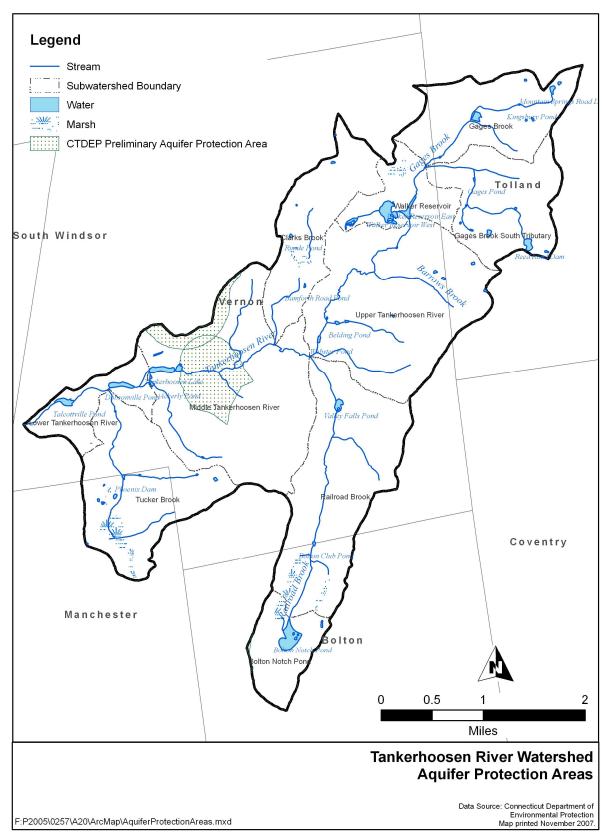


Figure 2-13. DEP Aquifer Protection Areas – Tankerhoosen River Watershed



Figure 2-14 depicts sewer service areas in the watershed. Areas outside of the mapped sewer service areas are presumed to be on individual sewage disposal (i.e., septic) systems. Approximately 23% of the overall Tankerhoosen River watershed area is served by municipal sanitary sewers.

Historical and current industrial and commercial development within the Tankerhoosen River watershed poses a potential threat to surface water and groundwater supplies in the watershed. Illegal waste disposal, improper use and disposal of chemicals such as used oil, pesticides, and herbicides, and chemical spills are potential sources of contaminants from industrial and commercial facilities. As summarized in Table 2-12, several hazardous waste generators and other regulated sites are located within the watershed. These facilities are located in both Vernon and Tolland in the central and upper portions of the watershed.

 Site Type
 Number of Sites

 Vernon
 Tolland

 Hazardous Waste Generator
 5
 6

 Air Emissions
 1
 2

 CERCLA Site
 1 (1 on Final NPL)
 0

Table 2-12. Summary of Regulated Sites

There is one site that is listed as potential hazardous waste site that EPA has evaluated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), otherwise known as "Superfund." This site, Precision Plating Corporation, is located in the Hillside Industrial Park in Vernon and is currently on the Final National Priorities List (NPL). Chromium contaminated groundwater at the site is being remediated under the direction of the DEP.

2.8 Land Use and Land Cover

The type and distribution of land use within a watershed have direct impact on nonpoint sources of pollution and water quality. This section describes the land use and land cover patterns in the Tankerhoosen River watershed.

2.8.1 Current Conditions

Land Use

Figure 2-15 depicts general land use patterns in the Tankerhoosen River watershed. The data in Figure 2-15 are parcel-based land use categories for the watershed communities, provided by the Capital Region Council of Governments (CRCOG). The land uses in the watershed include 20 land use categories (Table 2-13). Approximately 60% of the watershed consists of developed land uses, with single-family residential comprising the largest percentage (40%). Highway and other road right-of-ways comprise approximately 9% of the watershed area. Approximately 30% is classified as resource/recreation land use, which includes committed and uncommitted open space. Major portions of the riparian areas adjacent to the Tankerhoosen River and its tributaries are located within resource/recreation areas.

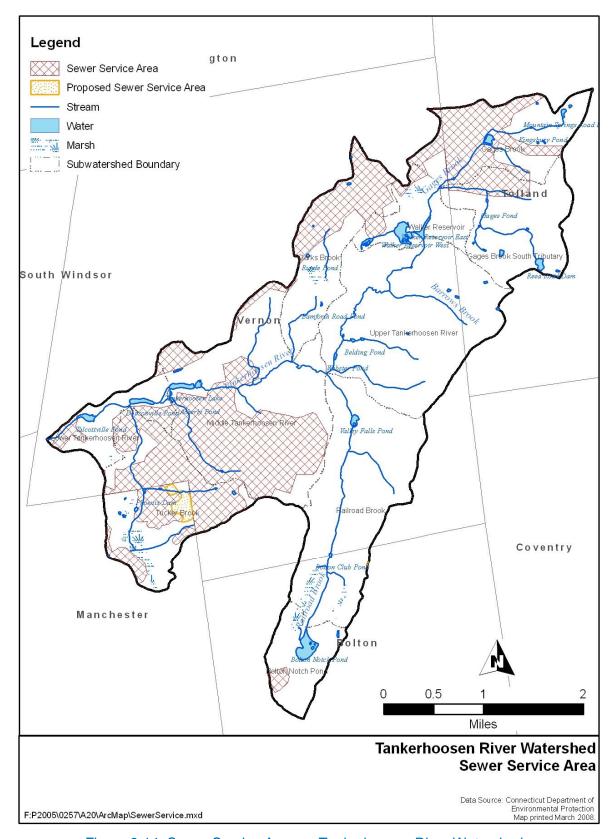


Figure 2-14. Sewer Service Areas – Tankerhoosen River Watershed

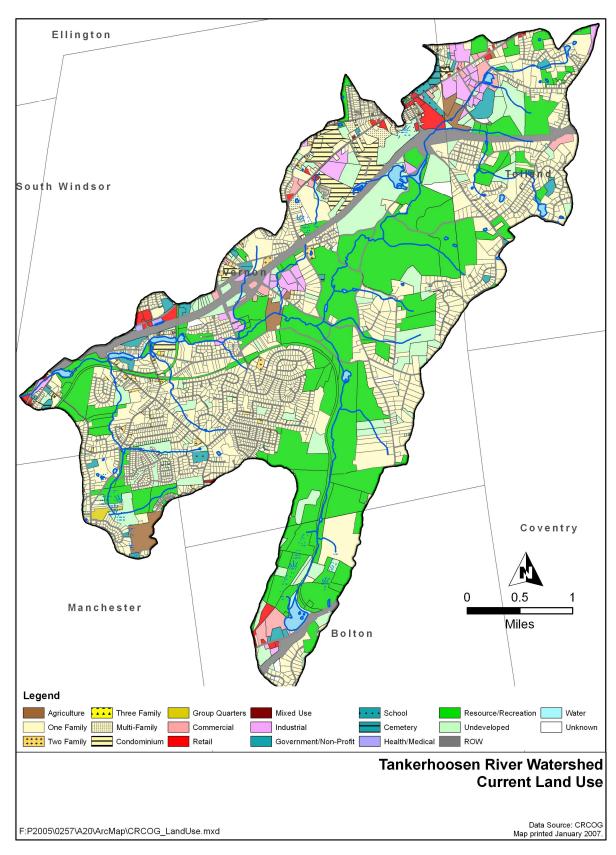


Figure 2-15. Current Land Use – Tankerhoosen River Watershed



Areas in the northern portion of the watershed are more commercialized and have a greater retail and industrial use, with commercial, retail, and industrial land uses comprising approximately 4% of the watershed area. The majority of the commercial, industrial, and retail areas are located in headwater regions adjacent to the major transportation corridors of I-84/Route 30 and I-384.

Table 2-13. Current Land Use – Tankerhoosen River Watershed

Land Use Type	Acres	Percent of Watershed
Agriculture	103	1%
One Family	3160	38%
Two Family	48	<1 %
Three Family	2	<1 %
Multi Family	39	<1 %
Condominium	165	2%
Group Quarters	12	<1 %
Commercial	110	1%
Retail	88	1%
Mixed Use	3	<1 %
Industrial	183	2%
Government/Non-Profit	102	1%
School	26	<1 %
Cemetery	22	<1 %
Health/Medical	6	<1 %
Resource/Recreation	2398	29%
Undeveloped	851	10%
Right-of-way	770	9%
Water	77	<1 %
Unknown	61	<1 %

In the Tankerhoosen River watershed, several tracts of potentially developable land have been permanently preserved as "committed" open space. Committed open space parcels in the Town of Vernon and the Town of Bolton were identified through available land use mapping and confirmed by members of the Technical Advisory Committee and the Bolton Conservation Commission. Committed open space parcels in Tolland and Manchester were determined through available mapping from each Town's Plan of Conservation and Development (POCD) and from the Connecticut Office of Policy and Management Municipal Plans of Conservation and Development. In general, the committed open space areas include deeded open space that is privately owned, parcels owned by land trusts, land owned by the State of Connecticut as well as parks owned by the Town of Vernon and Town of Bolton, including the Hop River State Park Trail, Valley Falls Park, Freja Park, and Bolton Notch State Park. This land is protected against future development and is generally located in the central and southern portion of the watershed. Figure 2-16 identifies the committed open space land in the watershed.

In addition, several parcels within the watershed are designated for agricultural or forestry use under Public Act 490. While development is not prohibited on this land, this program reduces the tax burden on this land, thereby relieving some of the pressure to develop the land and allows it to continue to serve as open space.

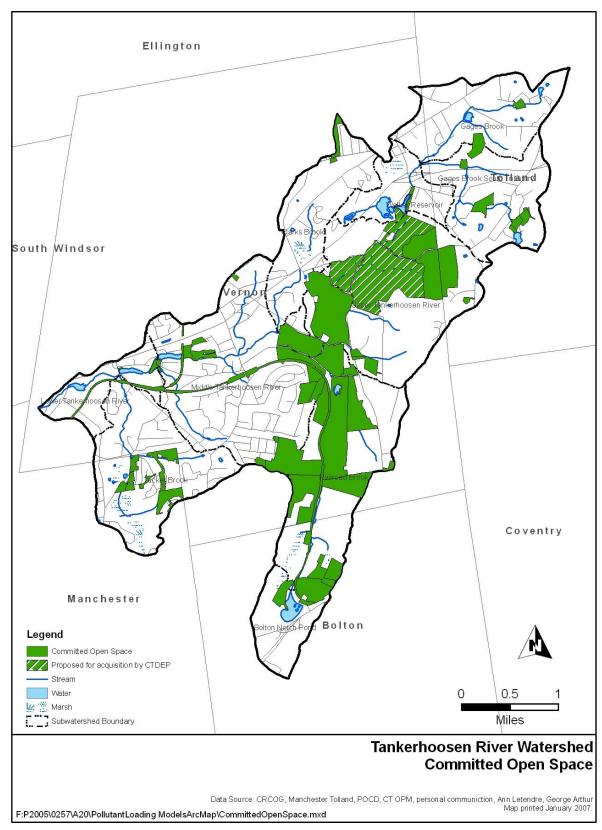


Figure 2-16. Committed Open Space – Tankerhoosen River Watershed



Zoning

Figure 2-17 depicts the zoning designations in the Tankerhoosen River watershed. The data in Figure 2-17 are also parcel-based and provided by CRCOG. The majority of the Tankerhoosen River watershed is zoned for residential uses. Commercial and industrial zones associated with the I-384 and I-84 corridors are located in the southern and northern portions of the watershed, respectively.

Land Cover

Figure 2-18 depicts the general land cover in the Tankerhoosen River watershed. Data shown in Figure 2-18 are land cover categories derived from 2002 Landsat satellite imagery with ground resolution of 30 meters. The land cover data in the watershed are summarized into ten categories (Table 2-8). These ten categories are those used in the Connecticut Land Cover Map Series and are described following the table (University of Connecticut Center for Land Use Education and Research).

Table 2-14. Land Cover – Tankerhoosen River Watershed

		1985	2	2002		Relative
Land Cover Type	Acres	Percent of Watershed	Acres	Percent of Watershed	Percent Change ¹	Percent Change ²
Barren	91	1%	162	2%	1%	78%
Coniferous Forest	454	6%	430	5%	-1%	-5%
Deciduous Forest	4581	56%	4085	50%	-6%	-11%
Developed	1793	22%	2201	27%	5%	23%
Forested Wetland	192	2%	175	2%	0	-9%
Non-Forested Wetland	2	< 1 %	19	<1 %	0	912%
Other Grasses and Agriculture	551	7%	603	7%	0	9%
Turf and grass	448	5%	447	5%	0	0%
Utility Right of Way	19	< 1 %	17	<1 %	0	-12%
Water	95	2%	88	1%	1%	-7%

¹Calculation = % land cover 2002 - % land cover 1985

- Barren Mostly non-agricultural areas free from vegetation, such as sand, sand and gravel operations, bare exposed rock, mines, and quarries. Also includes some urban areas where the composition of construction materials spectrally resembles more natural materials. Also includes some bare soil agricultural fields.
- Coniferous Forest Includes Southern New England mixed softwood forests. May include isolated low density residential areas.
- Deciduous Forest Includes Southern New England mixed hardwood forests. Also includes scrub areas characterized by patches of dense woody vegetation. May include isolated low density residential areas.
- Developed High density built-up areas typically associated with commercial, industrial and residential activities and transportation routes. These areas contain a significant amount of impervious surfaces, roofs, roads, and other concrete and asphalt surfaces.
- Forested Wetland Includes areas depicted as wetland, but with forested cover. Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.
- Non-forested Wetland Includes areas that predominantly are wet throughout most of the year and that have a detectable vegetative cover (therefore not open water). Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.
- Other Grasses and Agriculture Includes non-maintained grassy areas commonly found along transportation routes and other developed areas and also agricultural fields used for both crop production and pasture.

²Calculation = (acres land cover 2002 —acres land cover 1985) / acres land cover 1985 Source: University of Connecticut's Center for Land Use Education and Research (CLEAR)

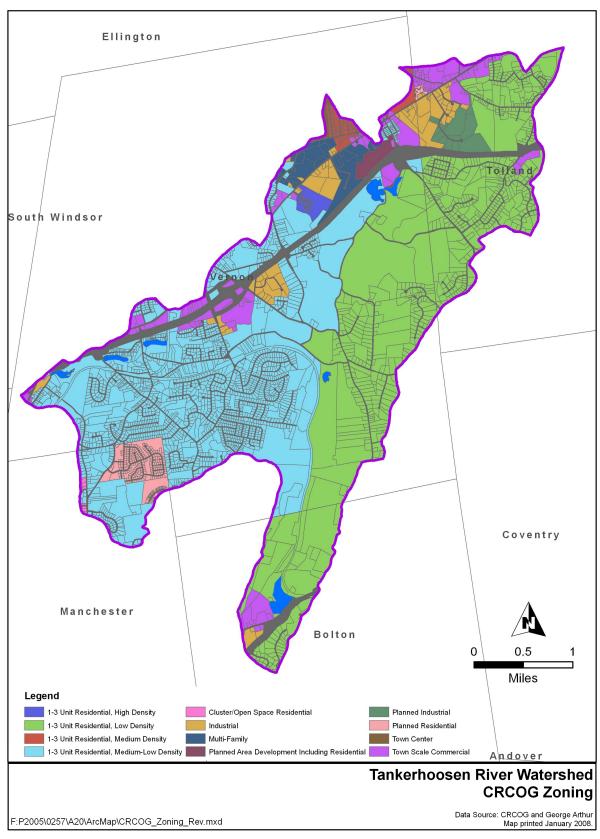


Figure 2-17. Watershed Zoning as Defined by CRCOG – Tankerhoosen River Watershed

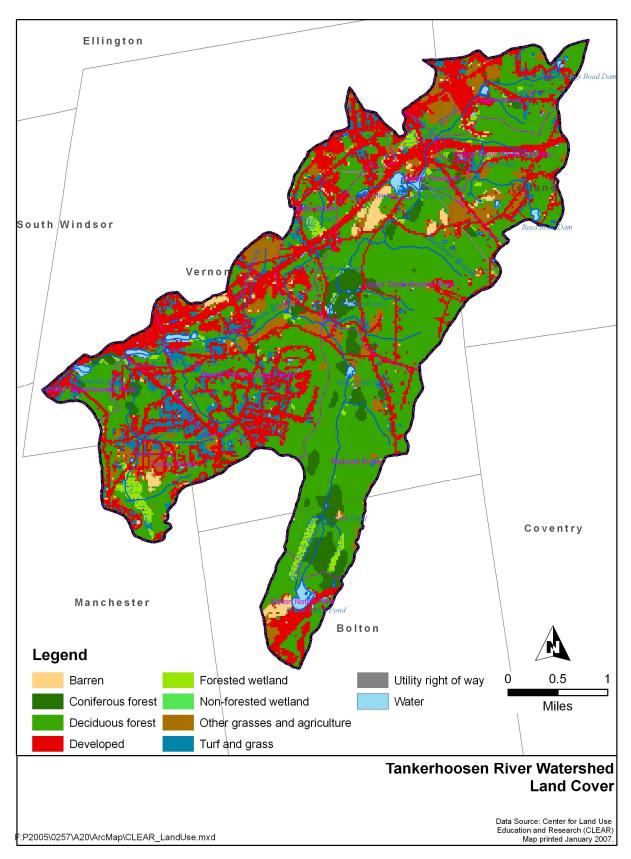


Figure 2-18. Land Cover – Tankerhoosen River Watershed



- Turf & Grass A compound category of undifferentiated maintained grasses associated mostly with
 developed areas. This class contains cultivated lawns typical of residential neighborhoods, parks, cemeteries,
 golf courses, turf farms, and other maintained grassy areas. Also includes some agricultural fields due to
 similar spectral reflectance properties.
- Utility Includes utility rights-of-way. This category was manually digitized on-screen from rights-of-way
 visible in the Landsat satellite imagery. The class was digitized within the deciduous and coniferous
 categories only.
- Water Open water bodies and watercourses with relatively deep water.

Forest Cover

Forested areas are the predominant land cover type in the Tankerhoosen River watershed. Approximately 55% of the watershed consists of deciduous and coniferous forests, primarily in the central and southern portions of the watershed. Table 2-15 compares the total acres and percent forest cover by subwatershed. The percent forest cover in each subwatershed ranges from approximately 31% in the Walker Reservoir subwatershed to approximately 86% in the Railroad Brook subwatershed. Based on a literature threshold values documented in several studies (CLEAR, 2007), watershed forest cover of 65% or greater is the minimum needed for a healthy aquatic invertebrate community. Only two of the ten subwatersheds, Railroad Brook and the Upper Tankerhoosen River, exceed the threshold value of 65%. Based on a recommendation of the American Forests organization, 40% forest cover is a reasonable threshold goal for urban areas. All but two subwatersheds, Clarks Brook (34.8 %) and Walker Reservoir (31.3 %), both of which are located in the northern and most developed portion of the watershed, meet this goal.

Table 2-15. Forest Cover - Tankerhoosen River Watershed

Subwatershed Name	Forest Cover in Subwatershed (acres)	Percent Forest Cover in each Subwatershed	Developable Forest Cover in Subwatershed (acres)	Forest Cover that is Developable
Bolton Notch Pond	171	49.60%	41	24.00%
Clarks Brook	226	34.80%	70	30.90%
Gages Brook	314	45.20%	134	42.60%
Gages Brook South Tributary	395	58.10%	171	43.30%
Lower Tankerhoosen River	149	46.60%	82	54.90%
Middle Tankerhoosen River	625	39.60%	122	19.60%
Railroad Brook	1043	86.30%	346	33.20%
Tucker Brook	374	40.00%	119	31.80%
Upper Tankerhoosen River	1110	75.40%	278	25.00%
Walker Reservoir	109	31.30%	54	49.20%
Tankerhoosen River Watershed	4515	54.90%	1416	31.40%

Table 2-15 also includes a comparison of the amount of forest cover in each subwatershed that could potentially be developed in the future (i.e., "developable"). Refer to Section 2.5.2 for a discussion of the determination of "developable" areas and watershed buildout scenario. The percent of forest cover that is developable for each subwatershed ranges from approximately 20% in the Middle Tankerhoosen River subwatershed and up to approximately 55% in the Lower Tankerhoosen River subwatershed. These results suggest that future development within the watershed has



the potential to significantly reduce forest cover and, in some subwatersheds, to below recommended thresholds.

Riparian Vegetation

Riparian, or streamside, corridors are critical areas important to stream stability, pollutant removal, and wildlife habitat. These areas are also sometimes called "buffer" areas, but are not to be confused with regulatory review zones, which are often also called buffers (CLEAR 2007). A stream walk survey of the Tankerhoosen River conducted in 1999 revealed that riparian buffers of 100 feet are common between the river and developed areas. However, some areas along the lower reaches of the Tankerhoosen River were identified as having stream buffers of less than 25 feet, according to the results of a 2000 stream walk survey of the Tankerhoosen River.

In order to assess the status and of the riparian corridors in the Tankerhoosen River watershed, the acreage of forest cover within the riparian area (defined as a 200-foot buffer on both sides of streams and a 200-foot buffer from waterbody shorelines) was calculated for each of the ten subwatersheds based on the 2002 Center for Land Use Education and Research (CLEAR) forest land cover classes (coniferous and deciduous forest). The results are provided in Table 2-16.

Forest Cover in Percent of 200-foot Subwatershed Name 200-foot Riparian Riparian Corridor Corridor (acres) that is Forested Bolton Notch Pond 34.90% 19 Clarks Brook 42 46.30% Gages Brook 85 61.40% Gages Brook South Tributary 93 62.30% Lower Tankerhoosen River 31 35.80% Middle Tankerhoosen River 99 41.80% Railroad Brook 167 87.20% Tucker Brook 92 51.80% Upper Tankerhoosen River 216 80.70% Walker Reservoir 21 23.10% Tankerhoosen River 866 58.30% Watershed

Table 2-16. Forest Cover in Riparian Corridors

Forest cover within the 200-foot riparian corridor for the overall Tankerhoosen River Watershed is nearly 60%, although the amounts vary considerably by subwatershed. Railroad Brook (87.2%) and the Upper Tankerhoosen River (80.7%) subwatersheds have the highest percentage of forest cover within the 200-foot riparian corridor. Walker Reservoir (23.1%) and Bolton Notch Pond (34.9%) have the lowest percentage of forest cover within the 200-foot riparian corridor. These results indicate that large portions of the watershed streams and waterbodies are well-protected by intact riparian forest cover, although several subwatersheds have significantly lower riparian forest cover.



Developed Areas

Developed areas are also a dominant land cover type in the Tankerhoosen River watershed. Approximately 27% of the watershed consists of commercial, industrial, residential, and transportation land cover types (i.e. "developed" category) that follow the major transportation corridors, regional retail and commercial areas, and population centers. Approximately 7% of the watershed consists of other grass and agriculture, although only a small portion of this (approximately 1%) consists of land in active agricultural use.

A comparison of watershed land cover data between 1985 and 2002 (Table 2-14) shows a moderate increase in watershed development during this period (5% increase in developed cover types) and a corresponding loss of coniferous (1% decrease) and deciduous forest (6% decrease).

Impervious Cover

Impervious cover has emerged as a measurable, integrating concept used to assess the overall condition of a watershed. Numerous studies have documented the cumulative effects of urbanization on stream and watershed ecology (Center for Watershed Protection, 2003; Schueler et al., 1992; Schueler, 1994; Schueler, 1995; Booth and Reinelt, 1993, Arnold and Gibbons, 1996; Brant, 1999; Shaver and Maxted, 1996). Research has also demonstrated similar effects of urbanization and watershed impervious cover on downstream receiving waters such as lakes, reservoirs, estuaries, and coastal areas.

The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. Although well-defined imperviousness thresholds are difficult to recommend, research has generally shown that when impervious cover in a watershed reaches between 10 and 25 percent, ecological stress becomes clearly apparent. Between 25 and 60 percent, stream stability is reduced, habitat is lost, water quality becomes degraded, and biological diversity decreases (NRDC, 1999). Watershed imperviousness in excess of 60 percent is generally indicative of watersheds with significant urban drainage. Figure 2-19 illustrates this effect. These research findings have been integrated into a general watershed planning model known as the impervious cover model (ICM) (CWP, 2003). The ICM has also been confirmed locally in Connecticut by the DEP, which has determined a statewide impervious cover threshold of 12 percent for aquatic life impairment (Belucci, DEP, 2007).

A GIS-based impervious cover analysis was performed for the Hockanum River watershed and including the Tankerhoosen River watershed by staff from the Department of Natural Resources Management and Engineering at the University of Connecticut (Civco, 2005). The satellite-derived land cover data described previously were used in the analysis. This technique, known as "direct impervious surface modeling", extracted impervious surface data directly from 2002 Landsat imagery to estimate the amount of impervious surface within each pixel. The DEP GIS basin layer was used to calculate the percent of imperviousness by basin. Figure 2-19 graphically summarizes the results of this analysis.



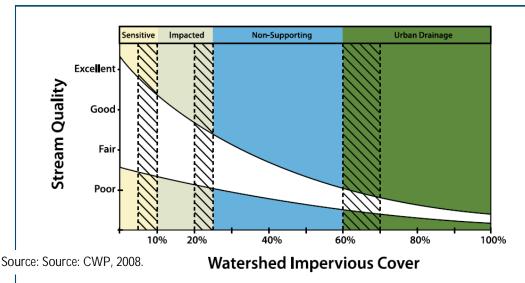


Figure 2-19. Conceptual Model Illustrating Relationship Between Watershed Impervious Cover and Stream Quality

The overall imperviousness of the Tankerhoosen River watershed is estimated at approximately 9.7%. This level of impervious cover is slightly below the CTDEP aquatic life impairment threshold of approximately 12%, where ecological stress and stream impacts become apparent. As shown in Figure 2-20 and summarized in Table 2-17, impervious cover in much of the central and southern portions of the watershed (Upper Tankerhoosen River and Railroad Brook watersheds) is less than 5%, consistent with the high percentage of forest cover and conservation land in these areas. The headwater tributaries of the Tankerhoosen River, specifically Gages Brook, are estimated to have approximately 11.5% impervious cover, while localized subwatershed areas around Bolton Notch Pond, Walker Reservoir, and Dobsonville Pond have impervious cover near or above 20%.

Table 2-17. Percent Impervious Cover – Tankerhoosen River Watershed

Subwatershed	Percent Impervious Cover
Bolton Notch Pond	16.60%
Clarks Brook	17.20%
Gages Brook	11.50%
Gages Brook South Tributary	11.30%
Lower Tankerhoosen River	15.80%
Middle Tankerhoosen River	12.90%
Railroad Brook	1.70%
Tucker Brook	8.10%
Upper Tankerhoosen River	4.50%
Walker Reservoir	19.90%
Tankerhoosen River Watershed	9.70%

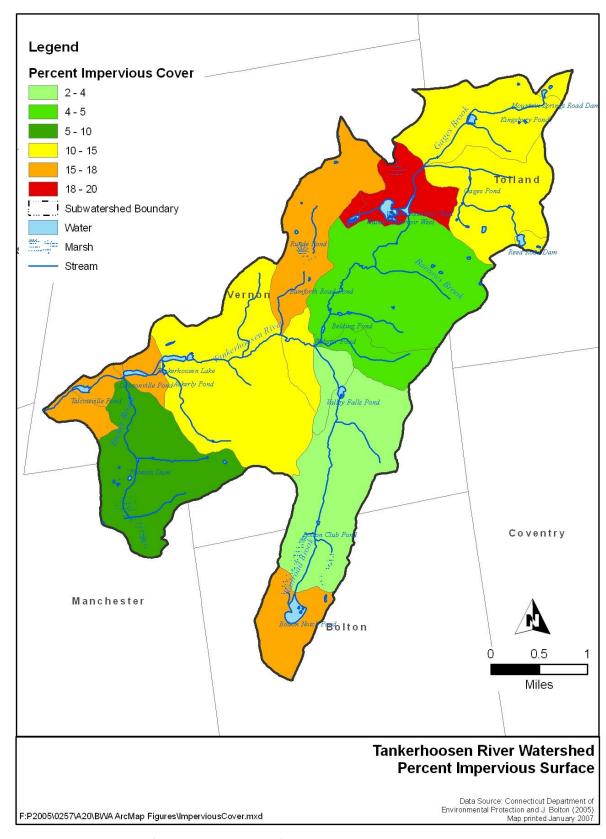


Figure 2-20. Current Impervious Cover – Tankerhoosen River Watershed



The results of this analysis provide an initial diagnosis of potential stream and receiving water quality within the watershed study area. The analysis method and ICM are based on several assumptions and caveats, which limits its application to screening-level evaluations. Some of the assumptions of the ICM include:

- Requires accurate estimates of percent impervious cover, which is defined as
 the total amount of impervious cover over a subwatershed area. The resolution
 of the land cover data used in the evaluation is relatively coarse, although
 sufficient for a screening-level analysis.
- Predicts potential rather than actual stream quality.
- Does not predict the precise score of an individual stream quality indicator but rather predicts the average behavior of a group of indicators over a range of impervious cover.
- The 10 percent and 25 percent thresholds are approximate transitions rather than sharp breakpoints.
- The ICM has not been validated for lakes, reservoirs, aguifers, and estuaries.
- Does not currently predict the impact of watershed best management practices (treatment or non-structural controls).
- Does not consider the geographic distribution of the impervious cover relative
 to the streams and receiving waters. Effective impervious cover (impervious
 cover that is hydraulically connected to the drainage system) has been
 recommended as a better metric, although determining effective impervious
 cover requires extensive and often subjective judgment as to whether it is
 connected or not.

Impervious cover is a more robust and reliable indicator of overall stream quality beyond the 10 percent threshold. The influence of impervious cover on stream quality is relatively weak compared to other potential watershed factors such as percent forest cover, riparian community, historical land use, soils, agriculture, etc. for impervious cover less than 10 percent.

2.8.2 Future Conditions

A watershed buildout analysis was also conducted as part of this assessment to assist in the identification of subwatersheds with the highest restoration potential as well as the greatest vulnerability. The purpose of the analysis is to estimate the future land use and impervious cover conditions of the watershed as a result of maximum development allowed by the current zoning within the watershed.

Land Use

Watershed lands that could be developed in the future (i.e., "developable" land) were subdivided into two categories, based on the CRCOG parcel-based land use data:

New Development - areas that are currently undeveloped and could become new
developments in the future. Land designated as "new development" includes
those parcels that are designated as "undeveloped" and "resource/recreation"
in the CROCG land use data and not identified as committed open space.



 Redevelopment - areas that are currently underdeveloped and could be redeveloped with a higher intensity land use in the future. Land designated for "redevelopment" were limited to single-family residential parcels in the CRCOG land use data that could be subdivided and/or redeveloped in the future.

Areas having the following physical and/or regulatory constraints were also removed from consideration for future development or redevelopment: water bodies, wetland soils, and soils whose slope characteristics defined by NRCS exceed 15% (i.e., steep slope soils). Resulting fragments of land smaller than ¼-acre in size for new development and 3 acres in size for redevelopment were also removed from the analysis. Table 2-18 and Figure 2-21 summarize the amount of developable land by subwatershed, including the new development and redevelopment categories.

Table 2-18. Developable Land – Tankerhoosen River Watershed

New New Development Land – Red

Subwatershed	New Development (acres)	New Development Percent in Subwatershed	Redevelopmen t (acres)	Redevelopment Percent in Subwatershed
Bolton Notch Pond	49	14.30%	11	3.20%
Clarks Brook	57	8.80%	52	8.10%
Gages Brook	129	18.50%	72	10.30%
Gages Brook South Trib.	123	18.10%	102	15.00%
Lower Tankerhoosen R.	91	28.50%	17	5.40%
Middle Tankerhoosen R.	127	8.00%	141	8.90%
Railroad Brook	212	17.60%	172	14.30%
Tucker Brook	122	13.10%	89	9.50%
Upper Tankerhoosen R.	238	16.10%	150	10.20%
Walker Reservoir	108	31.30%	13	3.80%
Total	1257	15.30%	820	10.00%

The future land use buildout scenario was estimated by assigning new land uses to developable areas, while maintaining the existing land uses for developed and unbuildable land (wetland soils, steep slope soils, etc.). The developable areas were assigned a future land use based on maximum degree of development allowed by the existing zoning category. Table 2-19 presents the future land use category assigned to each developable parcel based on the zoning category. This analysis assumes development of Act 490 parcels consistent with the underlying zoning and does not account for future zone changes or future land development regulatory changes.

Table 2-19. Assigned Future Land Use Category

Zoning Category	Future Land Use
1-3 Unit Residential, High Density	Condominium
1-3 Unit Residential, Medium Density	Three Family
1-3 Unit Residential, Medium-Low Density	Two Family
1-3 Unit Residential, Low Density	One Family
Cluster/Open Space Residential	One-Family
Industrial	Industrial
Multi-Family	Multi-Family
Planned Area Development Including Residential	Mixed Use
Planned Industrial	Industrial
Planned Residential	Multi-Family
Town Center	Mixed Use
Town Scale Commercial	Commercial

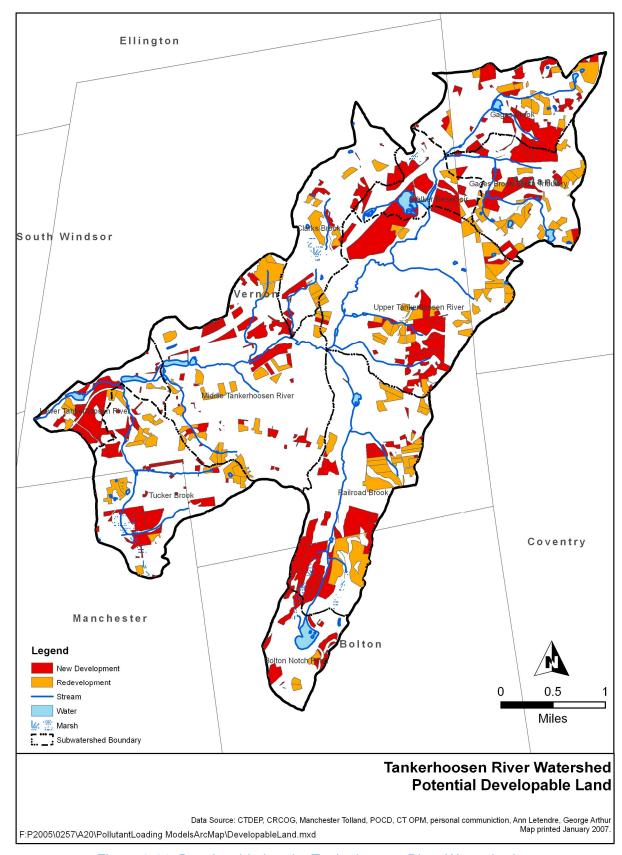


Figure 2-21. Developable Land – Tankerhoosen River Watershed



The results of the buildout analysis are summarized in Table 2-20, which compares acreage of existing and future land use in the watershed. The most significant potential land use change is in the residential land use categories, which is predicted to increase by approximately 15% watershed-wide. The area of resource/recreation and undeveloped land is predicted to decrease by approximately 15% watershed-wide, while commercial and industrial land are predicted to increase by approximately 3%.

Table 2-20. Landuse Buildout Analysis Results

Land Use Type	Acresexisting	Percent of Basin _{Existing}	Acres _{Future}	Percent of Basin _{Future}	Relative Percent Change
Agriculture	103	1%	89	1%	0
One Family	3160	38%	3415	42%	4%
Two Family	48	<1 %	811	10%	10%
Three Family	2	<1 %	3	<1 %	0
Multi Family	39	<1 %	60	1%	1%
Condominium	165	2%	177	2%	0
Group Quarters	12	<1 %	12	<1 %	0
Commercial	110	1%	206	3%	2%
Retail	88	1%	88	1%	0
Mixed Use	3	<1 %	33	<1 %	0
Industrial	183	2%	270	3%	1%
Government/Non-Profit	102	1%	102	1%	0
School	26	<1 %	26	<1 %	0
Cemetery	22	<1 %	14	<1 %	0
Health/Medical	6	<1 %	6	<1 %	0
Resource/Recreation	2398	29%	1787	22%	-7%
Undeveloped	851	10%	233	3%	-7%
Right-of-way	770	9%	770	9%	0
Water	77	<1 %	77	<1 %	0
Unknown	61	<1 %	46	<1 %	0

Impervious Cover

The watershed buildout analysis was used in conjunction with the existing conditions impervious cover analysis to estimate future impervious cover in the Tankerhoosen River subwatersheds. To complete this analysis, impervious cover was included as a parameter in the pollutant load model described in Section 2.6.

Land use data for both existing and buildout conditions were then entered into the model to determine the change in impervious cover for each subwatershed. The predicted change in impervious cover was then added to the existing impervious cover estimates to estimate future impervious cover.

Table 2-21 presents estimates of existing and future impervious cover by subwatershed. The shaded cells in the table highlight the subwatersheds in which future impervious cover is predicted to approach or exceed either the "sensitive" (10% to 12%) or "impacted" (25%) threshold values as described by the Impervious Cover Model.



Table 2-21. Percent Impervious Cover – Existing and Future Conditions

Subwatershed	Existing Percent Impervious Cover	Future Percent Impervious Cover	Percent Change ¹
Bolton Notch Pond	16.60%	18.90%	2.30%
Clarks Brook	17.20%	20.60%	3.40%
Gages Brook	11.50%	14.20%	2.70%
Gages Brook South Tributary	11.30%	13.50%	2.20%
Lower Tankerhoosen River	15.80%	23.00%	7.20%
Middle Tankerhoosen River	12.90%	15.50%	2.60%
Railroad Brook	1.70%	3.40%	1.70%
Tucker Brook	8.10%	10.30%	2.20%
Upper Tankerhoosen River	4.50%	4.70%	0.20%
Walker Reservoir	19.90%	29.13%	9.20%
Total	9.87%	12.47%	2.60%

^{1.} Percent change = (ICFuture — ICExisting) x 100

It is significant to note that, based on this analysis, the overall impervious cover in the Tankerhoosen River watershed is predicted to increase from less than 10% to greater than 12%, which is considered impacted. The largest change in impervious cover is predicted in the Walker Reservoir subwatershed, where imperviousness could increase from approximately 20%, or "impacted," to approximately 29%, or "non-supporting." Additionally, the impervious cover in Gages Brook and the associated Gages Brook South Tributary subwatersheds, both of which are important headwater streams, is predicted to cross the state-wide 12% sensitive threshold value.

Another useful metric was developed by Goetz et al. (2003) for the Chesapeake Bay region, which combines subwatershed impervious cover and tree cover within the 100-foot stream buffer. Each of the subwatersheds within the Tankerhoosen River Basin was analyzed with regard to the combined impervious cover/riparian zone metric, which is summarized in Table 2-22 by Goetz et al. (2003).

Table 2-22. Impervious Cover/Riparian Zone Metric

Stream Health	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer
Excellent	< = 6%	>=65%
Good	6-10%	60-65%
Fair	10-25%	40-60%
Poor	> 25%	<40%

Natural vegetation was determined using the CLEAR land cover data and included the deciduous forest, coniferous forest, forested wetland, and non-forested wetland categories. The Table 2-23 presents the results from the combined impervious cover/riparian zone metric.



Table 2-23. Impervious Cover/Riparian Zone Metric – Existing and Future Conditions

	Exis	ting	Future			
Subwatershed	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer		
Bolton Notch Pond	16.6%	40.4%	18.9%	39.8%		
Clarks Brook	17.2%	51.9%	20.6%	38.0%		
Gages Brook	11.5%	59.5%	14.2%	50.1%		
Gages Brook South Tributary	11.3%	69.6%	13.5%	40.2%		
Lower Tankerhoosen River	15.8%	42.7%	23.0%	26.0%		
Middle Tankerhoosen River	12.9%	49.7%	15.5%	41.8%		
Railroad Brook	1.7%	89.4%	3.4%	73.7%		
Tucker Brook	8.1%	65.5%	10.3%	49.6%		
Upper Tankerhoosen River	4.5%	84.6%	4.7%	76.3%		
Walker Reservoir	19.9%	41.2%	29.1%	31.8%		

Overall, most of the Tankerhoosen River subwatersheds are currently categorized as "fair" to "good" based on the riparian zone metric published by Goetz et al. (2003), while several of the key headwater streams, including Railroad Brook and the Upper Tankerhoosen River, fall into the highest category. Comparison between the existing and future ratings indicates that four of the ten subwatersheds (Clarks Brook, Gages Brook South Tributary, Lower Tankerhoosen River, and Tucker Brook) are predicted to experience a decline in stream health as a result of future development and, in particular, development within the riparian corridor.

2.9 Pollutant Loading

A pollutant loading model was developed using the land use/land cover data described in Section 2-5. The model was used to compare existing nonpoint source (NPS) pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario. It is important to note that the results of this screening-level analysis are intended for the purposes of comparing existing and future conditions and not to predict future water quality. This section summarizes the methods and results of the analysis, which are presented in greater detail in the *Baseline Watershed Assessment, Tankerhoosen River Watershed*, dated May 28, 2008 (Fuss & O'Neill, Inc.).

The Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), Version 4.0, was used for this analysis. This model was developed for US EPA by Tetra Tech in EPA Region 5 and has since been modified for use in other areas of the country. The model calculates watershed pollutant loads for sediment and nutrients based on land use-related pollutant sources, including urban runoff, septic system failures, stream bank erosion, and agricultural activities. The model also allows simulation of best management practices (BMPs) and Low Impact Development (LID) practices to reduce pollutant loads.



Data obtained as part of the Land Use/Land Cover analysis presented in Section 2.5.2 were used to generate model inputs. Several other model parameters were specified for each pollutant and subwatershed, including:

- Event Mean Concentrations (EMCs), which are literature values for the mean concentration of a pollutant in stormwater runoff for each land use.
- Curve Number (CN), which is a measure of the runoff potential of the land surface and is a function of soil type, cover condition, and slope.

The model was applied to each subwatershed to estimate pollutant loads for each subwatershed under existing land use and future land use scenarios, as described in Section 2-5. The existing and future pollutant loads were compared to assess anticipated changes in loads for each subwatershed. Table 2-24 presents the results of this analysis. Results are shown in terms of increase in pollutant loading rate (the mass of pollutant to be discharged from each acre of land in a watershed) and percent increase in pollutant load (based on the total pollutant discharge from each of the watersheds).

Table 2-24. Projected Pollutant Loading Rate and Load Increases

	(Lo	ad Incr	Rate Ind ease pe or ton]/	er Acre,	Load Increase (%) (Total for Each Watershed)				
Watershed	N	Р	BOD	Sediment	N	Р	BOD	Sediment	
Bolton Notch Pond (318 ac)	0.66	0.1	2.7	0.012	9.6%	8.0%	10.9%	7.7%	
Clarks Brook (647 ac)	0.91	0.13	3.9	0.017	14.1%	12.9%	16.1%	11.7%	
Gages Brook (695 ac)	1.29	0.19	5.6	0.027	19.4%	17.0%	21.5%	16.7%	
Gages Brook South Trib. (680 ac)	0.73	0.11	3.1	0.014	12.2%	10.2%	14.1%	10.5%	
Lower Tankerhoosen R. (306 ac)	1.31	0.1	6.3	0.022	20.0%	8.9%	27.6%	14.7%	
Middle Tankerhoosen R. (1570 ac)	0.63	0.07	3.1	0.008	10.6%	7.6%	14.2%	5.8%	
Railroad Brook (1203 ac)	0.89	0.06	4.3	0.015	56.8%	20.3%	69.8%	46.4%	
Tucker Brook (934 ac)	0.67	0.04	3.3	0.012	14.1%	5.3%	18.0%	9.4%	
Upper Tankerhoosen R. (1472 ac)	0.24	0.05	1.1	0.003	9.3%	11.1%	11.2%	6.0%	
Walker Reservoir (322 ac)	1.86	0.28	8.6	0.036	25.8%	23.3%	34.6%	21.6%	
Total (8149 ac)	0.77	0.09	3.5	0.013	16.0%	11.4%	19.9%	12.0%	

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario. These include:

Gages Brook. The existing conditions pollutant load model indicates that this
subwatershed is characterized by both relatively high total pollutant loads and
pollutant loading rates, with approximately 70% urban land use, the largest
amount of industrial land use, and the second-highest commercial land use
composition in the entire watershed. The buildout condition of this watershed
is projected to result in a 19% increase in urban land use with a corresponding
decrease in forest; and the new urban land is likely to consist of new residential



and industrial development. As such, relatively large loads and loading rate increases may occur.

- Lower Tankerhoosen River. The existing conditions pollutant load model for this
 subwatershed predicts relatively small loads (since the watershed area is small)
 and moderate loading rates. Under a buildout scenario, this subwatershed is
 projected to result in more than a 20% increase in nitrogen and BOD loads. The
 resulting loading rates for these parameters are projected to be the second
 highest of the Tankerhoosen River subwatersheds.
- Railroad Brook. The projected buildout pollutant loadings in this subwatershed
 for nitrogen and BOD are anticipated to increase by approximately 57% and
 70%, respectively. Significant increases are also anticipated in phosphorus and
 sediment loads. Currently, the Railroad Brook sub watershed is heavily forested,
 with comparatively little development. Several large tracts of land within this
 subwatershed are potentially available for future development, especially in
 Bolton and South Vernon, which makes this watershed vulnerable to potentially
 significant pollutant load increases.
- Walker Reservoir. The existing conditions pollutant loading model suggests that
 this subwatershed has some of the highest levels of pollutant loads within the
 overall Tankerhoosen River watershed. Potential land use changes in this
 subwatershed include significant areas of new residential and mixed-use
 development, much of which is located adjacent to Walker Reservoir. These
 changes are predicted to result in the greatest increases in pollutant loading rates
 for all of the parameters evaluated.

2.10 Comparative Subwatershed Analysis

A Comparative Subwatershed Analysis was performed for the Tankerhoosen River subwatersheds to identify the subwatersheds with the greatest vulnerability and restoration potential. Subwatershed "metrics" were used to conduct this analysis. Metrics are numeric values that characterize the relative vulnerability and restoration potential of a subwatershed. The metrics used are presented in Table 2-25. The results of this analysis will be used to prioritize field assessment efforts in future phases of this study and to guide plan recommendations.

The analysis involves a screening level evaluation of selected subwatershed metrics that are derived by analyzing available GIS layers and other subwatershed data sources. The basic approach used to conduct the Comparative Subwatershed Analysis consisted of:

- 1. Delineation of subwatershed boundaries and review of available metric data.
- 2. Selection and calculation of metrics that best describe subwatershed vulnerability and restoration potential. (The metrics used to rank subwatershed vulnerability were selected separately from the metrics used to rank subwatershed restoration potential.)
- 3. Developing weighting and scoring rules to assign points to each metric.



4. Computing aggregate scores and developing initial subwatershed rankings.

Subwatersheds with higher aggregate "vulnerability" scores are more sensitive to future development and should be the focus of watershed conservation efforts to maintain existing high-quality resources and conditions. Subwatersheds with higher aggregate "restoration potential" scores are more likely to have been impacted and have greater potential for restoration to improve upon existing conditions. This approach enables watershed planners to allocate limited resources on subwatershed where restoration and conservation efforts have the greatest chances of success.

The following sections describe the metrics used and the rationale for their selection, how the various metrics were calculated, and the results of the evaluation. Available GIS and other data were used to compute the value of each metric.

Table 2-25. Summary of Subwatershed Vulnerability Metrics

Subwatershed Metric	How Metric is Measured	Indicates Higher Vulnerability Potential When	Metric Points		
1. Impervious Cover Change	% increase in impervious cover in subwatershed	Increase in IC is high, suggesting greater development potential and stream impacts	Award 1 pt for each 1% increase in impervious cover		
2. Impervious Cover Threshold	Comparison of current and future IC relative to ICM threshold	Predicted IC crosses "impacted" (12%) threshold, development could result in significant stream impacts	Award 5 pts for each exceedance of the 12% threshold		
3. Stream Order	% of subwatershed consisting of 1 st or 2 nd order streams	Subwatershed consists of more lower order streams, vulnerability of headwater streams for habitat and water quality protection	Award 6 pts if 100% of streams are 1 st and 2 nd order; 4 pts if 50% are 1 st and 2 nd order; 2 pts if 33% are 1 st and 2 nd order; 0 pts if 0% are 1 st and 2 nd order		
4. Pollutant Loading	% increase in pollutant loading in subwatershed	increase in pollutant loading is high, suggesting water quality Award 1 pt for loading parameter and 2 pts for			
5. Industrial/ Commercial Land	% of subwatershed as industrial or commercial land	Industrial/commercial land is high, greater potential for water quality impacts from pollutant hot spot	Award 1 pt for each 2% of subwatershed classified as industrial or commercial/retail		
6. Forest Cover	% of subwatershed with developable forest cover	Area of developable forest cover is high, potential for significant future reductions in forested land	Award 1 pt for each 5% of subwatershed with developable forest cover		
7. Stream Corridor Forest Cover	% of stream corridor that is forested	Corridor forest cover is high, potential for significant future reductions in forested riparian areas if public ownership of corridor is low	Add 1 pt for each 10% increase in forest cover		
8. Public Ownership of Stream Corridor	% of stream corridor that is publicly owned	Public ownership is low (see metric 7)	Add 1 pt for each 10% reduction of stream corridor in public ownership		
9. Road Crossings	number of road crossings high, greater potential for d stormwater discharges fron roadways		<1 = 0pts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13- 15 = 7pt; >15 = 10 pts		
10. Developed	% of subwatershed	Area served by septic is high,	Award 1 pt for each 5% of		



Table 2-25. Summary of Subwatershed Vulnerability Metrics

Subwatershed Metric	How Metric is Measured	Indicates Higher Vulnerability Potential When	Metric Points
Areas with Septic	served by septic	indicating potential for pollutant loadings from failing septic systems	subwatershed area served by septic
11. Drinking Water Resources	Acreage of developable land within a public drinking water supply area	Area of developable land is high, greater potential for impacts to sensitive surface and groundwater drinking water supplies	Award 3 pts for each subwatershed within an aquifer protection area

2.10.1 Priority Subwatersheds for Conservation

The results of the subwatershed vulnerability analysis are summarized in Table 2-26.

Table 2-26. Results of Subwatershed Vulnerability Analysis

Subwatershed	Impervious Cover Change	Impervious Cover Threshold	Stream Order	Pollutant Loading	Industrial/ Commercial Land	Developable Forest Cover	Stream Corridor Forest Cover	Public Ownership of Stream Corridor	Road Crossings	Developed Areas Served by Septic	Drinking Water Resources	Total
Bolton Notch Pond	2	10	6	1	7	2	3	3	0	5	0	41
Clarks Brook	3	10	6	4	7	2	5	5	1	4	0	47
Gages Brook	3	5	6	6	11	4	6	6	3	5	0	55
Gages Brook South Tributary	2	5	6	4	1	5	6	5	3	5	0	42
Lower Tankerhoosen River	7	10	0	7	2	5	4	5	7	5	0	53
Middle Tankerhoosen River	3	10	2	2	2	2	4	5	3	3	3	38
Railroad Brook	2	0	6	12	0	6	9	0	5	1	0	40
Tucker Brook	2	0	6	2	0	3	5	6	3	2	0	28
Upper Tankerhoosen River	0	0	4	2	0	4	8	3	3	3	0	27
Walker Reservoir	9	10	4	4	2	3	2	5	10	6	0	56

As shown in Table 2-27, the following subwatersheds are considered most vulnerable to future development impacts and should be given highest priority for conservation efforts to maintain existing resource conditions:

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Walker Reservoir.



Table 2-27. Summary of Subwatershed Restoration Potential Metrics

Subwatershed Metric	How Metric is Measured	Indicates Higher Restoration Potential When	Metric Points
Existing Impervious Cover	% impervious cover in subwatershed	Current impervious cover is low, suggesting range of possible sites for storage retrofits and stream repairs	<10% = 10 pts; 10 to 15% = 5 pts; >15% = 1 pt
2. Publicly- owned land	% of subwatershed that is publicly owned	Public land ownership is high, providing range of potential sites for restoration practices	Award 1 pt for each 2.5% of subwatershed in public ownership
3. Industrial Land	% of subwatershed that is industrial land	Industrial land is high, suggesting potential for source controls, discharge prevention, and on-site retrofits	Award 1 pt for each 2% of subwatershed classified as industrial
4. Forest Cover	% forest cover in subwatershed	Forest cover is low, suggesting potential for upland and riparian reforestation	<35% = 7pts; 36 to 50% = 5 pts; 50 to 70% = 3 pts; >70% = 1pt
5. Wetland Cover	% of subwatershed that is wetlands	Wetland cover is high, suggesting potential for wetland and riparian restoration	Award 1 pt for each 2% of subwatershed area
6.Development Potential	% of developable land in subwatershed	No more development is expected; stable conditions increase feasibility of stream repairs and storage retrofits	30 to 35% = 1pts; 25 to 30% = 4 pts; 20 to 25% = 7 pts; 15 to 25% = 10pt
7. Stream Density	stream miles / square mile	Stream density is high, suggesting greater feasibility of corridor practices	Award 1 pt for each 10% increase in stream density from watershed average of 1.3 stream miles / square mile
8. Stream Corridor Forest Cover	% of stream corridor that is forested	Corridor forest cover is low, suggesting feasibility of riparian reforestation and stream repairs	Add 1 pt for each 10% reduction in forest cover
9. Public Ownership of Corridor	% of stream corridor that is publicly owned	Public corridor ownership is high, suggesting greater feasibility of corridor practices	Add 1 pt for each 10% of stream corridor in public ownership
10. Road Crossings	number of road crossings / square mile	Number of road crossings is high, suggesting greater potential for stream repairs, culvert modifications	<1 = Opts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13-15 = 7pt; >15 = 10 pts
11. Developed Areas with Septic	% of subwatershed that is served by septic	Area served by septic is high, suggesting greater potential for septic system upgrades	Award 1 pt for each 5% of subwatershed area served by septic
12. Water Quality Impairments	number of water quality impairments / square mile	Number of water quality impairments is high, suggesting regulatory need to focus on WQ improvements	Award 3 pts for each water quality impairment identified

The results of the subwatershed restoration potential analysis are summarized in Table 2-28.



Table 2-28. Results of Subwatershed Restoration Potential Analysis

Subwatershed	Existing Impervious Cover	Publicly-owned Land	Industrial Land	Forest Cover	Wetland Cover	Development Potential	Stream Density	Stream Corridor Forest Cover	Public Ownership of Stream Corridor	Road Crossings	Developed Areas Served by Septic	Water Quality Impairments	Total
Bolton Notch Pond	1	1	1	5	3	10	0	6	6	0	5	0	38
Clarks Brook	1	10	5	7	8	10	0	4	11	1	4	0	60
Gages Brook	5	12	6	5	8	4	10	3	12	3	5	6	79
Gages Brook South Tributary	5	3	0	3	3	1	14	2	9	3	5	9	57
Lower Tankerhoosen River	1	6	1	5	1	1	15	5	11	7	5	6	64
Middle Tankerhoosen River	5	6	1	5	6	10	5	5	10	5	3	0	61
Railroad Brook	10	0	0	1	6	1	9	0	0	5	1	0	34
Tucker Brook	10	10	0	5	6	7	11	4	11	1	2	0	66
Upper Tankerhoosen River	10	3	0	1	7	4	12	1	6	3	3	3	52
Walker Reservoir	1	10	1	7	4	1	0	7	9	10	6	0	55

As shown in Table 2-28, the following subwatersheds should be given highest priority for restoration potential to improve upon existing conditions:

- Clarks Brook,
- Gages Brook,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook.

Based on the combined results of the subwatershed vulnerability and restoration potential analyses, the following subwatersheds were recommended for detailed assessment and planning:

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook,
- Walker Reservoir.



3 Watershed Field Inventories

Field inventories were performed during summer 2008 to further assess existing watershed conditions and potential sources of pollution. The field inventories are screening level tools for locating potential pollutant sources and environmental problems in a watershed along with possible locations where restoration opportunities and mitigation measures can be implemented. The field inventories included selected stream corridors and upland areas within priority subwatersheds, which were identified from the Comparative Subwatershed Analysis. Field inventories were performed within the priority subwatersheds identified in Section 2.7.1.

This section of the watershed management plan provides a summary of the methods and results of the field inventories. More detailed information on the field inventory methods and findings is available in *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008), a copy of which is provided on CD-ROM as Appendix A of this watershed management plan.

The stream corridor assessment procedure used in this study is adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) method (CWP, 2005). Upland areas and activities that may impact stream quality were also assessed using methods adapted from the Center for Watershed Protection's Unified Subwatershed and Site Reconnaissance (USSR) techniques (CWP, 2005). The upland assessments included inventories of selected representative residential neighborhoods, streets and storm drainage systems, and land uses with higher potential pollutant loads (i.e., "hotspot" land uses). Field assessment efforts were targeted on stream segments and upland areas with the greatest potential for direct impacts to the streams. These areas were identified through aerial and land use mapping. To the extent possible, efforts were also focused on publicly-owned land, which typically offers greater opportunities for retrofits and mitigation projects as opposed to privately-owned land.

During the field inventories, crews assessed approximately 8.7 miles of stream corridors, six potential hotspot locations, five representative residential neighborhoods, and a number of streets and storm drainage systems associated with the residential neighborhoods and hotspot land uses. Field inventory nomenclature used throughout this report is summarized in Table 3-1. Copies of completed field assessment forms are provided as attachments to the *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008). Photographs of specific or representative pollutant sources and problem areas are included throughout this document for illustrative purposes. All of the photographs taken during the field inventories are available on CD.

Table 3-1. Field Inventory Nomenclature

Clarks Brook	CB
Lower Tankerhoosen River	LTR
Middle Tankerhoosen River	MTR
Walker Reservoir	WR
Gages Brook	GB
Gages Brook South Tributary	GBST
Tucker Brook	TB



Table 3-1. Field Inventory Nomenclature

Reach Level Assessment	RCH
Channel Modification	CM
Severe Bank Erosion	ER
Impacted Buffer	IB
Stormwater Outfall	OT
Stream Crossing	SC
Trash & Debris	TB
Utilities	UT
Hotspot Investigation	HSI
Neighborhood Site Assessment	NSA
Streets and Storm Drains	SSD

3.1 Summary of Findings

A variety of common issues and problems were identified during the field inventories. Some prevalent issues throughout the watershed are described below.

Overall in-stream habitat in the assessed reaches was mixed. Some of the assessed reaches have high quality habitat, with riparian cover, good floodplain connection, varied substrate, and significant stream shading. In other segments, in-stream habitat is marginal to poor due to bank erosion, buffer encroachment, trash and debris, lack of shading, and in-stream sedimentation. However, the majority of the stream reaches assessed appear to be either supporting biological communities (fish, frogs, birds, etc.) or sufficient to support such communities. Many potential barriers to fish passage were observed throughout the watershed, including perched culverts, culverts with



Arch-type railroad crossing (SC-02) may prevent fish passage and is suffering from downstream scour evidenced by the large pool shown in the photograph.

very shallow flow, and natural and manmade dams. Therefore, the impact of potential fish barriers and the feasibility of fish barrier removal efforts should be investigated further.

 Stream buffer encroachments are prevalent along stream corridors in or near areas of residential and commercial development. Residential lawns and some commercial lawns extend down to the banks of the stream in many areas, particularly in residential back yards. Yard waste such as grass clippings, leaves, and brush and waste materials were also common occurrences in and near these areas where easy access exists to the streams. Education, signage,



Stream segment GB-05B showing limited vegetative buffer and a small footbridge crossing the stream.



stream buffer regulations, and stream cleanups are potential approaches for improving buffer management.

Residential areas appear to contribute significant quantities of rooftop runoff to the storm drainage system, particularly in medium and high-density residential neighborhoods with smaller yards. Many small outfall pipes were observed from the backyards of residential areas, which are presumably associated with foundation drains, yard drains, or roof downspouts. Opportunities exist to disconnect residential rooftop runoff from the storm drainage



Trash and debris along Reach CB-02.

system and reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.

Numerous outfalls were observed from virtually all of the land uses encountered during the stream assessments. Many appear to be associated with sources having low potential for water quality impacts (i.e., residential foundation drains), while others were of unknown origin and should be the

focus of future investigation. Illicit discharge investigations are recommended in targeted areas and land uses.

Invasive species (phragmites, cattails, reed canary grass, etc.) were observed in stream corridors in many areas of the watershed. Invasive species management should be incorporated into stream corridor restoration activities.



Stream crossing (SC-01) below I-84 and outfall (OT-03) along reach GBST-02.

- Parking lots associated with apartment complexes, institutional land uses (schools), and commuter lots are potential candidates for stormwater retrofits to reduce site runoff and improve water quality through the use of bioretention, water quality swales, buffer strips/level spreaders, and other smallscale LID approaches.
- The field assessments identified very little evidence of storm drain stenciling or watershed stewardship signage, with the exception of a residential subdivision in the Tucker Brook subwatershed.
- Most of the developed areas surveyed have inadequate stormwater quality controls. Many of the residential developments were constructed prior to the



advent of modern stormwater quality regulations and design requirements. Therefore, most of the development observed in the watershed employs traditional curb and gutter storm drainage collection systems with little, if any, stormwater management beyond detention basins for peak flow control. In most cases, the stormwater management controls that were observed at newer developments were not being maintained.

- No Low Impact Development (LID) design practices were observed in the
 watershed. With the recent shift toward LID site design and stormwater
 management requirements, as demonstrated by the Town of Tolland's new
 LID regulations and design manual, the watershed is an ideal candidate to
 showcase LID practices for both new development and retrofit applications.
 Local LID demonstration sites are a valuable tool for public education and
 promoting the widespread use of such practices. Incorporating LID into town
 projects, including roadway projects, can also serve as a proactive model for
 private development.
- Stormwater runoff from Interstate 84, other state roads such as Route 30 and 31, and local roads typically receives little or no treatment prior to discharge. Such discharges are a source of sediment and other pollutants to the receiving water bodies. Opportunities exist for stormwater retrofits at roadway stormwater outfalls
- Relatively isolated areas of moderate to severe streambank erosion were observed throughout the assessed portions of the watershed. Most of these areas are located at or downstream of stormwater outfalls in developed areas of the watershed. Access to many of these areas is limited; therefore, potential candidate sites for bank stabilization projects should be evaluated further for overall feasibility.



Stream segment GB-05B showing area of stream bank

- Very few active construction sites were observed in the watershed. However, a
 large amount of developable land exists in the watershed, and future
 construction activity is a major potential source of polluted runoff. Approaches
 for stronger soil erosion and sedimentation controls include regulating building
 envelopes, encouraging property owners to minimize clearing for other
 purposes, and requiring drainage review for activities that disturb less than ½
 acre.
- Due to limited project funding, not all stream segments in the priority subwatersheds were assessed, and other subwatersheds (Railroad Brook, Bolton Notch Pond, and Upper Tankerhoosen River) were not assessed as they were determined to be less vulnerable to future development impacts. A schedule



should be established for assessing the remaining stream segments and subwatersheds.

3.2 Stream Corridor Assessment

Stream corridors within the Tankerhoosen River watershed were assessed during June 3 through 6, 2008, and on July 2 and 10, 2008. Field crews consisted of staff from Fuss & O'Neill, the North Central Conservation District, and volunteers with Friends of the Hockanum River Linear Park of Vernon. Stream corridors were assessed along selected reaches within priority subwatersheds using methods adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) (CWP, 2005).

The stream assessment method used in this study is a continuous stream walk method that identifies and evaluates the following impact conditions for each reach:

- Outfalls (OT), including stormwater and other manmade point discharges;
- Severe Bank Erosion (ER), such as bank sloughing, active widening, and incision;
- Impacted Buffer (IB), which is a narrowing or lack of natural vegetation;
- Utilities in the stream corridor (UT), such as leaking or exposed pipes;
- Trash and Debris (TR), such as drums, yard waste, and other illegal dumping;
- Stream Crossings (SC), which are hard objects, whether natural or artificial, that restrict or constrain the flow of water. These may include bridges, culverts, dams, and falls;
- Channel Modification (CM), where the stream bottom, banks, or direction have been modified:
- Miscellaneous (MI), other impacts or features not otherwise covered; and
- Reach Level Assessment (RCH), the average characteristics of each reach.

The stream assessment method also includes a semi-quantitative scoring system as part of the reach level assessment to evaluate the overall condition of the stream, riparian buffer, and floodplain, based on a consideration of in-stream habitat, vegetative protection, bank erosion, floodplain connection, vegetated buffer width, floodplain vegetation and habitat, and floodplain encroachment.

Collected information was entered into a database and used to quantify the overall condition of stream corridors in the watershed, compare subwatersheds within the watershed to each other, and prioritize areas for restoration, stormwater retrofit, land preservation, and other stewardship opportunities.

Stream reaches were assigned a subwatershed abbreviation followed by a two-digit numerical identifier. Reaches were generally numbered sequentially from downstream to upstream when in series and west to east upstream from confluences. A reach was considered to be a stream segment with relatively consistent geomorphology and surrounding land use, and generally less than one-half mile in length. Features noted at reach junctions (e.g., culvert crossings) were associated with the downstream reach. Impact conditions within each reach were numbered sequentially with an abbreviation



followed by a two-digit number. For example, the second stream crossing in a reach would have the identifier SC-02.

Forty-one stream reaches were evaluated in the Tankerhoosen River watershed using this stream assessment protocol. Table 3-2 summarizes the number of impact conditions identified and reach level assessments that were performed within each subwatershed.

Table 3-2. Number of Reach Level Assessments Performed and Impact Conditions Identified

Subwatershed	RCH	СМ	ER	ΙB	ОТ	SC	TD	UT
Clarks Brook	5		2	-	10	8	2	
Lower Tankerhoosen River	1				1	1		
Middle Tankerhoosen River	5		1		14	5	7	
Walker Reservoir	5				6	6		
Gages Brook	12	1	8	5	21	12	3	1
Gages Brook South Trib.	7	1	1	1	3	8		
Tucker Brook	6		2	4	9	9	3	

Reach level assessment scores were assigned by field crews based upon the overall stream, buffer, and floodplain conditions. A subjective determination of eight criteria is assessed on a scale of 0 to 20; 0 relating to poor conditions and 20 being optimal conditions. The total of these scores provides a quantitative index of overall stream health and condition. The maximum possible number of points that would be assigned for a fully optimal stream reach is 160 points.

Streams were assessed relative to a base condition, which for this study, is the highest scoring stream reach in the Tankerhoosen River watershed (153 points). All other assessed stream reaches were assigned a numerical score and categorized relative to the base score of 153 points (Table 3-3). Reaches scoring greater than 90% of the base condition (138 points) are considered "excellent", between 75% and 90% of the base condition are categorized as "good", between 55% and 75% of the base condition are categorized as "fair", between 35% and 55% of the base condition are categorized as "poor", and less than 35% of the base condition are categorized as "very poor". Table 3-4 summarizes stream reach assessment scores and classifications for the assessed stream reaches.

Table 3-3. Stream Reach Classifications

Category	Percentile	Point Threshold
Excellent	90%	≥138
Good	75%	≥115
Fair	55%	≥84
Poor	35%	≥54
Very Poor	<35%	<54



Table 3-4. Stream Reach Assessment Scores and Classifications

Excelle	nt	Good		Fair	•	Poor		Very F	oor
Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score
MTR-08	153	GBST-02	127	GB-09	114	TB-04B	83	GB-05B	53
GB-10	146	GB-02	120	GBST-03	111	MTR-01	82	WR-01	35
GBST-04A	146	GBST-09B	120	LTR-03	111	GB-04	80		
GBST-01	145	TB-02	119	GB-07	105	WR-02	80		
MTR-07	139	GBST-04B	117	CB-03	104	WR-04	76		
CB-04	138	TB-01	116	GB-01	102	GB-03B	72		
		GB-08	115	GB-03A	97	GBST-09A	59		
				MTR-09	94				
				GB-05A	93				
				CB-02	93				
				TB-03	92				
				TB-04A	92				
				WR-03	91				
				GB-06	88				
				MTR-02	87				
				CB-01	85				
				WR-05	84				
Note: TB04C	and CB-0	5 were not sco	red durin	g the reach le	evel asses	ssment		•	

As depicted in Figure 3-1, MTR-08 is the highest rated stream reach due to good riparian cover and bed material. WR-03 is considered fair due to the presence of invasive species within the riparian corridor. TB-04B and GB-05B are poor and very poor, respectively, because of poor channel characteristics, outfalls, stream crossings, trash and debris and lack of stream buffer and bank erosion in the case of GB-05B.



Figure 3-1. Examples of Stream Reaches in Various Classification Categories

Additional details regarding the assessed stream reaches are provided in *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008), a copy of which is provided on CD-ROM in Appendix A of this plan.



3.3 Upland Assessments

Fuss and O'Neill conducted upland assessments in the Tankerhoosen watershed in July 2008. The field observations assist in identifying pollution prevention and potential restoration opportunities at hotspot land uses and residential neighborhoods in the watershed. Factors that were considered when determining which hotspots and neighborhood areas to prioritize for assessment include:

- Stream condition (assessed during stream corridor inventory),
- Site proximity to the stream,
- Land use type and development density,
- Land ownership,
- Restoration potential.

The assessment framework was adapted from the Unified Subwatershed and Site Reconnaissance (USSR) method developed by the Center for Watershed Protection. USSR is a "windshield survey" evaluation method in which field crews drive and walk through areas of the watershed to quickly identify pollution prevention and restoration opportunities. The three major components to the upland assessments conducted in the Tankerhoosen watershed are: hotspots, residential neighborhoods, and streets and storm drains. Field data forms that were completed during the assessments are provided in *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008).

3.3.1 Hotspot Investigations

Hotspot site investigations were conducted for six representative sites with a high potential to contribute polluted stormwater runoff to the storm drain system and receiving streams. The purpose of the investigation was to qualitatively assess the potential for stormwater pollution from previously identified commercial, industrial, municipal or transport-related sites. The hotspot investigation was limited in scope to representative hotspot facilities in order to evaluate and illustrate common issues. The investigation was not intended to be an exhaustive review of all potential hotspot facilities in the entire watershed nor a detailed inspection or audit of each facility, which are beyond the scope of this study.

The hotspots examined in the field were located within the Lower Tankerhoosen River, Walker Reservoir, Clarks Brook, and Gages Brook subwatersheds. Representative priority hotspots were selected to cover a range of watersheds and land uses, including three industrial sites, one commercial site, one transportation-related site, and one state/municipal site. Sites are identified by the watershed abbreviation, followed by "HSI" and a numeric identifier. Table 3-5 summarizes the selected hotspots that were evaluated. Several of the sites that were investigated are privately owned, and field crews were unable to gain full access to the sites to closely evaluate the storm drainage and other site characteristics.



Table 3-5. Hotspot Site Investigation Summary

Site ID (Watershed)	Land Use Category	Description of Site Operations
GB-HSI-01 (Gages Brook)	Industrial	Industrial Park - Gerber Technologies Office Building
GB-HSI-02 (Gages Brook)	Industrial	Dari Farms Ice Cream Distribution Center
WR-HIS-01 (Walker Reservoir)	Transportation	ConnDOT Commuter Lot
CB-HIS-01 (Clarks Brook)	Commercial	Superior Energy - Propane
CB-HIS-02 (Clarks Brook)	Industrial	Sand, gravel, construction storage/processing facility
LTR-HIS-01 (Lower Tankerhoosen River)	State/Municipal	ConnDOT Maintenance and Service Center

Gerber Technologies Office Building

The Gerber Technologies office building is located in the Tolland Industrial on Industrial Park Road West adjacent to Gages Brook. The office building has landscaped areas around the building with shrubs and turf lawn. The site is characterized by a large amount of impervious cover, consisting of building roof areas and parking lots. Approximately 100 vehicles were parked in the employee parking lots at the time of the inspection. Stormwater runoff from the site appears to discharge to the stormwater basin located near the southern limit of the site. The stormwater basin is a wet pond design containing a permanent pool of water and is approximately 70 feet wide by 140 feet long. The basin contained accumulated sediment captured from the site runoff. The basin outfall discharges to Gages Brook via a riprap spillway.

The stormwater basin that receives runoff from the Gerber Technologies facility incorporates many of the recommended elements to meet current stormwater quantity and quality design criteria. However, the basin is also in need of maintenance as demonstrated by the sediment accumulation near the center of the basin and the overgrown woody vegetation at the overflow spillway. Existing stormwater basins such as this one may also be good retrofit candidate to improve treatment effectiveness by incorporating a sediment forebay at the basin inlet, which may also facilitate routine sediment removal.





Stormwater basin at the Gerber Technologies facility on Industrial Park Road West. Sediment has built up near the center of the basin (A) and its overflow spillway is overgrown with vegetation (B).



Dari Farms Ice Cream Distribution Facility

The Dari Farms distribution facility is also located in the Tolland Industrial Park on Research Way/Gerber Drive near the divide between the Gages Brook and Gages Brook South Tributary subwatersheds. The facility is estimated to be less than 5 years old, as evidenced by the facility's modern pollution prevention site design elements including a covered fueling station, no visible outdoor storage of materials, and well maintained landscaping on the grounds. Possible pollution sources to the storm drainage



The Dari Farms Ice Cream Distribution Facility has a covered fueling station and landscaped grounds (shown in the foreground).

system are the runoff from the large impervious areas on the site (the roof and parking areas) and potential vehicle fluids from truck fueling activities and employee vehicles. It could not be determined whether stormwater is managed on-site, by the downgradient stormwater basin near the Gerber Technologies facility, or both. The site did not appear to incorporate Low Impact Development (LID) design features such as vegetated swales or parking lot bioretention. New commercial and industrial facilities with significant impervious area, such as this one, are potential candidates for on-site LID and stormwater treatment practices to reduce runoff volume and pollutant loads.

ConnDOT Commuter Parking Lot

The hotspot investigation included the Connecticut Department of Transportation commuter parking lot at exit 67 of Interstate-84, which is located in the Walker Reservoir subwatershed.

Approximately 150 vehicles were parked at the lot during the site visit, which occurred on a weekday during mid-day. The site is contains significant impervious cover and high-intensity vehicle usage and is therefore a source of automobile-related stormwater pollutants including hydrocarbons, sediment, and metals. The entire parking lot drains to a double catch basin located on the southeastern side of the lot. The catch basin discharges through a short



The southeastern side of the Interstate 86 Exit 67 commuter parking lot showing the edge of the lot on the left side of the photograph and the wetland corridor on the right side. The center of the photograph shows the easily accessible and open area for a potential stormwater retrofit.

wetland corridor and subsequently to the stream segment located upstream of Reservoir Road and Walker Reservoir East. An easily accessible grass strip exists between the paved lot and the adjacent wetland and stream corridor. This site is a potential stormwater retrofit candidate (bioretention or water quality swale) to encourage infiltration and provide additional treatment for the parking lot runoff.



Superior Energy

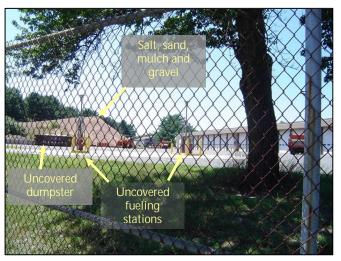
Superior Energy is a propane gas and related equipment distributor located on Hartford Turnpike (Route 30) in Vernon. The site is located within the Clarks Brook subwatershed near the headwaters of Clarks Brook. The property consists of a retail store, a paved parking lot for delivery trucks, and outdoor storage of propane tanks. It is unknown if vehicle maintenance or fueling occurs on-site. The site appears to have been modified in the past through grading/filling based on an inspection of the existing site drainage and discussions with facility personnel. This site should be further investigated to better define potential impacts of the historical filling, current drainage issues, and plans for additional site development.

Sand & Gravel Facility

The facility is located on Člark Road at the western end of Industrial Park Road and near the western limit of the Clarks Brook subwatershed. Facility operations appear to include storage and processing of sand, gravel and other construction materials. The site contains one building, which is assumed to be an office and/or maintenance area. The majority of the site consists of an unpaved yard used for the storage of sand and gravel piles and equipment to process the materials and load transport vehicles. The site contains numerous potential sources of sediment and other pollutants associated with the sand and gravel stockpiles, heavy equipment and vehicles, waste construction materials stored outdoors, and pipes and debris in the yard. Sand and gravel operations such as this should employ stormwater pollution prevention practices and source controls as required by the DEP General Permit for Stormwater Discharges Associated with Industrial Activity, in addition to stormwater treatment practices to reduce sediment and hydrocarbon loadings in site stormwater runoff.

DOT Maintenance Service Center

The State of Connecticut operates a Department of Transportation Maintenance Service Center for District #1 located on Campbell Avenue in Vernon, which is located in the Lower Tankerhoosen River subwatershed. The facility has an office building, garages for vehicle storage and maintenance, a small parking lot, outdoor storage of sand, salt, gravel and mulch, and an uncovered outdoor fueling station. Vehicle maintenance activities and outdoor vehicle fueling are



ConnDOT District #1 Maintenance Service Center, Campbell Avenue

potential sources of stormwater pollution, in addition to the outdoor stockpile storage.



A rolloff dumpster was observed to be overflowing and uncovered at the time of the windshield survey. Municipal and state-operated highway maintenance facilities such as this should employ source controls, pollution prevention, and stormwater treatment practices as necessary in accordance with the DEP *General Permit for Stormwater Discharges Associated with Industrial Activity*.

3.3.2 Neighborhood Source Assessment

Stormwater runoff from existing residential neighborhoods and future residential development in the watershed is an important consideration for this study, since approximately 40 percent of the Tankerhoosen River watershed consists of residential land use and future buildout of the watershed could result in conversion of an additional 10 percent of the watershed to residential land use. Neighborhood source assessments were conducted on July 16, 2008 to evaluate pollution source areas, stewardship behaviors, and residential restoration opportunities within individual residential neighborhoods throughout the watershed. The residential behaviors that contribute to stormwater quality were assessed by considering the following source areas for "average" neighborhoods throughout the subwatershed:

- Yards and Lawns
- Driveways, Sidewalks, and Curbs
- Rooftops
- Common Areas

Neighborhoods were selected for assessment based on their proximity to stream corridors and their overall potential to contribute pollutants to the stream. The selected neighborhoods include a variety of residential types, including low- and high-density single-family residential and multi-family residential (apartments and condos). One field sheet was completed for each neighborhood assessed. The selected neighborhoods are located in the Tucker Brook, Lower Tankerhoosen River, Clarks Brook, Walker Reservoir, and Gages Brook subwatersheds, as summarized in Table 3-6.

Each neighborhood was assigned a score for pollution severity and restoration potential. Pollution severity is a measure of how much nonpoint source pollution a neighborhood is likely generating based on easily observable features such as lawn care practices, drainage patterns, oil stains, etc. Restoration potential is a measure of the feasibility of on-site retrofits or behavior changes based on available space, number of opportunities, presence of a strong homeowners association, and other factors.



Table 3-6. Neighborhood Source Assessments Conducted in the Tankerhoosen River Watershed

Neighborhood/ Subdivision Name	Subwatershed	Residential Type	Pollution Severity	Restoration Potential
Mount Vernon Apartments	Walker Reservoir	Multi-family	Moderate	Moderate
Campbell Avenue	Lower Tankerhoosen River	High-density, single-family	Moderate	Low
Valley View Drive/Andrew Way	Gages Brook	Medium-density, single-family	None	Low
High Manor Mobile Home Park	Clarks Brook	High-density, single-family	Moderate	Moderate
Meadowbrook Drive	Tucker Brook	Medium-density, single-family with open space areas	None	Low

Mount Vernon Apartments

The Mount Vernon apartments are a 33-acre multi-family housing complex situated between Hartford Turnpike (Route 30) and Interstate 84 in the Walker Reservoir subwatershed. The apartments are served by outdoor surface parking lots in front of each building. Site imperviousness is estimated at approximately 50 percent. Runoff downspouts are connected directly to the site stormwater drainage system, and parking areas are served by traditional curb and gutter drainage. The complex is generally well-maintained, with generally clean gutters, catch basins, and parking areas. Some oil staining was observed on the pavement within individual parking stalls

The overall pollution severity is rated as moderate due to the large amount of directly connected impervious area and potential pollutant sources from parking areas. This site is a potential retrofit candidate to reduce stormwater runoff from the site, including disconnecting downspouts from the storm drainage system and redirecting them to pervious grass areas, rain barrels/cisterns, and rain gardens. Multi-family parking lots, such as the parking lots at this complex, may also be good candidates for stormwater retrofits. The following photograph depicts an existing landscaped area adjacent to the parking lot that could potentially function as a bioretention/rain garden.





The Mount Vernon apartment complex buildings showing clean and well-maintained parking areas and landscaping (A) and a landscaped area that has the potential to be used as a rain garden (B).



Campbell Avenue

The Campbell Avenue residential development is a 13-acre neighborhood of single family homes on approximately ¼ acre lots. The neighborhood is located off of Dobson Avenue and is situated between Interstate 84 and the ConnDOT Maintenance Service Center to the north and Dobsonville Pond to the south. The age of the neighborhood is estimated as approximately 50 years. Almost none of the homes have a garage, and nearly all have impervious driveways connected to the street curb and gutter drainage system. No on-site or centralized stormwater management practices were observed, other than curb and gutter drainage. Most of the homes have downspouts that are directed to pervious lawn areas near the house. Landscaping practices were minimal. This type of older, high density single family residential neighborhood has limited potential for stormwater retrofits due to limited land area.

Valley View Drive/Andrew Way

The Valley View Drive/Andrew Way neighborhood is approximately 55 acres in size and located near the headwaters of Gages Brook. The neighborhood is approximately 25 years old and consists of single family homes occupying approximately 1-acre lots. Most of the homes have garages and a high percentage of the lots are covered by lawn (60%) and landscaped areas (20%). The subdivision is served by traditional curb and gutter drainage. No centralized stormwater management measures were observed. Approximately three quarters of



A typical lot in the Valley View Drive/Andrew Way neighborhood.

the roof downspouts are connected to adjacent pervious areas. Overall, the neighborhood was rated as having low pollution potential and limited potential for stormwater retrofits.

High Manor Mobile Home Park

High Manor Mobile Home Park is an approximately 28-acre neighborhood located in the Clarks Brook subwatershed, situated between Route 30 and Interstate 84. The park is believed to have been developed in the 1970s. The average lot in the neighborhood has approximately 40 percent impervious cover, including the home and driveway, 40 percent grass cover, and 20 percent landscaped area. Approximately 90 percent of the homes have roof downspouts that discharge to lawns. The streets have traditional curb and gutter drainage, and storm drain inlets were observed to be clean. No centralized stormwater management measures were observed.



A street view of the High Manor Mobile Home Park showing turf lawns with some mature trees on the properties.



Meadowbrook Drive

The Meadowbrook Drive neighborhood is an approximately 100-acre residential neighborhood in the northeast corner of Manchester. The neighborhood is situated in the central portion of the Tucker Brook subwatershed, and Tucker Brook flows partially through and along the north and west sides of the development. The subdivision is estimated as approximately 10 years old, and the average lot size for the single family homes in the subdivision is approximately ½ acre. All of the homes have garages. The driveway, sidewalks and curb areas are clean and dry. A majority of the homes have roof downspouts that discharge to pervious lawn areas. The street storm drains are stenciled. An approximately 1-acre wet stormwater basin near the corner of Yale and Chatham Drives receives runoff from the subdivision storm drainage system. The basin outlet discharges to Tucker Brook. At the time of the inspection the stormwater basin outlet was observed to be overgrown with vegetation, and stream bank erosion was observed at the outfall to the stream. The basin appears to be in need of regular maintenance. Buffer encroachment, stream crossings, residential drain outfalls, and yard waste dumping were common in residential areas along the stream corridors in this subdivision.





Typical conditions in the Meadowbrook Drive neighborhood showing landscaping, lot sizes, and general cleanliness.

3.3.3 Streets and Storm Drain Assessment

Urban streets and storm drains can be a source of stormwater pollutants if not maintained on a regular basis. The condition of the local road and storm drain infrastructure can be assessed to determine if existing maintenance practice could reduce pollutant accumulation. Selected streets and storm drains were assessed during the upland field inventories conducted on July 16, 2008. Most of the streets and storm drains that were assessed are located in or near hotspot or neighborhood source assessment locations. Findings of the street and storm drain assessment are summarized below. Photographs of the storm drains and the street conditions evaluated are provided as Table 3-7.



Table 3-7. Streets and Storm Drain Assessment Photographs

Location	Storm	Drains	Streets
Campbell Avenue			
Mount Vernon Apartments			
Valley View Drive/Andrew Way			
High Manor Mobile Home Park			
Gerber Technologies			
Clark Road Industrial Park			[No photo]



Most of the streets were clean, free of sediment and debris, and in good condition. The one exception is Industrial Park Road in the Clark Road Industrial Park where roads were observed to be in poor condition (cracked, broken, and sediment accumulation). Storm drains along Industrial Park Road were also partially obstructed with sediment, leaves, trash, and one of the catch basins had standing water above the elevation of the stream water surface, indicating blockage of the outlet pipe. Many of the inspected catch basins had varying degrees of sediment accumulation and nearly all could benefit from increased clean-out and street sweeping. With the exception of the Meadowbrook Drive subdivision in the Tucker Brook subwatershed, none of the storm drains observed during the field assessments was stenciled.



4 Land Use Regulatory Review

4.1 Introduction

Municipal land use regulations control patterns of new development and redevelopment and can play a significant role in protecting water quality and other natural resources in a watershed. These commonly include local plans of conservation and development, zoning regulations, subdivision regulations, inland wetland regulations, and stormwater regulations, all of which influence the type and density of development that can occur within a watershed. Local land use regulations often vary by town within a watershed, and regulations are periodically revised in response to development pressure, shifts in attitude toward natural resource protection, and political and socioeconomic factors.

A key element in the development of a Watershed Management Plan is to identify potential land use regulatory mechanisms (i.e., new or modified land use regulations) that can be implemented by the watershed towns to strengthen existing land use controls and better protect natural resources within the watershed. Many Connecticut communities are in the process of developing new or modified land use regulations that incorporate Low Impact Development (LID) and related stormwater management approaches to address stormwater quantity and quality objectives. Communities in urbanized areas are also faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl.

An opportunity exists for the watershed towns to develop revised and/or new regulatory mechanisms to satisfy Phase II stormwater requirements, while also protecting water quality and other natural resources in the Tankerhoosen River watershed consistent with the objectives of this plan.

This section summarizes the following information:

- Existing municipal land use planning entities and regulations for each of the
 watershed communities based on information obtained from a land use
 questionnaire conducted by the North Central Conservation District in 2005 as
 part of the Hockanum River State of the Watershed Report (Fuss & O'Neill, 2005).
 The information was updated where necessary to reflect current conditions.
- Existing land use regulations and related planning documents that pertain to stormwater management and natural resource protection issues, as well as potential approaches for developing regulatory mechanisms to incorporate improved stormwater management, including LID concepts and opportunities to reduce impervious cover, into the local land use regulations. The regulatory review was performed for the towns of Tolland and Vernon because they comprise the majority of the land area in the Tankerhoosen River watershed



and have the greatest potential for future development. Findings of the regulatory review are described in the report *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008), as well as a technical memorandum dated June 9, 2008 for the Town of Vernon, a copy of which is provided in Appendix B of this watershed management plan.

4.2 Summary of Land Use Planning Entities

The 2005 land use questionnaire provided information from the watershed municipalities on the land use regulations in each town, including information on wetlands and watercourses regulations, zoning regulations, plans of development, open space planning, and stormwater regulations. The following paragraphs summarize information obtained from the questionnaire, which was updated to reflect current conditions as of October 2008.

Local land use regulations are administered by various Town commissions, boards, and agencies. Land use commissions in the Tankerhoosen River watershed communities are summarized in Table 4-1.

Table 4-1. Tankerhoosen River Watershed Land Use Commissions

Town	Land Use Commissions
Manchester	 Planning and Zoning Commission (acts as Inland Wetlands and Watercourses Agency) Conservation Commission
Vernon	 Planning and Zoning Commission Inland Wetlands Commission Conservation Commission Design Review Advisory Commission Open Space Task Force Local Historic Properties Commission
Tolland	 Planning and Zoning Commission Inland Wetlands and Watercourses Commission Conservation Commission Design Advisory Board
Bolton	 Planning and Zoning Commission Inland Wetlands Commission Conservation Commission Open Space Preservation, Acquisition, and Conservation Committee

Source: Hockanum River —State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

Table 4-2 summarizes the current plan of development, subdivision, inland wetlands, zoning, floodplain management, and stormwater regulations for the watershed towns. The table lists the last revision date for the applicable land use regulations.



Table 4-2. Municipal Land Use Regulations

Regulation	Manchester	Vernon	Tolland	Bolton	
Plan of Development 2004		2001	1999	1990	
Subdivision Regulations 2005		2007	2008	2004	
Wetlands Regulations 2007		2006	2007	2006	
Zoning Regulations	2008	2009	2008	2005	
Floodplain Management	1994	In Zoning Regs.	None	2005	
Stormwater Regulations	Connecticut Stormwater Quality Manual	In Zoning Regs.	2008 (LID)	2004	

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

Inland Wetlands & Watercourses

Regulating activity with the potential to affect wetlands and watercourses is an essential component in preserving or improving the water quality and overall health of the Tankerhoosen River. In Connecticut, the Inland Wetlands and Watercourses Act requires that each municipality establish an Inland Wetlands and Watercourses Agency or Commission and local regulations regulating private and municipal work located in or affecting wetlands or watercourses.

Each of the surveyed watershed towns has an inland wetlands agency, and each town has defined an upland review area, or distance from wetlands and watercourses that is subject to review. Three of the four watershed towns indicated that they have identified wetlands or watercourses that are impaired or that require restoration or require special protection. Table 4-3 summarizes the regulating agencies, upland review areas, and identified wetlands and watercourses of special significance for the surveyed watershed towns.

Table 4-3. Inland Wetlands and Watercourses Regulations

Town	Regulating Agency	Upland Review Area	Wetlands and Watercourses of Special Significance
Manchester	Planning & Zoning Commission	50' wetlands and watercourses	None identified
Vernon	Inland Wetlands & Watercourses Agency	100' wetlands 200' designated watercourses	 Vernal pools on Box Mountain Road Tankerhoosen River Hockanum River Belding Wildlife Management Area
Tolland	Inland Wetlands & Watercourses Commission	50' wetlands 100' watercourses	Preliminary*
Bolton	Inland Wetlands Commission, Conservation Commission	100' wetlands and watercourses	Yes*

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005. *Information available from the individual towns; amended in 2008.



Stormwater Management and Soil Erosion and Sediment Control

Development of the landscape with impervious surfaces can alter the hydrology of a watershed and has the potential to adversely affect water quality and aquatic habitat. As a result of development, vegetated and forested land that consists of pervious surfaces is largely replaced by land uses with impervious surfaces. This transformation increases the amount of stormwater runoff from a site, decreases infiltration and groundwater recharge, and alters natural drainage patterns. Natural pollutant removal mechanisms provided by on-site vegetation and soils have less opportunity to remove pollutants from stormwater runoff. During construction, soils are also exposed to rainfall, which increases the potential for erosion and sedimentation. Development can also introduce new sources of pollutants from everyday activities associated with residential, commercial, and industrial land uses.

Stormwater runoff both during construction and following completion of construction for new development and redevelopment projects is regulated at the local and state levels. All of the watershed towns have erosion and sediment control regulations as mandated by the Soil Erosion and Sediment Control Act. Most Connecticut municipalities have adopted regulations requiring that a soil erosion and sediment control plan be submitted with any application for development within the municipality when the disturbed area of such development is more than one-half acre. Projects that disturb greater than 5 acres of land are subject to regulation under the DEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities. This permit applies to discharges of stormwater and dewatering wastewaters from construction activities including, but not limited to, clearing, grading, and excavation that result in the disturbance of 5 or more acres of total land area on a site. Pursuant to Phase II of the NPDES Stormwater Program, construction activities disturbing between 1 and 5 acres have been delegated by DEP to the municipalities provided that the erosion and sediment control plan is reviewed and receives approval from the town, under the Soil Erosion and Sedimentation Control Act.

Post-construction stormwater quantity and quality are also regulated by the watershed municipalities through municipal planning and zoning and inland wetlands and watercourses regulations. All of the watershed towns are subject to the requirements of the NPDES Phase II stormwater program, which is regulated under the DEP *General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems* (MS4 General Permit). The MS4 General Permit regulates the quality of municipal stormwater discharges and requires the creation of a Stormwater Management Plan that addresses the following six minimum control measures:

- 1. Public education and outreach on storm water impacts required throughout the entire municipality;
- 2. Public involvement/participation required throughout the entire municipality;
- 3. Illicit discharge detection and elimination required throughout the entire municipality including mapping all storm water discharges from a pipe or conduit with a diameter of 15 inches or greater (or equivalent cross-sectional area) owned or operated by the municipality;
- 4. Construction site storm water runoff control required throughout the entire municipality;



- 5. Post-construction storm water management in new development and redevelopment; and
- 6. Pollution prevention/good housekeeping for municipal operations.

The DEP *Connecticut Stormwater Quality Manual* provides guidance on the measures necessary to protect the waters of the State of Connecticut from the adverse impacts of post-construction stormwater runoff. It is intended for use as a planning tool and design guidance document by the regulated and regulatory communities involved in stormwater quality management in Connecticut. The manual provides uniform guidance for developers, engineers, and review agencies on the selection, design, and application of stormwater control measures. All of the watershed towns in the Tankerhoosen River watershed have indicated that they use the stormwater manual in reviewing development proposals for stormwater management issues.

In February 2008, the Town of Tolland amended its zoning and subdivision regulations to require that Low Impact Development (LID) techniques be implemented on all development to protect high quality wetlands, watercourses, open water bodies and other sensitive areas from the impacts of point and nonpoint sources of stormwater due to land development projects. Tolland also developed a companion LID design manual.

Open Space

Open space plays a critical role in protecting and preserving the health of a watershed by limiting development and impervious coverage, preserving natural pollutant attenuation characteristics, and supporting other planning objectives such as farmland preservation, community preservation, and passive recreation. Open space includes preserved natural areas as well as lightly developed parks and playgrounds.

While approximately 40 percent of the Tankerhoosen River watershed consists of undeveloped land uses, much of this land is not considered open space because it may be privately owned and ultimately developed. Protected open space areas include deeded open space that is privately owned, parcels owned by land trusts, state and federally-owned land, land owned by water companies, and municipal park land. Such land is protected against future development. Each of the watershed towns has prepared an open space plan for their respective communities (Table 4-4).

Table 4-4. Status of Municipal Open Space Plans in the Tankerhoosen River Watershed

Town	Open Space Plan
Manchester	2004
Vernon	2005
Tolland	2006
Bolton	2004

Source: Hockanum River — State of the Watershed Land Use Questionnaire, North Central Conservation District. 2005: amended in 2008.

In addition to the designation of protected open space through donation, purchase of land by a town, conservation or land trusts, or other private and/or public agencies, towns also require that some land be dedicated as open space with the development of



new subdivisions. The subdivision regulations of all of the towns in the Tankerhoosen River watershed require the set aside of a percentage of new subdivisions as open space, and all but Manchester have provisions for fee-in-lieu-of open space. Table 4-5 summarizes responses from the surveyed watershed communities regarding their current open space regulations.

A majority of the surveyed watershed towns also allow "cluster development" and "open space subdivisions" in their subdivision regulations. These are compact forms of development that concentrate density in one portion of the site in exchange for reduced density elsewhere, thereby reducing overall site imperviousness and associated stormwater impacts and potentially avoiding development in sensitive areas of a site.

Subdivision Open Space Allow Open Allow Cluster Town Space Development Required Fee in lieu of Subdivisions Yes Yes, 6% No Manchester No Vernon Yes No Yes Yes Yes, 10% Tolland Yes Yes Yes

Table 4-5. Open Space Regulations

Yes Source: Hockanum River — State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

Yes

Yes

4.3 **Summary of Existing Regulations**

Yes

The following policy, regulatory and planning documents were reviewed for the towns of Vernon and Tolland relative to stormwater management and natural resource protection:

- Subdivision Regulations,
- Zoning Regulations,
- Inland Wetland and Watercourses Regulations,
- Plan of Conservation and Development/Open Space Plan.

4.3.1 Town of Vernon

Bolton

The Town of Vernon has a number of land use regulations that regulate construction and post-construction stormwater runoff from new development and redevelopment activities, and provide for protection of natural resources. The local regulations are particularly strong in terms of erosion and sediment control (as well as consistent between the various regulations), open space protection, and regulating activities that can potentially affect wetlands and watercourses, including requirements for watercourse buffers. However, there are several areas where the regulations and design standards and guidance could be strengthened through amendments or new regulations to clarify and strengthen stormwater management requirements and better promote the use of LID principles.



This section contains preliminary recommendations for the town of Vernon based on the review of the existing land use regulations and planning documents. The recommendations in this section are a summary of the more detailed regulatory review, which is provided in the technical memorandum dated June 9, 2008 (Appendix B).

Town Design Manual

- Develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the DEP Connecticut Stormwater Quality Manual to take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town. The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.
- Include a section of the design manual that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects.
 Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management facilities.
- Incorporate/reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.

Stormwater Management Standards

• Develop and incorporate into the Town stormwater design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance. Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the *Connecticut Stormwater Quality Manual* and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included with the memorandum in Appendix B.

New or Modified Stormwater Regulations

Develop and implement new or revised stormwater regulations to 1) satisfy
Phase II Stormwater Program regulatory requirements, 2) encourage or require
LID principles to be implemented for development projects in Vernon, and 3)
address other local drainage and natural resource protection issues identified by
the Town. Two potential approaches have been identified —1) a new stand-



alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.

- Form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:
 - o If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
 - Which projects and activities will the new ordinance apply to (i.e., applicability)?
 - o How will applications be received and reviewed?
 - o Who will be responsible for inspections and enforcement?
 - Will additional staff be required to handle the increased workload to review and process applications?

4.3.2 Town of Tolland

Zoning and Subdivision Regulations

The Town of Tolland amended its zoning and subdivision regulations to:

- 1. Incorporate Low Impact Development (LID) principles. The Town also developed a companion LID Design Manual that provides recommendations for site design, road design, and stormwater management.
- 2. Create a natural Resource and Wildlife Protection Overlay Zone around sensitive habitat areas and steep slopes throughout the town.
- 3. Adopt density-based zoning to replace the minimum lot size requirements.

Tolland is one of the first towns in Connecticut to adopt comprehensive LID regulations. The regulations are a good model for the other watershed communities to require the use of LID practices. The regulations are currently in the early stages of implementation. The Town should continue to monitor the effectiveness of the LID regulations as development projects subject to the new regulations are designed, reviewed, and constructed.

Inland Wetlands and Watercourses Regulations

The Inland Wetlands and Watercourses regulations were amended in 2007, and are in accordance with the Connecticut General Statues. The regulations define an Upland Review Area extending a minimum 50 feet from the edge of a wetlands and/or watercourse and a extending a minimum of one hundred 100 feet from any watercourse, including intermittent watercourses. The width of the Upland Review Area may be doubled in cases where the slopes bordering the wetland and/or watercourse are in excess of 15%, the presence of highly erodible soils, or unique and/or easily damaged wetland ecosystems exist.



Permit application requirements include documentation that proposed stormwater quality management systems, at a minimum, conform to the DEP *Connecticut Stormwater Quality Manual*, as amended. The Inland Wetlands and Watercourses Regulations should be revised to require that projects also meet the design requirements contained in the Tolland LID Design Manual, for consistency with the zoning and subdivision regulations and to promote the use of LID.

The town should also consider incorporating more explicit watercourse buffer recommendations, including minimum buffer widths, similar to the watercourse buffer provisions in the Town of Vernon Inland Wetlands and Watercourses Regulations. Pending passage of enabling legislation by the Connecticut state legislature, the Town should also adopt riparian buffer protection regulations that would establish requirements for a contiguous buffer strip on either side of selected watercourses such that they remain in a natural, undisturbed state.

Plan of Conservation and Development

The Tolland Planning & Zoning Commission is in the process of updating the 1999 Plan of Conservation & Development (POCD) in accordance with the Connecticut General Statutes which requires the plan to be updated every ten years. The plan will establish a common vision for the future of the community and determine policies that will help attain that vision. The plan will address a range of themes, including natural resources, open space, utility infrastructure, and community development.

The Town's planning consultant has prepared draft recommendations related to conservation issues as part of the POCD update process. The recommendations address surface and groundwater quality, important habitat areas, drainage issues, green infrastructure, and open space protection. Some of the key recommendations for natural resource protection that also apply within the Tankerhoosen River watershed include (Planimetrics, 2008):

- Future development should occur in a manner and in locations that are environmentally sustainable.
- Impacts from existing development should be minimized through education, incentives, and town leadership.

Open Space and Conservation Plan

The 2006 Tolland Open Space and Conservation Plan inventoried natural resources throughout the town, including wetlands, rivers and streams, lakes and ponds, vernal pools, water supply watersheds, forest resources, and wildlife resources. In addition to the Open Space and Conservation Plan, the town has also completed or is implementing the following open space preservation activities (Planimetrics, 2008):

- Establishing an Open Space Acquisition Fund.
- Setting up a structured process for open space procurement and management.
- Promoting the use of open space, with trail maps and programmed activities.
- Tapping into a volunteer group for maintenance (Tolland Conservation Corps).



5 Watershed Goals and Objectives

This section presents the overall management goals for the watershed, specific objectives and indicators to measure progress in achieving the objectives, and recommended management strategies. The goals, objectives, and management strategies presented in this section were developed in conjunction with the Technical Advisory Committee based upon the results of the watershed inventory and evaluation phases of the project.

5.1 Watershed Management Goals

The watershed management goals for the Tankerhoosen River watershed are summarized below. The first two goals listed below reflect the overall goals for managing the Tankerhoosen River, while the latter two reflect protection/preservation and restoration goals, respectively.

- Develop an affordable and effective watershed management plan that can be implemented by the watershed municipalities, residents, and other stakeholders.
- Maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries, which is essential to the economic wellbeing, environmental and public health, recreational opportunities, and quality of life for the residents, local governments, and visitors of the Tankerhoosen River watershed.
- Protect the upper region of the Tankerhoosen River watershed, including highquality headwater streams that sustain significant natural resources such as the Belding Wild Trout Management Area, from existing pollutant sources and future threats related to new development and redevelopment.
- Restore and enhance the water quality and ecological health of impacted portions of the Tankerhoosen River and its tributaries to support designated uses for fish and wildlife habitat and recreational use.

5.2 Watershed Management Objectives and Strategies

Specific objectives and recommended management strategies to achieve the watershed management goals are described below. Additional details of the recommended management strategies, including implementation priority, schedule, costs, funding sources, and implementation responsibilities, are presented in Section 6 of this plan.



Objective 1. Establish a sustainable coalition of partners to take a leadership role in implementing the Tankerhoosen River Watershed Management Plan, and encourage intermunicipal coordination in managing water quality and habitat issues in the watershed through this coalition.

Management Strategies

- Maintain the existing Technical Advisory Committee but shift its responsibilities from planning to implementation.
- Include representatives from each of the watershed municipalities (Vernon, Tolland, Manchester, and Bolton), the Connecticut Department of Environmental Protection, and possibly new members to fill in missing expertise.
- This group would form the core of a watershed partnership or coalition specifically for implementing the Tankerhoosen River Watershed Management Plan. The coalition would take the lead on implementing specific action items identified in the watershed plan, including:
 - o Identify funding opportunities for grants or other financial assistance,
 - Periodically review and update action items in the plan (at least every 5 years),
 - Develop annual work plans (i.e., specific "to-do" lists),
 - Host annual public meetings to celebrate accomplishments, recognize participants, review lessons learned, and solicit feedback on plan updates and next steps.
- Encourage adoption of the watershed plan by the watershed municipalities.
- Identify funding sources and prepare and submit grant applications for projects identified in the watershed plan.

Objective 2. Enhance in-stream and riparian habitat along the river and its tributaries to sustain a diversity of aquatic life.

- Conduct a fish passage assessment to refine the understanding of fish passage barriers throughout the watershed and opportunities for restoring fish passage and aquatic habitat for various parts of the river system.
- Revise local storm drainage design standards and regulations such that new or modified stream crossings are designed consistent with the Connecticut DEP Stream Crossing Guidelines (February 26, 2008).
- Investigate the feasibility of dam removal, including the implications of release
 of contaminated sediments behind the dams. Consider the impacts of dams
 beyond barriers to anadromous fish passage and fragmentation of resident fish
 populations. Dams affect water quality and particularly coldwater habitat.
 Accompany dam removal feasibility studies with assessments of fish passage at
 culverts upstream and downstream of the dams.
- Implement priority stream bank stabilization projects identified during the watershed field inventories.



Objective 3. Protect existing and restore degraded vegetative and riparian buffers.

Management Strategies

- Implement priority buffer reforestation and invasive species management projects identified during the watershed field inventories.
- Pending passage of enabling legislation by the Connecticut state legislature, adopt riparian buffer protection regulations that would establish a contiguous buffer strip on either side of the river such that it remains in a natural, undisturbed state.
- Tolland should consider incorporating more explicit watercourse buffer protection, including minimum buffer widths, similar to the watercourse buffer recommendations in the Town of Vernon Inland Wetlands and Watercourses Regulations.
 - Vernon should adopt LID regulations, which include site design credits or other similar incentives for developers to restore or establish vegetative buffers as part of site development.
 - Partner with the Connecticut Department of Transportation on state roadway projects in the watershed to request Transportation Equity Enhancement funding available for habitat/ecological restoration projects under SAFTEA-LU).
 - Educate developers, town staff, and the public.

Objective 4. Improve water quality by identifying and eliminating illicit discharges and encouraging stream cleanups.

- Follow-up with recommended discharge investigations (by the responsible municipality) identified during the watershed field inventories.
- Ensure that illicit discharge detection and elimination (IDDE) efforts of the watershed municipalities (required by the MS4 General Permit) include their respective areas of the Tankerhoosen River watershed.
- Ensure that the watershed municipalities implement IDDE programs as required by the MS4 General Permit, including an ordinance or other regulatory mechanism to effectively prohibit non-stormwater discharges into the regulated municipal separate storm sewer system and an IDDE Plan to detect and eliminate existing and future non-stormwater discharges, including illegal dumping.
- Implement priority stream cleanup projects identified during the watershed field inventories.
- Educate town staff and the public.



Objective 5. Build awareness of land stewardship and management practices and reduce nonpoint source impacts in residential areas.

Management Strategies

- Increase watershed stewardship signage (watershed, stream, stormwater pollution prevention, and storm drain markings).
- Encourage disconnection of rooftop runoff from the storm drainage system to reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.
- Tailor education efforts to the types of pollution producing behaviors observed in residential neighborhoods throughout the watershed (buffer encroachments, yard waste, piped discharges, septic system maintenance for unsewered areas, etc.).
- Encourage the creation of backyard habitat in residential areas that abut the Tankerhoosen River and its tributaries and recognize efforts of the public.

Objective 6. Advance local government and community business awareness of the Tankerhoosen River through pollution prevention education and watershed restoration outreach activities.

- The watershed municipalities should review the current compliance of their municipal facilities in the watershed with pollution prevention best management practices and applicable regulatory programs. "Good housekeeping" at municipal facilities should serve as demonstration sites for comparable private operations. Recognize examples of good practices and hold them up as models.
- The watershed municipalities should improve implementation of municipal stormwater management programs during the second term of the MS4 General Permit.
- Create a general brochure and presentation to inform businesses about pollution prevention. Conduct compliance assistance outreach (e.g., visits, group training, and/or printed materials) for specific types of businesses in the watershed (e.g., light industry, offices, commercial retail centers, restaurants).
 - Create educational displays in highly visible, strategic locations throughout the watershed to highlight water quality and habitat amenities, and to reinforce the watershed protection efforts in the watershed.
 - o Increase watershed stewardship signage (watershed, stream, stormwater pollution prevention, and storm drain markings).



Objective 7. Implement an ongoing water quality and biological monitoring program to assess the effectiveness of implementation efforts and build upon the existing water quality database to guide future decision making.

Management Strategies

- Establish a long-term water quality and biological monitoring program building upon previous baseline monitoring and ongoing DEP and volunteer monitoring efforts.
- Conduct a field monitoring study of the effectiveness of new LID practices (pervious pavement, rain gardens, etc.) in the watershed. The study could be used as a demonstration project to highlight a "local, real-world" example of LID stormwater design.

Objective 8. Manage, maintain, and promote existing open space and continue to acquire open space that meets resource protection and recreational goals within the watershed.

- Continue efforts to acquire unprotected open space, with priority given to the headwater subwatersheds (Gages Brook, Gages Brook South Tributary, Walker Reservoir, Upper Tankerhoosen River, Railroad Brook, and Bolton Notch Pond), riparian areas, and contiguous unfragmented parcels of open space.
- Implement existing municipal Open Space Plans and update the plans at least once every 5 years. Endorse the remaining priority open space in the watershed as high priority open space conservation areas in the municipal Open Space Plans and Plans of Conservation and Development.
- Seek alternative funding sources and approaches for open space acquisition such as state grants, limited market rate development on a parcel to help fund the acquisition of the remainder of the parcel as open space, transferring development rights from sensitive locations to locations better suited for development.
- Create watershed-wide trail maps and promote the use of existing open space by publicizing trail maps and events on open space parcels.
- Develop an invasive species management plan for the watershed, including
 prevention and education efforts to preempt arrivals, early detection and citizen
 monitoring efforts, rapid response measures for successful eradication, and
 when a species cannot be eradicated, continued control efforts that are
 necessary to minimize ecological and economic impacts.



Objective 9. Mitigate the negative impacts of stormwater runoff on hydrology and water quality through the use of Low Impact Development, sustainable design, and other state-of-the-art stormwater management practices.

Management Strategies (Regulatory)

- All municipalities in the watershed are subject to the NPDES Phase II
 requirements, including adoption of a local regulatory mechanism to control
 construction and post-construction runoff from new development and
 redevelopment projects.
- Tolland is one of the first towns in Connecticut to adopt comprehensive LID regulations. The regulations are a good model for the other watershed communities to require the use of LID practices. The regulations are currently in the early stages of implementation. The Town of Tolland should continue to monitor the effectiveness of the LID regulations as development projects subject to the new regulations are designed, reviewed, and constructed.
- The Tolland Inland Wetlands and Watercourses Regulations should be revised to require that projects also meet the design requirements contained in the Tolland LID Design Manual, for consistency with the zoning and subdivision regulations.
- Vernon should develop and implement new or revised stormwater/LID regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects, and 3) address other local drainage and natural resource protection issues identified by the Town.
 - Two potential approaches have been identified —1) a new stand-alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.
 - Vernon should form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon.
 - Vernon should develop a Town stormwater and LID design manual, incorporating a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater regulations.
- Other amendments to the Vernon Subdivision, Zoning, and Inland Wetlands regulations are recommended to achieve reductions in impervious cover and to promote the use of LID practices (see Vernon Land Use Regulatory Review recommendations, Appendix B).
- Manchester and Bolton should also consider adopting LID design guidance and regulations or similar regulatory mechanism that satisfies the NPDES Phase II requirements and promotes or requires the use of LID design practices.
- All of the watershed communities should consider updating their zoning regulations to require a zoning permit/drainage review for land clearing activities less than ½ acre and minimize land clearing by regulating building envelope or through the use of an LID credit system.



Management Strategies (Structural)

- Install priority stormwater retrofits (municipal, state, and private outfalls and/or sites) for water quality improvements based on watershed field inventory recommendations.
- Watershed towns should incorporate LID into town projects, including roadway work using emerging LID/Green Roads principles. The Town of Tolland should take a leadership role by incorporating LID into a high-profile demonstration project at a publicly-owned facility. The site should be regularly monitored and actively used for educational purposes.
- Education for developers, town staff, and the public.

Objective 10. Conduct additional assessment in non-priority subwatersheds.

Management Strategies

 Not all of the Tankerhoosen River subwatersheds and/or stream reaches were assessed during the development of this watershed management plan. Therefore, the remaining subwatersheds (Railroad Brook, Bolton Notch Pond, and the Upper Tankerhoosen River) and stream reaches should be assessed over the next two years to identify additional site-specific issues and restoration projects.



6 Watershed Management Recommendations

This section of the plan describes specific recommendations to meet the watershed management goals and objectives outlined in Section 5. The recommendations include watershed-wide recommendations that can be implemented throughout the Tankerhoosen River watershed, targeted recommendations that are tailored to issues within specific subwatersheds or areas, and site-specific recommendations to address issues at selected sites that were identified during the watershed field inventories.

The recommendations presented in this section are classified according to their implementation priority. Recommendations can be viewed as short-term, mid-term, and long-term, as summarized below:

- Short-Term Recommendations are initial actions to be accomplished within
 the first one to two years of plan implementation. These actions establish the
 framework for implementing subsequent plan recommendations. Such actions
 include development of local regulations and stormwater design guidance,
 discharge investigations, education program planning, and field inventories
 within previously unassessed subwatersheds. Small demonstration restoration
 projects could be completed during this phase, however construction of larger
 retrofit practices and stream restoration projects requiring extensive design,
 engineering, and permitting should be planned for later implementation.
- Mid-Term Recommendations involve continued programmatic and operational measures, delivery of educational and outreach materials, and construction of one or two larger retrofit and/or stream restoration projects over the next two to four years. Progress on land conservation, LID implementation, and discharge investigation follow-up activities should be completed during this period, as well as project monitoring and tracking.
- Long-Term Recommendations consist of continued implementation of any additional projects necessary to meet watershed objectives, as well as an evaluation of progress, accounting of successes and lessons learned, and an update of the watershed management plan. Long-term recommendations are intended to be completed during the next 5- to 10-year timeframe and beyond.

Table 6-1 summarizes the management recommendations for the Tankerhoosen River watershed based upon the management objectives identified in the previous section. The recommendations are organized by implementation priority (short-, mid-, and long-term), scale and location (watershed, targeted, or site-specific), and the groups who are responsible for implementing the recommendations. The remainder of this section presents detailed plan recommendations, including implementation priority, schedule, anticipated benefits, potential costs, funding sources, implementation responsibilities, and an evaluation framework to measure the progress and of plan implementation.



Table 6-1. Watershed Management Plan Recommendations Summary

				_	Who	Shoul	d be li	nvolve	ed (L =	= lead,	, A = a	issist)		
Key Actions	Priority	Scale/Location	Watershed Towns	Friends of HRLP	Watershed Coalition	Landowners	NCCD	HRWA	Belding WMA	ConnDOT	СТДЕР	NRCS	USEPA	Citizens/Volunteers
Objective 1. Build a Foundation for Implementing the Plan				•			•			•	•			
Form sustainable partnership or coalition	S	W	Α	L			Α	Α	Α		Α			
Adopt watershed management plan	S	W	L		Α									
Identify potential funding sources and submit grant applications	S	W	L		L	Α	Α	Α	Α	Α	Α	Α		
Objective 2. Enhance In-Stream and Riparian Habitat														
Conduct fish passage assessments	S	T	Α		L		Α	Α						
Revise local stream crossing & stormwater design standards	S	W	L											
Belding Pond Dam removal feasibility evaluation	S	Т			Α						Α	L		
Conduct aquatic invasive species study	S	S	Α		L									
Priority stream restoration projects	M/L	S	Α		L							Α		
Objective 3. Protect/Restore Riparian Buffers														
Priority riparian buffer restoration projects	M/L	S	Α		L	Α			Α			Α		
Adopt stream buffer regulations, pending enabling legislation	М	W	L											
Revise riparian buffer recommendations (Tolland)	S	W	L											
Incorporate invasive species management measures	М	Т			L			Α	Α		Α			
Objective 4. Identify and Eliminate Illicit Discharges														
Targeted illicit discharge investigations	S	Т	L		Α		Α							
Implement municipal IDDE programs	М	W	L											
Priority stream cleanup efforts	S	S			L			Α						Α
Develop education/outreach materials	S	W			L		Α				Α			
Deliver education/outreach to the public	М	W	L				Α							
Objective 5. Residential Management Practices														
Increase watershed stewardship signage in residential areas	М	W	L		Α		Α	Α						Α
Encourage disconnection of rooftop runoff	М	W	L		Α		Α							
Develop education/outreach materials	S	W			L		Α							
Deliver education/outreach to the public	М	W	L				Α							
Objective 6. Municipal and Business Management Practices														
Review municipal facility compliance	S	W	L											
Improve municipal stormwater management programs	S/M	W	L											
Implement street sweeping and catch basin cleaning	М	W	L							L				

F:\P2005\0257\A20\Tank Watershed Plan Final.doc



Table 6-1. Watershed Management Plan Recommendations Summary

					Who	Shoul	d be l	nvolve	ed (L =	= lead,	, A = a	ıssist)		
Key Actions	Priority	Scale/Location	Watershed Towns	Friends of HRLP	Watershed Coalition	Landowners	NCCD	HRWA	Belding WMA	ConnDOT	СТДЕР	NRCS	USEPA	Citizens/Volunteers
Develop education/outreach materials	S	W			L		Α							
Deliver education/outreach to the public	M	W	L				Α							
Increase watershed stewardship signage in commercial areas	M	W	L		Α		Α	Α						Α
Objective 7. Implement Water Quality Monitoring Program	1	1	1			1						1		
Develop and implement long-term monitoring program	S	W	_		L		Α	Α			Α			Α
Field monitoring study of LID effectiveness	М	W	Α		L		Α							<u> </u>
Objective 8. Protect Open Space			1 .		1 -	1 -		ı	1 -		T -	ı		
Priority land acquisitions	S/M	T	L		Α	Α			Α		Α			
Continue to implement municipal open space plans	S	T	L											
Seek alternative funding sources for open space acquisition	S/M	T	L		A									
Promote use of open space through trail maps and events	S/M	T			L			A	Α					
Develop and implement invasive species management plan	М	T			L			Α			Α			Α
Objective 9. Promote LID and Sustainable Site Design	1000				ı			ı	ı	1	1	ı		
Monitor effectiveness of LID regulations (Tolland)	S/M	W	L											
Revise Inland Wetland regulations for consistency (Tolland)	S	W	L											
Develop and implement new stormwater/LID regulations (Vernon)	S	W	L											
Form advisory committee	S	W	L											
Develop Town stormwater/LID manual and/or guidance	S S	W	L											
Update existing zoning, subdivision, wetlands regulations	M/L		L				۸			_				
Priority stormwater retrofits		S W	A		L		Α			Α				
Incorporate LID into Town projects LID demonstration projects (green roads, public works, schools)	M S	S			Α		Α							
Develop education/outreach materials	S	W			ı		A				Α			
Deliver education/outreach to the public	M	W	l ,		L		A				A			
Objective 10. Assess Additional Subwatersheds	1 141	_ vv												<u> </u>
Perform stream and upland assessments	S	Т					Α	Α	А					Λ
Priority Abbreviations: S = short-term M = mid-term L = long-term	_	cale/I		. Al-l-	<u> </u>	\ \ /				T 1		l C .		!£!-

Priority Abbreviations: S = short-term, M = mid-term, L = long-term Scale/Location Abbreviations: W = watershed-wide, T = targeted, S = site-specific HRLP — Hockanum River Linear Park, NCCD — North Central Conservation District, HRWA — Hockanum River Watershed Association, ConnDOT — Connecticut Department of Transportation, CTDEP — Connecticut Department of Environmental Protection, NRCS — Natural Resource Conservation Service, USGS — United States Geological Survey, USEPA — U.S. Environmental Protection Agency, Belding WMA — Belding Wildlife Management Area

F:\P2005\0257\A20\Tank Watershed Plan Final.doc



6.1 Watershed-Wide Recommendations

Watershed-wide recommendations are those recommendations that can be implemented throughout the Tankerhoosen River watershed. These basic measures can be implemented in each of the watershed towns, are applicable in most areas of the watershed, and are intended to address nonpoint source pollution through municipal land use regulations, public education and outreach, open space protection, and watershed monitoring. The benefits of these measures are primarily long-term, cumulative benefits resulting from source control, pollution prevention, and improved stormwater management for new development and redevelopment projects.

6.1.1 Build a Foundation for Implementing the Plan

During the planning process, the Technical Advisory Committee provided direction and local knowledge of the watershed in guiding the watershed assessments, determining priorities, and developing the management plan. As the focus of the planning process moves towards implementation, the Technical Advisory Committee, under the leadership of the Friends of the Hockanum River Linear Park, should transition to a watershed partnership or coalition specifically for implementing the Tankerhoosen River Watershed Management Plan. Recommended actions include:

- Maintain the existing Technical Advisory Committee but shift its responsibilities from planning to implementation.
- Include representatives from each of the watershed municipalities (Vernon, Tolland, Manchester, and Bolton), the Connecticut Department of Environmental Protection, and possibly new members to fill in missing expertise.
- Periodically review and update action items in the plan (at least every 5 years).
- Develop annual work plans (i.e., specific "to-do" lists).
- Host annual public meetings to celebrate accomplishments, recognize participants, review lessons learned, and solicit feedback on plan updates and next steps.
- Encourage adoption of the watershed plan by the watershed municipalities. As a group, the watershed partnership or coalition should encourage formal adoption of the watershed plan by the watershed towns and develop basic guidelines and procedures for long-term membership.
- Review and prioritize potential funding sources that have been preliminarily identified in this plan (see Section 6.5.3), and prepare and submit grant applications for projects identified in the watershed plan.



6.1.2 Municipal Regulations and Design Guidance

The regulatory review described in Section 4 of this plan identifies areas for improvements in local land use regulations and municipal stormwater design guidance to strengthen stormwater management and resource protection throughout the watershed. More detailed recommendations that were identified for the Town of Vernon are described in the technical memorandum provided in Appendix B. Many of the detailed concepts and recommendations that are described in the Vernon land use regulatory review memorandum are also applicable to the other watershed towns.

Town of Tolland

1. LID/Stormwater Regulations

Tolland is one of the first towns in Connecticut to adopt comprehensive LID
regulations. The regulations are a good model for the other watershed
communities to require the use of LID practices. The regulations are currently
in the early stages of implementation. The Town of Tolland should continue to
monitor the effectiveness of the LID regulations as development projects
subject to the new regulations are designed, reviewed, and constructed.

2. Inland Wetlands and Watercourses Regulations

- The Tolland Inland Wetlands and Watercourses Regulations should be revised to require that projects also meet the design requirements contained in the Tolland LID Design Manual, for consistency with the zoning and subdivision regulations and to further promote the use of LID. Permit application requirements include documentation that proposed stormwater quality management systems, at a minimum, conform to the DEP Connecticut Stormwater Quality Manual, as amended.
- The town should also consider incorporating more explicit watercourse buffer recommendations, including minimum buffer widths, similar to the watercourse buffer provisions in the Town of Vernon Inland Wetlands and Watercourses Regulations. Pending passage of enabling legislation by the Connecticut state legislature, the Town should also adopt riparian buffer protection regulations that would establish requirements for a contiguous buffer strip on either side of selected watercourses such that they remain in a natural, undisturbed state.

Town of Vernon

1. Town Design Manual

 Vernon should develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the DEP Connecticut Stormwater Quality Manual to take advantage of the existing design guidance,



but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town. The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.

- The design manual should include a section that addresses stormwater retrofits
 for redevelopment and drainage system upgrade and maintenance projects.
 Stormwater retrofits for residential and commercial redevelopment projects are
 an important element for the Town's stormwater management strategy given
 the level of existing development in the Town. Stormwater retrofits also
 present an opportunity to implement lot-level LID strategies as opposed to
 larger end-of-pipe controls where land may not be available for stormwater
 management.
- The design manual should incorporate or reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.

2. Stormwater Management Standards

• The Town should develop and incorporate into the design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance. Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the DEP Connecticut Stormwater Quality Manual and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included in the memorandum in Appendix B.

3. New or Modified Stormwater Regulations

- The Town of Vernon should develop and implement new or revised stormwater regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects in Vernon, and 3) address other local drainage and natural resource protection issues identified by the Town. Two potential approaches have been identified —1) a new stand-alone stormwater ordinance, or 2) addition or amendments to the existing Zoning Regulations. Both approaches are discussed in Appendix B.
- The Town should form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:



- o If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
- Which projects and activities will the new ordinance apply to (i.e., applicability)?
- o How will applications be received and reviewed?
- o Who will be responsible for inspections and enforcement?
- Will additional staff be required to handle the increased workload to review and process applications?

4. Subdivision Regulations

- Amend Section 6.4 to reference the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, as opposed to the outdated reference to the 1976 version of the Erosion and Sediment Control Handbook.
- Section 6.5.1.1 (Street Grading and Improvement): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.6.6 (Cul-de-sacs): Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.
- Section 6.7.1 (Design Standards, Road Width): Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.
- Section 6.7.2 (Design Standards, Curbs): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.9 (Drainage and Storm Sewers): Modify these sections to reference stormwater management standards and LID principles contained in a standalone stormwater ordinance or new section of the Zoning Regulations, and/or the Town stormwater design manual.
- Section 6.9.3 (Drainage Design): Amend this section to allow the use of roadside vegetated swales designed in accordance with the Town stormwater design manual.



- Section 6.12.1 (Sidewalks): Consider requiring sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.
- Section 6.14 (Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

5. Zoning Regulations

- Section 3.4 (General Provisions): If the Town develops a local stormwater design manual, change the reference to the Connecticut Stormwater Quality Manual to the Town manual.
- Sections 4.1 through 4.25 (Use Districts, Setbacks and Lot Dimensions): Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.
- Section 12 (Off-street Parking and Loading): Review existing parking ratios to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.

Clarify Section 12 of the regulations to encourage the use of shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.

 Section 18 (Activities Requiring a Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.



6. Inland Wetlands and Watercourses Regulations

- Section 4.5 (Evaluation of Proposed Activities): Add language referencing the stormwater management standards and LID principles contained in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.
- Pending passage of enabling legislation by the Connecticut state legislature, the Town should also adopt riparian buffer protection regulations that would establish requirements (as opposed to recommendations) for a contiguous buffer strip on either side of selected watercourses such that they remain in a natural, undisturbed state.

Other Watershed Towns

- Manchester and Bolton should also consider adopting LID design guidance and regulations or similar regulatory mechanism that satisfies the NPDES Phase II requirements and promotes or requires the use of LID design practices.
- All of the watershed communities should consider updating their zoning regulations to require a zoning permit/drainage review for land clearing activities less than ½ acre and minimize land clearing by regulating building envelope or through the use of an LID credit system.

6.1.3 Illicit Discharge Detection and Elimination

Municipal Illicit Discharge Programs

Illicit discharges are non-stormwater flows that discharge into the stormwater drainage system or directly into surface waters. Failing septic systems, wastewater connections to the storm drain system, and illegal dumping are among the types of illicit discharges that can occur in residential and commercial areas. Depending on the source, an illicit discharge may contain a variety of pollutants that can impact both human health and the aquatic environment. A number of potential illicit discharges were identified throughout the watershed during the stream inventories. Identifying and eliminating these discharges is an important means of pollution source control for the watershed.

All of the watershed towns are subject to the requirements of the NPDES Phase II stormwater program, which is regulated under the DEP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 General Permit). The MS4 General Permit regulates the quality of discharges from municipal storm drainage systems. The program requires the towns to implement an ordinance or other regulatory mechanism to effectively prohibit non-stormwater discharges into the municipal storm drainage system, as well as sanctions to ensure compliance. This includes developing an Illicit Discharge Detection and Elimination (IDDE) Plan to detect and eliminate existing and future non-stormwater discharges, including illegal dumping.



The MS4 General Permit is anticipated to be reissued in 2009, which represents an opportunity for the watershed towns to review their compliance status relative to the MS4 General Permit requirements, including the illicit discharge detection and elimination component.

The following recommendations apply to each of the watershed towns:

- Review the compliance status of the municipal stormwater management programs relative to each of the minimum measures addressed in the existing and proposed MS4 General Permit. Modify the stormwater management plans as necessary.
- Ensure that illicit discharge detection and elimination efforts of the watershed municipalities include their respective areas of the Tankerhoosen River watershed.
- Conduct follow-up illicit discharge investigations at priority outfall locations identified during the watershed inventories (see Site-Specific Recommendations).
- Develop and implement an ordinance or other regulatory mechanism to effectively prohibit non-stormwater discharges into the regulated municipal separate storm sewer system and an IDDE Plan to detect and eliminate existing and future non-stormwater discharges, including illegal dumping.

6.1.4 Residential Practices

Watershed Stewardship Signage

Stewardship signage can be an effective way of educating the public on the importance of preserving natural resources and common ways in which they may be impacting these resources. The general public is often unaware of the cumulative effects of their every-day activities. Signage can play an important role in making the connection between every-day activities and their sometimes harmful results.

Routine residential practices that can affect water quality and the natural environment include improper disposal of trash, pet waste, yard waste, and hazardous wastes; excessive use of fertilizers and pesticides; depositing fluids and materials in storm drains; and improper management of riparian areas. Educational signage can take the form of kiosks in public areas, storm drain markers or stencils, anti-dumping signs, proper pet waste management signs, and roadside/stream side signage (examples include "adopt a stream/roadway" programs).

The watershed field inventories identified very little evidence of storm drain stenciling or watershed stewardship signage. Stormwater and pollution prevention signage is generally lacking in most residential areas of the watershed. The watershed towns, together with other local stakeholders and volunteers, should consider additional storm drain marking in residential neighborhoods, heavy pedestrian areas served by storm sewers, and municipal facilities (schools, town offices, parks, libraries, etc.).



Rooftop Disconnection

Residential areas appear to contribute significant quantities of rooftop runoff to the storm drainage system, particularly in medium and high-density residential neighborhoods with smaller yards. Many small outfall pipes were observed from the backyards of residential areas, which are presumably associated with foundation drains, yard drains, or roof downspouts. Opportunities exist to disconnect residential rooftop runoff from the storm



Rain barrel used to capture and re-use rooftop runoff (Source: CWP, 2007).

drainage system or surface waters directly, and reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.

Rooftop disconnection (also referred to as "downspout or roof leader disconnection") is a cost-effective on-site option for reducing the volume and cost of stormwater that requires public management. Runoff from residential rooftops is collected by eaves troughs, which are installed along the edge of the roofline. Water collected in the eaves trough is conveyed to ground level by one or more downspouts. Downspouts may then connect directly into the storm sewer system or discharge to driveways, which in turn convey the water to the street and storm drainage system.



Runoff from commercial rooftops can be directed to bioretention planting beds (Source: CWP, 2007).

Rooftop disconnection has a number of economic and environmental benefits to the municipality and the homeowner. The major benefits include:

- Reduces volumes of flows conveyed and resulting loads to watercourses,
- Reduces the volume of flow to the municipal storm drainage system,
- Increases infiltration and groundwater recharge,
- Provides options to "recycle" rainwater.

Rooftop disconnection is ideal in neighborhoods where roof leaders are directly connected to the storm drainage system and in medium density residential areas with lot sizes in the 0.25 to 1.0 acre range (CWP, 2007). However, most residential areas that contribute rooftop runoff to the storm drainage system are potential retrofit candidates for some form of rooftop disconnection.

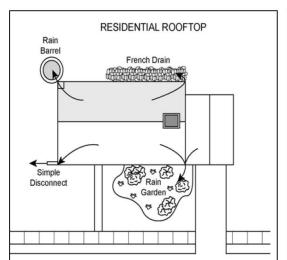
A variety of alternatives are available for residential and non-residential rooftop disconnections, ranging from simple disconnections to more complex delivery systems. Residential rooftop disconnection options include (Figure 6-1):



- Simple disconnection,
- Rain barrels and rain gardens,
- French drain or dry wells.

Non-residential rooftop disconnection options include (Figure 6-1):

- Simple disconnection,
- Rain gardens,
- Stormwater planters and cisterns,
- Green rooftops.



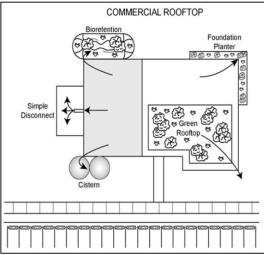


Figure 6-1. Residential and Commercial Rooftop Disconnection Retrofit Strategies (Source: CWP, 2007)

The Town of Vernon should incorporate rooftop disconnections for new development and redevelopment projects in the recommended stormwater/LID regulatory mechanism and design manual. The manual should require the use of rooftop disconnection and other LID techniques or provide incentives for their use such as an LID credit system. The manual should also include specific criteria regarding the suitability and design of various rooftop disconnection practices.

Individual rooftop retrofits target a small area, requiring the participation of many homeowners and businesses to make a measurable difference across a subwatershed. As a result, a coordinated effort is required for widespread participation in such a program, which typically includes a combination of targeted education, technical assistance, and financial subsidies to homeowners or the business community. Examples of effective local rooftop disconnection programs are presented in *Urban Stormwater Retrofit Practices* (CWP, 2007)

http://www.cwp.org/Resource Library/Center Docs/USRM/ELC USRM3.pdf.



6.1.5 Municipal and Business Practices

The municipal/state facilities and businesses that were observed during the field inventories exhibited examples of both good pollution prevention practices and opportunities for improvement. The watershed municipalities and ConnDOT should review the current compliance of their respective facilities (public works/maintenance facilities, parks, schools, public safety facilities, etc.) in the watershed with pollution prevention best management practices and applicable regulatory requirements. "Good housekeeping" at municipal facilities should serve as demonstration sites for comparable private operations, many of which are also subject to stormwater pollution prevention and other similar state and federal regulatory programs (oil pollution prevention, hazardous waste, air emissions). Examples of good practices should be recognized and modeled. The proposed watershed coalition should provide guidance (e.g., visits, group training, and/or printed materials) and develop incentives to encourage local businesses to adopt these model practices. Light industry, offices, commercial retail centers, and restaurants in the watershed should be the focus of these efforts.

With the pending reissuance of the DEP MS4 General Permit, the watershed towns have an opportunity to re-evaluate and improve upon the effectiveness of their municipal stormwater management programs during the second term of the MS4 General Permit. This includes the municipal good housekeeping minimum measure contained in the General Permit. The towns should modify their stormwater management plans to include audits of pollution prevention and good housekeeping practices at their respective municipal facilities, as well as re-evaluate their municipal street sweeping, catch basin cleaning, and drainage system maintenance efforts. At a minimum, all streets in the watershed should be swept at least twice per year, with more frequent sweeping of targeted areas, as necessary and as equipment and funding allow. Vacuum-assisted sweeping has been shown to be more effective than conventional mechanical broom sweeping for removing finer particulates.

Educational signage should also be considered in commercial business areas along the major transportation corridors in the watershed, including Interstate 84, Route 30, Route 31, and other heavily-traveled local roads that cross the Tankerhoosen River and its major tributaries. Increased educational signage explaining the linkage between recreational centers in the watershed and the Tankerhoosen River is also recommended within Walker Reservoir East, the Belding Wildlife Management Area, Valley Falls Park, Bolton Notch Pond, Freja Park, the Rails-to-Trails, and Phoenix Mill Park.

6.1.6 Education and Outreach

Nearly all source control and pollution prevention measures rely on some form of public education to change public behavior. In some cases, education efforts must be targeted at municipal officials and public works employees (e.g., stormwater ordinances, roadway deicing application, storm drainage system maintenance). The general public, including residents, business owners and operators, plays an important role in almost all of the source control and pollution prevention measures described in this plan.



Often, the public is not aware of the critical role they have in protecting water resources. Public education is an important part of an overall pollution prevention and source control program because it raises awareness of both personal responsibilities and the responsibilities of others relative to environmental protection and teaches people what individual actions they can take to prevent pollution. This increased understanding has the additional benefit of fostering support for watershed management efforts.

Public education programs can consist of a variety of elements including:

- Educational displays, pamphlets, booklets, and utility stuffers;
- Use of the media (newspapers, television, radio);
- Promotional giveaways (hats, t-shirts, bumper stickers, etc.);
- Stormwater educational materials;
- Classroom education.

The choice of outreach materials depends on the resources available and the target audience. A public education and outreach program should be designed to offer a broad discussion of stormwater and water quality issues. For maximum effectiveness, the program should target selected geographic areas or subwatersheds, audiences, and potential sources of pollution. A variety of general educational materials on stormwater and pollution prevention are available from state and federal government agencies, as well as education and industry groups.

The NPDES Phase II stormwater permitting program has generated a plethora of educational materials regarding water quality and nonpoint source pollution. A collection of educational materials is maintained by the U.S. EPA and is accessible to the public via the U.S. EPA's Nonpoint Source Outreach Toolbox (http://www.epa.gov/nps/toolbox/) and NPDES Stormwater Program page (http://cfpub.epa.gov/npdes/home.cfm?program_id=6). The materials target various audiences including the residences, commercial businesses, and industry. Additional materials can be found at www.stormwatereducation.com/index_flash.html.

Through implementation of their municipal stormwater programs, the watershed towns should ensure that their public participation and outreach programs focus on target audiences and areas within the Tankerhoosen River watershed. The following target audiences are recommended for watershed public education and outreach programs:

- Homeowners and renters,
- Public school system,
- Builders and residential contractors,
- Residential and commercial lawn care and landscaping professionals,
- Commercial and retail businesses.



Public education and outreach programs should target one or more of the following activities and sources of pollution:

- Illicit discharges,
- Residential downspout disconnection (rain barrels, dry wells, etc.),
- Lawn care practices,
- Yard waste disposal,
- Backyard riparian buffer practices,
- Low Impact Development for homeowners and contractors,
- Septic system maintenance,
- Construction erosion and sediment control,
- Pet waste management.

Educational displays should also be considered for highly visible, strategic locations throughout the watershed to highlight water quality and habitat amenities, and to reinforce the watershed protection efforts. Potential locations include stormwater and LID retrofit demonstration projects at schools, public parking lots, commuter parking lots, and recreational areas (see Site-Specific Recommendations).

6.1.7 Water Quality Monitoring Program

Long-Term Monitoring Program

Continued chemical and biological monitoring within the Tankerhoosen River watershed is recommended to refine the understanding of water quality impacts from potential point and non-point pollution sources in the watershed, to continue developing a water quality database for the watershed to guide environmental decision-making, and to measure the progress toward meeting water quality goals in the watershed. Additional funding sources should be sought to finance future monitoring efforts.

Recommended modifications to the Tankerhoosen river watershed water quality monitoring program for future monitoring events include:

- Chemical monitoring is recommended along Gages Brook immediately downstream of the industrial park to further evaluate potential dry weather impacts and possible illicit connections/discharges from facilities in the industrial park. The Town of Tolland should designate the industrial park as a focus area for its municipal stormwater management program, including outfall monitoring and illicit discharge detection and elimination efforts.
- Chemical monitoring is recommended along tributaries of the lower Tankerhoosen River (Tucker Brook and Tunnel Brook) that have not been previously monitored to provide information on pollutant contributions from developed areas within the lower Tankerhoosen River watershed.



LID Retrofit Demonstration Monitoring

Water quality monitoring (runoff volumes and pollutant concentrations) is recommended in conjunction with the potential LID retrofit demonstration projects that are described in the Targeted and Site-Specific Recommendations sections of this plan. Monitoring of the retrofit site(s) is recommended before and after the installation of the retrofit. Such a monitoring program could help quantify the benefits of innovative LID techniques within the Tankerhoosen River watershed, but would require a significant funding source for a comprehensive and statistically-valid "before and after" study design.

6.2 Targeted Recommendations

Targeted recommendations are tailored to address issues within specific subwatersheds or areas, rather than watershed-wide. Targeted recommendations also include actions to address common types of problems that were identified at representative locations throughout the watershed, but where additional studies or evaluations are required to develop site-specific recommendations. Targeted recommendations can have both short- and long-term benefits. Appendix C contains a series of subwatershed maps that depict targeted stream corridor recommendations.

6.2.1 Priority Parcels for Open Space Protection

As described earlier in this plan, conservation of open space is critical in protecting and preserving the health of a watershed by limiting development and impervious coverage, preserving natural pollutant attenuation characteristics, and supporting other planning objectives such as farmland preservation, community preservation, and passive recreation. Each of the watershed towns continues to implement open space plans for their respective communities.

There are several common ways that undeveloped land can be preserved and protected as open space. These include outright purchase (fee simple), conservation easements, purchase of development rights, and land donations. Regardless of the mechanism, critical to the success of protecting open space land is having a source of funding that can be readily accessed when windows of opportunity to acquire significant parcels arise.

The open space plans of the watershed towns identify priority parcels for preservation and protection. A key goal of the Town of Vernon's Open Space Plan (Revised October 12, 2005) is to protect the Tankerhoosen River watershed and associated wildlife habitat by creating contiguous greenways within the watershed. Preservation of key parcels in the watershed will help to offset the long-term, cumulative impacts of non-point source pollution. The plan's objective is to expand the large contiguous greenway formed by Valley Falls Park, the Belding Wildlife Management Area, Bolton Lakes, and State of Connecticut preserved land in order to protect the Tankerhoosen River and its tributaries from non-point source pollution, link important wildlife habitats, enhance biodiversity, and create extensive opportunities for outdoor recreation. The open space plans of the other watershed towns also identify protection



of key natural resources and water quality, including the Tankerhoosen River and its watershed, as an important goal.

The watershed towns, working closely with other stakeholders including local land owners, should:

- Continue to implement their municipal Open Space Plans and update the plans at least once every 5 years. Endorse the remaining priority open space in the watershed as high priority open space conservation areas in the municipal Open Space Plans and Plans of Conservation and Development.
- Continue to pursue funding sources and alternative approaches for open space acquisition such as state grants, limited market rate development on a parcel to help fund the acquisition of the remainder of the parcel as open space, and transferring development rights from sensitive locations to locations better suited for development.
- Create watershed-wide trail maps and promote the use of existing open space by publicizing trail maps and events on open space parcels.

Priority should be given to larger properties that meet one or more of the following general criteria:

- Are contiguous with and would extend current greenways and riparian areas along headwater (1st or 2nd order) streams and other water bodies,
- Provide linkages between existing open space areas and linkages to existing trails,
- Provide important scenic, historic, cultural, or natural resource value,
- Protect groundwater and surface water supply sources,
- Protect other critical environmental resources.

Figure 6-2 identifies priority parcels throughout the watershed that should be targeted for open space protection. Several of these parcels, which are among Vernon's highest priority for open space protection, are also described below.

Tancanhoosen LLC Property

This collection of parcels comprises approximately 470 acres of land and is situated in the headwaters of the Tankerhoosen River watershed, between Walker Reservoir and the Belding Wildlife Management Area. The site is located near the Exit 67 interchange of Interstate 84 and has experienced significant development pressure. The parcel encompasses over 1.5 miles of the Tankerhoosen River that harbors a significant wild trout area. The site is characterized mostly by forested upland, and some steeply-sloped forested wetlands along the Tankerhoosen. A forested swamp and marsh area also exists on the site near Walker Reservoir. Preservation of this property would serve to offset continuing non-point source pollution pressures on the Tankerhoosen; contribute significantly to the wildlife corridor (greenway) expansion; and provide recreational value and diverse habitats including wetland aquatic habitats, stream habitats, and upland forest habitats.

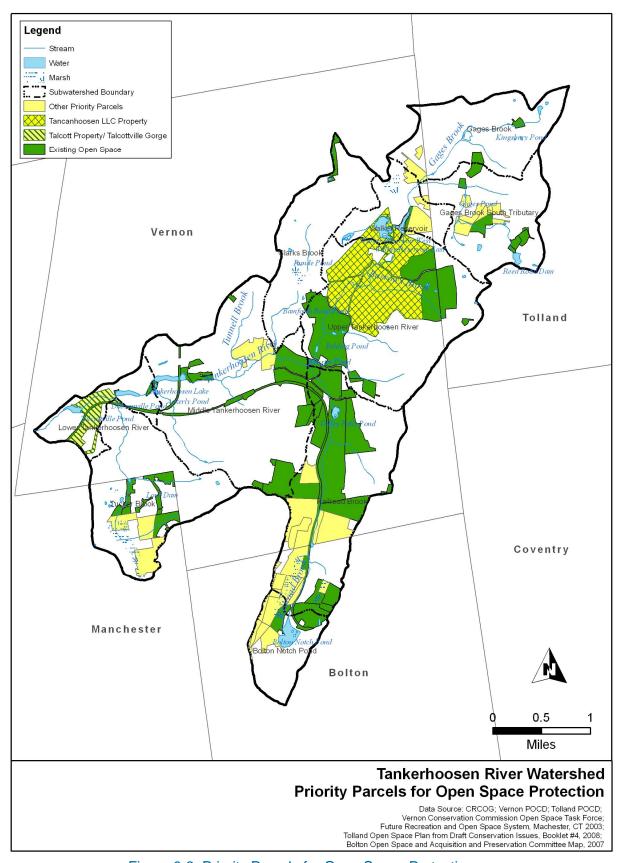


Figure 6-2. Priority Parcels for Open Space Protection



The DEP has been actively pursuing purchase of this property, although funding has been delayed due to recent state budget cuts. The property remains a high priority for acquisition by the DEP, which is a key open space recommendation of this watershed management plan.

Talcottville Gorge Property

This area, known as Talcottville Gorge, is a largely forested, scenic area bisected by the Tankerhoosen River, generally situated between Talcottville Pond and Dobsonville Pond in the lower Tankerhoosen River watershed. The site encompasses a geologically significant gorge with steeply sloped rock outcroppings, a dam and falls, a small pond; and remains of early 19th century textile mills. The acreage also encompasses parcels on either side of Elm Hill Road, which are comprised of some wetlands and steep slopes and forested land and also bound the Rails to Trails. The nearby village area is designated a local historic district. Due to its diverse natural resource, cultural, and recreational value, this property ranks as the highest priority in the Town of Vernon's Open Space Plan.

6.2.2 Invasive Plant Species Management

Invasive terrestrial plant species (phragmites, cattails, reed canary grass, etc.) were observed in stream corridors in many areas of the watershed during the field inventories. Management measures for control of invasive plant species should be incorporated into site-specific stream restoration activities. An invasive plant species management plan should be developed for targeted areas or subwatersheds, including the Walker Reservoir, Tucker Brook, and Gages Brook South Tributary subwatersheds. The plan could identify prevention and education efforts to preempt arrivals, early detection and citizen monitoring efforts, response measures for successful eradication, and when a species cannot be eradicated, continued control efforts that are necessary to minimize ecological and economic impacts. Information on invasive plant species planning and management can be obtained from:

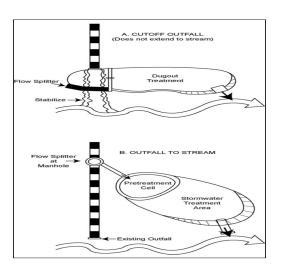
- U.S. Fish and Wildlife Service: (http://www.fws.gov/invasives/staffTrainingModule/planning/introduction.h tml).
- The Connecticut Department of Environmental Protection,
- The Nature Conservancy (TNC),
- Connecticut Invasive Plant Working Group (CIPWG).

6.2.3 Targeted Stormwater Outfall Retrofits

Stormwater runoff from many of the state and local roads in the watershed typically receives little or no treatment prior to discharge. Such discharges are a source of sediment and other pollutants to the receiving water bodies. Opportunities exist for stormwater retrofits at roadway stormwater outfalls, particularly at or near roadway stream crossings.



This type of retrofit creates new treatment adjacent to the stream corridor near the terminus of an existing storm drain outfall. Outfall retrofits are designed off-line by splitting flow from the existing storm drain pipe (or ditch) and diverting it to a stormwater treatment area formed by an existing depression, excavation or constructed berm. A flow splitter allows larger storms to remain in the existing pipe (or ditch) and bypass the retrofit. Typical stormwater treatment options at outfall retrofits can include stormwater basins, constructed wetlands (Figure 6-3), and bioretention.



A common strategy for outfall retrofits in the stream corridor (Source: CWP, 2007).

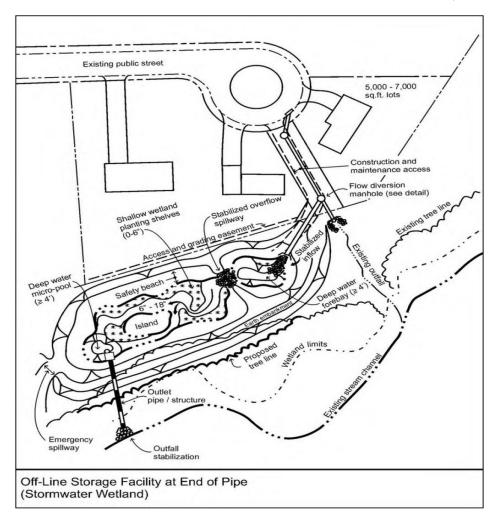


Figure 6-3. Example Constructed Wetland Outfall Retrofit (Source: CWP, 2007)



Table 6-2 lists potential outfall retrofit opportunities that were identified during the watershed field inventories, as well as outfalls where illicit discharge investigations and stabilization measures are recommended (see maps in Appendix C). The feasibility of retrofits at these outfalls should be further evaluated based on consideration of site-specific factors including hydraulic head, available space, soil conditions, and easements.

Table 6-2. Priority Outfall Retrofit Sites

			R	ecommendation		
Watershed	Stream Reach	ID	Stormwater Retrofit	Investigate Illicit Discharge	Stabilize or Repair Outfall	Location
Clarks Brook	CB-04	OT-01		ü		Downstream of Rockledge Road
	GB-03A	OT-01			ü	Outfall of sedimentation basin on Gerber Drive
	GB-04	OT-01	ü			Adjacent to Industrial Park Road West
	GB-04	OT-02		ü		250 ft south of Industrial Park Road East
	GB-04	OT-03	ü		ü	100 ft south of Industrial Park Road East
Gages Brook GB-04	GB-04	OT- 04B		ü		Adjacent to Industrial Park Road East
	GB-05B	OT-01			ü	Outfall of detention pond CNC Software
	GB-09	OT-01	ü	ü		Along road adjacent to Industrial Park Road East
	GB-09	OT-02			ü	Along road adjacent to Industrial Park Road East
Gages Brook South	GBST- 02	OT-01	ü		ü	I-84 Drainage at 0.6 miles east of Exit 67
Tributary	GBST- 02	OT-02			ü	I-84 Drainage 1,000 ft east of OT-01
Lower Tankerhoosen River	LTR-03	OT-01		ü		I-84 runoff from detention pond near Exit 65
Middle Tankerhoosen River	MTR-09	OT-10		ü		South of Warren Street



Table 6-2. Priority Outfall Retrofit Sites

			R	Recommendation			
Watershed	Stream Reach	ID	Stormwater Retrofit	Investigate Illicit Discharge	Stabilize or Repair Outfall	Location	
	TB-04B	OT-01	ü		ü	End of Yale Drive, outfall from detention pond	
Tucker Brook	TB-04C	OT-02		ü		North of Chatham Drive 500 ft east of OT-01	
	TB-04C	OT-04		ü	ü	North of Chatham Drive 350 ft east of OT-02	
Walker Reservoir	WR-05	OT-01	_	ü		At Mile Hill Road	

6.2.4 Watershed Fish Passage Assessments

Upper Tankerhoosen

The upper portion of the Tankerhoosen River and Railroad Brook support a variety of fish species. This portion of the watershed also includes the Belding Wild Trout Management Area, which has some of the highest-quality, self-sustaining native trout populations in the state. A number of existing or potential barriers to fish passage were identified during the stream inventories (Appendix C). However, the Upper Tankerhoosen River and Railroad Brook subwatersheds were not assessed during the field inventories as they were determined to be less vulnerable to future development impacts.

A field inventory is recommended along the upper portions of the Tankerhoosen River to identify potential barriers to fish passage such as culverts, dams, and other obstructions. The Tankerhoosen River is a cold water stream starting only a short distance below Walker Reservoir. The proposed removal of Belding Pond Dam approximately 1 mile downstream of Walker Reservoir (see Section 6.3.4) could potentially provide for additional passage of resident fish populations upstream to Walker Reservoir and tributaries of the Upper Tankerhoosen River, including Rickenback Brook and Barrows Brook.

Lower Tankerhoosen

The three run-of-river impoundments on the Lower Tankerhoosen River restrict fish passage within this portion of the river. Nevertheless, resident populations of brown trout, bass, and other fish species have been documented in the Lower Tankerhoosen. Although there are no diadromous fish (herring, shad) passage plans for these dams, there has been an effort in recent years to provide American eel passage at inland dams when there is a need and an opportunity.

The Lower Tankerhoosen River should be further evaluated for the presence of American eel and other resident fish populations that could potentially benefit from fish passage at these three dams. If justified, the DEP Inland Fisheries Division should



request that any repairs to the dams include provisions for fish passage for resident fish populations.

6.2.5 Targeted Illicit Discharge Investigations

Numerous outfalls were observed from virtually all of the land uses encountered during the stream assessments. Many appear to be associated with sources having low potential for water quality impacts (i.e., residential foundation drains), while others were of unknown origin and should be the focus of future investigation. Priority outfalls that were identified for follow-up illicit discharge investigations are depicted on the subwatershed maps in Appendix C and summarized in Table 6-2.

Methods for identifying illicit discharges can vary widely in the level of effort and cost required for implementation. The following field-based methods are typically used to identify illicit discharges:

- Testing of Dry Weather Discharges: Flows from stormwater outfalls during dry weather may indicate an illicit discharge. A combination of visual inspection and chemical analysis of dry weather discharges can aid in identifying potential discharge sources.
- Visual Inspection: Examination of piping connections by either physical examination or closed-circuit camera can be used to identify possible illicit connections.
- Review of Piping Schematics: Examination of architectural plans and plumbing details can reveal potential sites of improper connections.
- Smoke Testing: Injection of a non-toxic vapor (smoke) into the facility plumbing system and following its path of travel can be used to locate connections.
- Dye Testing: In this method, appropriate colored dyes are added into the
 drain water of suspect piping. Appearance of the dyed water in the storm
 drainage system indicates an illicit discharge. As mentioned in the discussion of
 septic system discharges, testing for optical brighteners can provide an
 indication of the presence of domestic wastewater flows.
- Infrared, Aerial, and Thermal Photography: Use of aerial, infrared, and thermal photography to locate patterns of stream temperature, land surface moisture, and vegetative growth are emerging techniques to identify potential illicit discharges to stormwater systems.

Other sources of information on performing illicit discharge investigations include:

- New England Interstate Water Pollution Control Commission: http://www.neiwpcc.org/neiwpcc_docs/iddmanual.pdf
- Center for Watershed Protection: http://www.cwp.org/Resource Library/Controlling Runoff and Discharges/idde.htm



The watershed towns are required to develop illicit discharge detection and elimination programs under the NPDES Stormwater Phase II program. The Towns should perform follow-up investigations of the potential illicit discharges that were identified in this watershed study as part of their ongoing municipal stormwater permit program.

6.2.6 Additional Subwatershed Field Assessments

Due to limited project funding, not all stream segments in the priority subwatersheds were assessed, and other subwatersheds were not assessed as they were determined to be less vulnerable to future development impacts. The remaining subwatersheds and stream reaches (Table 6-3) should be assessed over the next two years, pending the availability of funding, to identify additional site-specific issues and potential watershed restoration opportunities.

Subwatershed	Stream Reach	Proposed Schedule		
Lower Tankerhoosen River	All except LTR-03	Summer/Fall 2009		
Middle Tankerhoosen River	MTR-03, MTR-04, MTR-05, MTR- 06, MTR-10, MTR-11, MTR-12	Summer/Fall 2009		
Gages Brook South Tributary	GBST-06, GBST-07, GBST-08	Summer/Fall 2009		
Tucker Brook	TB-05, TB-06, TB-07, TB-08, TB-09, TB-10, TB-11, TB-12	Summer/Fall 2009		
Railroad Brook	All reaches	Summer/Fall 2010		
Bolton Notch Pond	All reaches	Summer/Fall 2010		
Upper Tankerhoosen River	All reaches	Summer/Fall 2010		

Table 6-3. Additional Subwatersheds and Stream Reaches to be Assessed

6.3 Site-Specific Recommendations

Site-specific recommendations are tailored to address issues at selected sites that were identified during the watershed field inventories. These recommendations also provide examples of the types of projects that could be implemented at similar sites throughout the watershed. Site-specific recommendations can have both short- and long-term benefits.

6.3.1 Stormwater Retrofit Opportunities

Stormwater retrofits are structural practices installed in upland areas to capture and treat stormwater runoff before it is delivered to the storm drainage system, and ultimately, the Tankerhoosen River or its tributaries. A total of 10 retrofit sites were identified based on the field inventories and review of previous studies and reports. The majority of the stormwater retrofit opportunities are on publicly-owned land. This list is not intended to be all-inclusive, as only several representative subwatersheds and target areas were included in the field inventories. Rather, the retrofit sites identified in this section should be considered representative of the types of retrofit opportunities that exist throughout the watershed.



The stormwater retrofit options identified in this section generally focus on Low Impact Development techniques such as bioretention practices, porous pavement, water quality swales, stormwater basins, and constructed wetlands. They also include traditional practices such as sediment forebays and deep sump catch basins. Conceptual designs and typical details for the proposed retrofit concepts are provided in Appendix D. While the retrofit concepts presented in this section require additional site-specific evaluation to verify their ultimate feasibility, they illustrate how stormwater retrofits can be applied at these and similar sites throughout the watershed and provide the basis for future implementation projects.

Northeast School

- The paved driveway and parking area at the Northeast School provides an
 opportunity for a highly visible parking lot retrofit. Retrofits at schools provide
 an ideal learning opportunity for children and the community. Similar retrofits
 could be implemented at other schools throughout the watershed.
- Bioretention on existing traffic island and parking lot median. These retrofits could be implemented in the Northeast School parking lot by excavating a depression in the existing landscaped areas and planting with plants that tolerate wet conditions. Existing curbing separating the parking area from the traffic islands could also be removed and replaced with curb stops, allowing stormwater to flow into the bioretention areas while protecting the areas from vehicular traffic. Adjacent paved walkways could be replaced with porous pavers for additional infiltration. Existing driveway catch basins could be replaced with outlet structures for the bioretention areas. If soils are not suitable for stormwater infiltration, an underdrain could be installed below the bioretention areas, which would then serve as stormwater filtration devices primarily to treat the water quality volume.
- Install a new stormwater basin. As an alternative to the bioretention concept, a new stormwater basin could be located near the corner of Route 30 and the school driveway adjacent to the athletic field to treat runoff from the driveway and parking lot. A new outlet structure could connect to the existing storm drainage system.

Mount Vernon Apartments

• Install a new stormwater basin in the lawn area along the apartment complex driveway. The new basin would receive stormwater from the apartment complex's existing drainage system via a diversion manhole that could be constructed to divert low to moderate flows into the stormwater basin for treatment, but high flows would bypass the basin. Existing catch basins could also be replaced with deep sump, hooded catch basins to remove coarse sediment and floatable material.

Fire Station (Route 30)

• Replace the existing stormwater leakoff with a constructed stormwater basin and swale. A small constructed stormwater basin and vegetated swale is recommended to treat runoff from the fire station parking lot. The basin would be located along the south side of the parking lot/access road. Removal of a



portion of the paved area may be necessary to allow room for the basin. The basin would discharge to the existing natural wetland via a short vegetated swale. The swale would be located on the outlet side of the wetland. Other types of stormwater treatment measures may not be feasible for this location since groundwater is likely to be shallow due to its close proximity to natural wetlands

Vernon Historical Society (Route 30)

- Construct a new vegetated swale and pocket wetland. A new vegetated swale could be constructed along the south side of the parking lot. This swale would convey runoff to the west along the edge of the parking lot. On the southwestern corner of the property's upland area, a pocket wetland could be constructed adjacent to Myrtle's Garden, an existing landscaped area. The pocket wetland would provide partial treatment of stormwater flows and could be used as a demonstration project. The pocket wetland would discharge to existing natural wetlands via a short vegetated swale.
- The retrofits for the Vernon Historical Society and Fire Station sites are examples of the types of retrofits that could be applied at other municipal parking lots throughout the watershed.

ConnDOT Commuter Lot (Route 6/44 and I-384 Interchange)

• Construct a new vegetated swale and stormwater basin along the east side of the commuter lot. The commuter lot located at the I-384 and Route6/44 interchange near Bolton Notch Pond is elevated significantly, providing a low area on the south and east sides of the lot. This topography creates two areas that offer potential opportunities for stormwater basins. The low area on the east side of the lot is a more feasible location for a new stormwater basin since buried utilities may be present to the south, and existing surface drainage from the commuter lot enters the low area south of the lot. Surface drainage from the parking lot would be conveyed and treated by creating a new water quality swale. The swale would convey runoff to a new sediment forebay and stormwater basin, which would discharge to an existing ditch and culvert.

ConnDOT Commuter Lot (I-84, Exit 67)

- Install a long, narrow stormwater basin along the east side of the commuter lot to capture and treat flows from the parking area. An existing catch basin inlet can be eliminated and a short swale provided to convey flow into the basin. The basin would then convey flows north to maximize retention time since the majority of runoff would enter the wetland at its southern end. Curbing along the adjacent edge of the parking lot could be eliminated and replaced with curb stops, and the area between the basin and the parking lot replaced with a vegetated filter strip if overland flow to the wetland could be facilitated at other low points.
- Similar stormwater retrofits could potentially be implemented at other state, municipal, and commercial parking lots throughout the watershed.



Gerber Technologies Office Building

- Retrofit an existing stormwater basin with a riprap berm to form a sediment forebay. The existing stormwater basin that receives runoff from the Gerber Technologies facility incorporates many of the recommended elements to meet current stormwater quantity and quality design criteria. However, the basin is also in need of maintenance as demonstrated by the sediment accumulation near the center of the basin and the overgrown woody vegetation at the overflow spillway. Existing stormwater basins such as this one may also be good retrofit candidate to improve treatment effectiveness by incorporating a sediment forebay at the basin inlet, which may also facilitate routine sediment removal. A sediment forebay would restrict coarse pollutants to a smaller area in the basin, improving treatment of the stormwater that the basin currently receives and facilitating easier maintenance.
- Maintain the existing riprap outfall, or replace if necessary. The existing riprap channel leading from this basin to Gages Brook is becoming blocked with shrubs and trees which may restrict its function during a large precipitation event. Additionally, water was observed flowing through the channel rather than over it. The trees and vegetation should be cleared from this channel and the stumps removed. The existing riprap should then be removed, and either replaced with properly bedded riprap, perhaps of a smaller average diameter stone if appropriate, or replaced with a grass swale to facilitate mowing if discharge velocities allow.

Lake Street School

- Convert existing island in turn-around in front of school into demonstration bioretention/rain garden. The traffic island in front of the school is a potentially ideal candidate for conversion to a stormwater bioretention area to treat runoff from the school parking lot. The existing island receives surface runoff from the paved turnaround and parking lot areas, but conveys the runoff via a paved low-flow channel through the island to a downgradient headwall and piped drainage system. The island could be converted to a planted bioretention area, incorporating either an exfiltration design if soils allow or an underdrain discharge to the existing storm drainage system for stormwater filtration. The existing walkway and culvert could be replaced with a small pedestrian bridge to. The existing headwall and culvert could be replaced with an outlet structure to convey higher flows.
- This potential retrofit is an excellent opportunity for a bioretention demonstration project.

Tankerhoosen Lake and Tankerhoosen River Road Crossings

 Construct sediment forebay at inlet of Tankerhoosen Lake and associated treatment retrofits at selected road crossings. In a 2004 watershed study of Tankerhoosen Lake, Baystate Environmental Consultants recommended the creation of a sediment trap/forebay at the inlet of Tankerhoosen Lake, installation of deep sump catch basins at key locations, maintenance of cross-culverts and drainage structures, and grass swales and vegetated filter strips. None of the BEC recommendations has been implemented to date.



6.3.2 Riparian Buffer Restoration Opportunities

Riparian buffers are naturally vegetated areas adjacent to waterways, including streams, ponds, and wetlands. This natural vegetation protects the land adjoining a waterway by preserving the floodplain, keeping native soils intact, and maintaining the streamside land and streambanks. Vegetative buffers help encourage infiltration of rainfall and runoff, and provide absorption for high stream flows, which helps reduce flooding and drought. The vegetative community of riparian



A mature riparian buffer (Source: Delaware Riverkeeper Network).

buffers provides habitat for many species of plants and animals, many of them dependent on riparian habitat features for survival and many of them threatened or endangered species. The buffer area provides a living cushion between upland land use and water, protecting water quality, the hydrologic regime of the waterway and stream structure. The naturally vegetated buffer filters out pollutants, captures sediment, regulates stream water temperature and processes many contaminants through vegetative uptake. Riparian buffers should be kept intact or restored wherever possible (Delaware Riverkeeper Network, undated).

Stream buffer encroachments are prevalent throughout the Tankerhoosen River watershed along stream corridors in or near areas of residential and commercial development. Residential lawns and some commercial lawns extend down to the banks of the stream in many areas, particularly in residential back yards. Yard waste such as grass clippings, leaves, and brush and waste materials were also common occurrences in and near these areas where easy access exists to the streams. Historical mill development along the banks of the Tankerhoosen and its tributaries has also resulted in the loss of riparian forest cover and encroachment of the built environment upon the river.

Table 6-4 lists stream reaches with impacted riparian buffers and potential buffer restoration candidates that were identified during the watershed field inventories (see maps in Appendix C). In general, riparian buffers are more effective along smaller, headwater streams. Potential riparian buffer restoration approaches for these areas include:

- Installation of new riparian buffers,
- Widening existing riparian buffers,
- Invasive species removal/management,
- Tree planting/reforestation.



The feasibility of riparian buffer restoration at these sites should be further evaluated based on consideration of site-specific factors including site access, available land area, land ownership, soil conditions, appropriate buffer width, and native plant species.

Table 6-4. Priority Riparian Buffer Restoration Sites

Watershed	Stream Reach	ID	Location
	GB-03B	IB-01	Along Gerber Drive
	GB-06	IB-01	At footbridge south of Valley View Drive
Gages Brook	GB-07	IB-01	100 feet downstream of Andrew Way
	GB-08	IB-01	50 feet upstream of Andrew Way
	GB-10	IB-01	Begins at house on downstream end of reach to 1,500 feet upstream
Gages Brook South Tributary	GBST-04B	IB-01	Rear of house along Leohr Road
Lower Tankerhoosen River	1	Not Assessed	400-ft length of Tankerhoosen River adjacent to Talcottville Mill
	TB-01	IB-01	At confluent with Lower Tankerhoosen River
	TB-03	IB-01	50 feet downstream of IB-02
Tucker Brook	TB-03	IB-02	400 feet downstream of IB-03
	TB-03	IB-03	250 feet northwest of Vernon Street
	TB-04C	IB-01	Behind houses at end of Yale Drive
	TB-04C	IB-02	Behind houses along Chatham Drive

Talcottville Mill Riparian Damage

In the fall of 2008, extensive removal of trees and vegetated buffer occurred along an approximately 400-foot segment of the Lower Tankerhoosen River. The vegetation removal, and subsequent installation of stone bank stabilization along both sides of the Tankerhoosen River, was associated with redevelopment activities at the Talcottville Mill property. The work was performed without prior approval from the Town of Vernon, the DEP, or the U.S. Army Corps of Engineers. The Town continues to coordinate with the state and federal resource agencies to determine an appropriate course of action to repair the riparian damage.

Corrective actions to restore the lost streambank vegetation and riparian habitat should balance the goal of full restoration with potential disturbance and further water quality impacts associated with complete removal of the existing stone. A dual approach that utilizes the existing stone bank stabilization and introduces new vegetative plantings may be prudent. The feasibility of such an approach should be further evaluated. Subsequent site redevelopment should also incorporate riparian buffer restoration measures (trees and vegetative plantings) into the master plan for the site.

6.3.3 Stream Restoration Opportunities

Relatively isolated areas of moderate to severe streambank erosion were observed throughout the assessed portions of the watershed. Most of these areas are located at or downstream of stormwater outfalls in developed areas of the watershed. Table 6-5 lists stream reaches with



Streambank erosion along Gages Brook.



moderate to severe bank erosion that were identified during the watershed field inventories (see maps in Appendix C). These reaches are potential streambank restoration candidates. Streambank restoration requires use of a system of treatment techniques that work together to stabilize slopes, reduce erosion, and improve aquatic habitat. Although every site is different and requires detailed design of restoration components that work together, typical restoration techniques include:

• Slope Stabilization Techniques. Of primary concern is preventing an unstable slope from additional failure. It is likely that the slope of an eroded bank is close to the limit of its stability, such that additional loading or

saturation of the soil could cause a slide. The slope must first be stabilized before techniques to prevent additional erosion can be implemented. If

Cut the gravel or sand bar to compensate for lost channel capacity and to provide material to build the bench.

Riprap

adequate room is available surrounding the stream, it may be possible to flatten

Typical slope stabilization where flattering the slope is not allowable (Source: NEH-654).

the slope to ensure stability. If site constraints prevent flattening the slope, such as a road, structure, or utilities lying just inland from the bank, it may be necessary to provide structural support for the slope, or buttress the slope while providing adequate flow capacity by widening the channel by a corresponding amount along the inside of the bend. In combination with earthwork, slope stabilization should also include a combination of plantings and toe protection techniques to prevent future destabilization.

• Toe Protection
Techniques. The toe of
the streambank, or the
portion of the bank where
the slope transitions into
the relatively flat stream
channel bottom, is subject
to constant erosive forces
of flowing water, especially
along the outside bank of
bends. Protecting the toe
is critical to ensure that
upper portions of the bank

This part of slope planted to shrubs and grass

Original ground line to shrubs and grass

Fill

Geotextile or bedding material as needed

1 ft minimum

Top of slope

Placement direction

Side view

Front view

are not further undermined. A variety of techniques have developed for toe protection, including constructing

Typical toe protection for erosion and scour resistance (Source: NEH-654).

cribs made from logs, gabions (baskets filled with stone), woody debris anchored in place, and placed or dumped riprap protection. Bioengineering



techniques are usually not adequate on this part of the slope since the selected treatment technique must be designed to resist the shear stress and energy of the flowing water during high flow conditions, continue deep enough below the stream bottom to resist scour, and not be susceptible to ice damage.

Although hard armoring and engineered slope stability systems can be used effectively to restore an area of degraded bank, these techniques often lack habitat and riparian ecological value that natural conditions provide. In addition, engineered techniques are not 'self-healing,' in that, when damaged, they may fail and allow the degradation of the bank to resume. Bioengineering techniques can be used to avoid



Bioengineering techniques used for slope stabilization and redirection (Source: NEH-654).

these consequences. Streambank bioengineering includes the use of living plant material to supplement or replace engineered systems. Typically, grasses, forbes, shrubs, and trees are used to hold soil in place, resist erosion of high flow events, provide habitat value, and grow into a natural system that could work in place of engineered systems when those systems eventually fail. Native shrub and tree species that root well from cuttings, such as willow and dogwood, can be planted along the bank, projecting into the stream, or through a riprap layer using a variety of techniques to meet site needs. Native grasses and forbes can be planted in areas subject to ice damage or where trees and shrubs are not preferred.

- Grade Control Techniques. Downcutting of a stream can present a significant problem since it may disconnect a stream from its wetland. Treatment techniques are available that create artificial hard points along a downcutting reach. These points set the bottom elevation of the stream channel, limiting its downward movement along the treated reach.
- Riparian Buffer Improvement. An important step in preventing degradation
 of the river corridor is to improve the width and quality of the existing riparian
 buffer, or providing a buffer where encroachment has removed it. The riparian
 buffer provides an important protection and ecological system that supports
 and complements the riverine system.

Access to many of the potential streambank restoration sites is limited; therefore, potential candidate sites for bank stabilization projects should be evaluated further for overall feasibility including land ownership, erosion severity, upstream and downstream conditions, infrastructure constraints, and construction access to the stream.



Table 6-5. Priority Stream Restoration Sites

Watershed	Stream Reach	ID	Location
	GB-01	ER-01	250 feet upstream of confluence with Gages South Tributary
	GB-01	ER-02	250 feet upstream of confluence with Gages South Tributary
Carras Drask	GB-03A	ER-01	Along entire reach
Gages Brook	GB-05B	ER-01	Downstream side of Old Post Road
	GB-06	ER-01	450 ft upstream of Old Post Road
	GB-06	ER-02	900 ft upstream of Old Post Road
	GB-06	ER-03	1,100 ft upstream of Old Post Road
	GB-06	ER-04	1,200 ft upstream of Old Post Road
Gages Brook South Tributary	GBST-09B	ER-01	700 ft downstream of Tolland Farms Road
Middle Tankerhoosen River	MTR-09	ER-01	Adjacent to Warren Avenue
	TB-01	ER-01	100 ft upstream of confluence with Lower Tankerhoosen River
Tucker Brook	TB-03	ER-01	400 ft downstream of Phoenix Street, adjacent to utility Right-of- Way
Clarks Brook	CB-02	ER-01	Adjacent to baseball field on Bolton Road
CIGINS DIOUK	CB-03	ER-01	Rear of Industrial Park Road building complex

6.3.4 Dams and Impoundments

In addition to the recommended fish passage barrier assessments along the upper and lower portions of the Tankerhoosen River (see Section 6.2.4), additional site-specific actions are recommended for several of the dams and impoundments in the watershed.

Walker Reservoir Dam

An engineering evaluation of Walker Reservoir Dam was performed in 1998 by Karl Acimovic, P.E. on behalf of the Vernon Parks and Recreation Department. The dam was determined to be in poor to fair overall condition, requiring significant modifications and improvements to prevent overtopping of the embankment adjacent to the spillway and subsequent erosion of the crest of the dam. The dam should be reevaluated to verify what modifications, if any, were implemented in response to the 1998 study findings and to assess current conditions.

Walker Reservoir feeds the headwaters of the Tankerhoosen River and is believed to function as "sink" for pollutants carried from upstream areas including Gages Brook. Walker Reservoir is suspected to play a key role in protecting the high quality of the upper portions of the Tankerhoosen River, in addition to the spring water inputs that also feed the upper reaches of the Tankerhoosen. The relationship between the water quality of Walker Reservoir and the Tankerhoosen River is unclear given the limited available monitoring data. Additional study of the water quality of Walker Reservoir and its potential impact on the Tankerhoosen River is recommended in order to understand this relationship and develop management recommendations for Walker Reservoir that are also protective of the Tankerhoosen River.



Valley Falls Pond Dam

An engineering evaluation of Valley Falls Pond Dam was performed in 1997 by Karl Acimovic, P.E. on behalf of the Vernon Parks and Recreation Department. The dam was also determined to be in poor to fair condition due to the poor structural condition of the downstream earth embankment, seepage from the downstream toe of embankment, and poor condition of the secondary spillway and inadequate spillway capacity. A number of recommendations were made including tree removal, increasing the spillway capacity, a new intake/outlet structure, embankment reconstruction and toe drain installation, and reconstruction of the primary spillway. The dam should be re-evaluated to verify what modifications, if any, were implemented in response to the 1997 study findings and to assess current conditions.

Belding Pond Dam

The Natural Resources Conservation Service (NRCS) is evaluating the feasibility of removing the Belding Pond Dam, which is located along the Tankerhoosen River upstream of the Belding Wildlife Management Area. As described previously, removal of the dam could potentially provide for additional passage of resident fish populations upstream to Walker Reservoir and tributaries of the Upper Tankerhoosen River, including Rickenback Brook and Barrows Brook. The feasibility evaluation should consider a range of factors including potential impacts of removal on stream geomorphology, habitat, recreation, economics, and management of legacy sediment accumulated behind the dam.

6.3.5 Aquatic Invasive Species Study

In 2008, the Vernon Conservation Commission verified the presence of the aquatic invasive species, variable leaf milfoil, in Valley Falls Pond, which is located along Railroad Brook before the confluence with the Tankerhoosen River in the Belding WMA. Variable leaf milfoil is one of the two most common invasive milfoil species found in Connecticut, the other being Eurasian milfoil.

Variable leaf milfoil is native to the southern U.S. It first arrived in Connecticut in 1936, and has become a nuisance in many Connecticut lakes, especially in the southeast part of the state. Like Eurasian milfoil, variable leaf milfoil produces long stems that rise to the water's surface, where they spread, producing dense mats of vegetation. Control of this species can be difficult. According to "Nuisance Aquatic Vegetation Management," a guidebook published by DEP (undated), milfoil should generally not be cut to control it, since each piece can grow into another plant. The guidebook states that the most effective chemical controls are systemic herbicides applied at low dosages, which would require a DEP permit. A physical removal method, referred to as "suction harvesting", is being used to remove variable leaf milfoil from Crystal Lake in Ellington and Stafford Springs, Connecticut.

Fanwort, another aquatic invasive plant species that can form large colonies in quiet water bodies, was recently noted in Walker Reservoir by Aquatics Research. Fanwort can grow aggressively and clog drainage canals, ponds, lakes, reservoirs, and slow-moving freshwater streams. It represents a threat to Walker Reservoir and other water bodies throughout the watershed.



An aquatic plant survey and feasibility study is recommended to evaluate the extent and distribution of variable leaf milfoil in Valley Falls Pond, evaluate a range of potential control alternatives, and to identify a preferred control strategy, including costs and potential funding sources. An aquatic plant study of Walker Reservoir is also recommended, including a plant survey for fanwort and other aquatic plants that could threaten the health of the reservoir and other water bodies in the watershed.

More information on aquatic invasive plants is available from:

- Connecticut Invasive Plants council is available at: http://nbii-nin.ciesin.columbia.edu/ipane/ctcouncil/CT_invasive.htm.
- Connecticut Agricultural Experiment Station at: http://www.ct.gov/caes/
- Connecticut Department of Environmental Protection at http://www.ct.gov/dep/cwp/view.asp?a=2702&q=323494&depNav_GID=1641
- The Connecticut Aquatic Nuisance Species Management Plan: http://www.ctiwr.uconn.edu/ProjANS/SubmittedMaterial2005/Material200601/ANS%20Plan%20Final%20Draft121905.pdf.
- The National Invasive Species Information Center: http://www.invasivespeciesinfo.gov/aquatics/watermilfoil.shtml.

6.3.6 Priority Stream Cleanups

The watershed field inventories identified isolated areas of trash and debris dumping along most of the assessed streams. Stream clean-ups and trash removal are often cosmetic and temporary. However, they are an effective tool for involving and educating the public about stream degradation. In addition, some trash and debris accumulation may present risks to infrastructure and increased flooding, such as when outfalls and culverts become clogged with trash.

Table 6-6 lists stream reaches where significant trash and debris were observed (see maps in Appendix C). These sites are recommended candidates for targeted stream cleanups.



Table 6-6. Priority Stream Cleanup Sites

Watershed	Stream Reach	ID	Location	Material
	GB-01	TR-01	Near bridge downstream of detention pond	Sticks, brush wood fencing
Gages Brook	GB-02	TR-01	300 ft upstream of detention pond, adjacent to agricultural field	Tires and automotive debris
	GB-08	TR-01	350 ft downstream of Mountain Springs Road	Tire, bathtub, and two 55-gal drums
	MTR-01	TR-01	650 ft upstream of TR-02	55-gal drum (unknown material, may be toxic)
	MTR-01	TR-02	North of residence on Frederick Road	Debris piled from removal of beaver dam
Middle Tankerhoosen	MTR-01	TR-03	South of residence on Susan Road	Approx. 16 closed 5- gal buckets
River	MTR-09	TR-01	Rear of residences on Tunnel View Terrace	Yard waste and tennis balls
	MTR-09	TR-02	Rear of residences on Tunnel View Terrace	Yard waste (small amount)
	MTR-09	TR-03	Rear of residences on Warren Avenue	Yard waste (small amount)
	MTR-09	TR-04	400 ft downstream of Tunnel Road	Leaves, logs, tires stumps
	TB-04B	TR-01	End of Yale Drive, outfall from detention pond	Grass and brush clippings
Tucker Brook	TB-04C	TR-01	Behind houses along Chatham Drive	Yard waste
	TB-04C	TR-02	Behind houses along Chatham Drive	Pieces of tree approx 1 ft diameter; 2-10ft long
Clarks Brook	CB-02	TR-01	50 ft upstream of Industrial Park Road stream crossing	6 tires; automotive waste; appliance; 55-gallon drum
	CB-03	TR-01	Rear of Industrial Park Road building complex	Automotive waste

6.4 Estimated Costs and Load Reductions

6.4.1 Estimated Costs

Planning level costs were estimated for the targeted and site-specific recommendations in this plan, where sufficiently detailed information was available. The cost estimates assist watershed stakeholders to evaluate the financial resources and funding sources that may be required to implement the plan.

Table 6-7 summarizes typical ranges of planning level unit costs for the targeted recommendations, and some of the site-specific recommendations, that are identified in this plan. Additional information is required to develop more detailed cost estimates for these recommendations.



Table 6-7. Typical Unit Costs for Management Plan Recommendations

Recommendation	Planning Level Cost (\$)	Source
Invasive Species Management Plan	\$15,000 to 30,000	Professional engineering experience
Targeted Stormwater Outfall Retrofits (design and construction; 2009 \$ per cubic ft of runoff treated) Bioretention Stormwater Ponds/Basins	\$10.00 to 25.00 \$4.00 to 13.00	Center for Watershed Protection, Urban Stormwater Retrofit Practices (2007)
Water Quality Swales Watershed Fish Passage Assessment	\$11.00 to 31.00	
Upper Tankerhoosen Lower Tankerhoosen	\$10,000 to 15,000 \$5,000 to 10,000	
Illicit Discharge Investigation	Costs vary significantly depending on investigation methods and findings	Center for Watershed Protection, IDDE Manual (2004), NEIWPCC IDDE Manual (2003)
Additional Subwatershed Field Assessments	\$10,000 to 15,000 (varies depending on the use of volunteers)	Center for Watershed Protection, Unified Stream Assessment (2005)
Riparian Buffer Restoration (\$ per acre)		NRCS, Coginchaug River Watershed Based Plan (2008)
Grass/herbaceous buffer Tree and shrub planting	\$450 to 850 \$2,000 to 3,000	
Streambank Restoration (good access, \$ per 100 linear feet)) Bank stabilization Channel rehabilitation	\$1,300 to 9,600 \$1,100 to 3,700	NOAA Stream Restoration Cost Estimates (2000)
Evaluation of Dams & Impoundments		Professional engineering experience
Walker Reservoir Dam Evaluation Walker Reservoir Water Quality Study Valley Falls Pond Dam Evaluation Belding Pond Dam Removal Feasibility Evaluation	\$5,000 to 10,000 \$20,000 to 30,000 \$5,000 to 10,000 \$30,000 to 40,000	
Aquatic Invasive Species Study and Invasives Control (Valley Falls Pond and Walker Reservoir)	Cost varies depending on removal method (mechanical harvesting, herbicide application, etc.)	
Stream Cleanups	Highly dependent on the amount of donated supplies and services	

More detailed planning level costs were estimated for the site-specific stormwater retrofits described in Section 6.3.1. These estimates are based upon unit costs derived from published sources and the conceptual designs presented in Appendix D of this plan. Capital (construction, design, permitting, and contingency) and operation and maintenance costs were included in the estimates, and a total annualized cost is presented in 2009 dollars based on the anticipated design life of each retrofit. Table 6-8 summarizes planning level cost estimates for the site-specific stormwater retrofits. A more detailed cost estimate table is included in Appendix E.



Table 6-8. Planning Level Cost Estimates for Site-Specific Stormwater Retrofits

	ıst	Perr	sign, nitting, ingency			e	_		ost/yr
Recommendation	Construction Cost (2009)	% Construction	Cost	Total Cost	Lifespan (yrs)	Annual Cost Over Lifespan	O&M (% Cost)	O&M (\$/yr)	Total Capitalized Costlyr over lifespan
Tankerhoosen Lake									
Sediment Forebay	\$93,700	32%	\$30,000	\$123,700	30	\$6,310	6%	\$380	\$6,690
Deep Sump CBs, piping, and swale	\$24,300	32%	\$7,800	\$32,100	50	\$1,250	15%	\$190	\$1,440
Northeast School							ı	1	
Bioretention Area 1	\$42,100	32%	\$13,500	\$55,600	15	\$4,660	8%	\$370	\$5,030
Bioretention Area 2	\$31,100	32%	\$10,000	\$41,100	15	\$3,440	8%	\$280	\$3,720
SW Basin	\$18,100	32%	\$5,800	\$23,900	30	\$1,220	6%	\$70	\$1,290
Mount Vernon Apartm	ents								
SW Basin	\$42,600	32%	\$13,600	\$56,200	30	\$2,870	6%	\$170	\$3,040
Deep Sump CBs	\$18,800	32%	\$6,000	\$24,800	50	\$960	20%	\$190	\$1,150
Fire Station (Route 30)								
SW Basin	\$21,600	32%	\$6,900	\$28,500	30	\$1,450	6%	\$90	\$1,540
Vegetated Swale	\$900	32%	\$300	\$1,200	10	\$140	7%	\$10	\$150
Vernon Historical Soc	iety (Route	30)							
Pocket Wetland	\$5,500	32%	\$1,800	\$7,300	10	\$860	6%	\$50	\$910
Vegetated swale	\$9,600	32%	\$3,100	\$12,700	10	\$1,490	6%	\$90	\$1,580
ConnDOT Commuter	Lot (Route	6/44 and	I-384 Inter	change)			T		
Vegetated swale	\$7,700	32%	\$2,500	\$10,200	29	\$530	7%	\$40	\$570
SW Basin	\$51,700	32%	\$16,500	\$68,200	30	\$3,480	6%	\$210	3,690
ConnDOT Commuter	Lot (I-84, E	xit 67)							
SW Basin	\$38,500	32%	\$12,300	\$50,800	30	\$2,590	6%	\$160	\$2,750
Vegetated Swale	\$1,500	32%	\$500	\$2,000	10	\$230	7%	\$20	\$250
Gerber Technologies							l	1	
Sediment Forebay	\$2,000	32%	\$600	\$2,600	30	\$130	30%	\$40	\$170
Discharge Channel	\$9,000	32%	\$2,900	\$11,900	30	\$610	10%	\$60	\$670
Lake Street School									
Bioretention	\$71,300	32%	\$22,800	\$94,100	15	\$7,880	8%	\$630	\$8,510

6.4.2 Load Reductions

Pollutant load reductions were estimated for the following watershed management plan recommendations using the STEPL pollutant loading model described in the *Baseline Watershed Assessment* report (Fuss & O'Neill, May 28, 2008):



- Implementation of LID treatment practices (bioretention, filter or buffer strips adjacent to impervious areas, and infiltration swales to treat runoff from impervious surfaces) for all future development and redevelopment activity in the watershed, assuming adoption of a local LID stormwater regulatory mechanism and design standards by the Town of Vernon and the other watershed towns that currently do not have such requirements,
- 2. Implementation of stormwater retrofits in existing developed areas (commercial, industrial, institutional and roadway land uses) to treat runoff from a percentage of each subwatershed, which would be dictated by subwatershed feasibility factors and site-specific conditions.

Pollutant load reductions for total suspended solids (TSS), phosphorus (P), nitrogen (N), and biochemical oxygen demand (BOD) for the above scenarios were estimated for 1) existing conditions, 2) future buildout of the watershed without the proposed controls, and 3) future buildout with the proposed controls.

Table 6-9 summarizes anticipated sediment loads and anticipated load reductions resulting from the implementation of LID treatment practices for all future development and redevelopment projects in the watershed. Sediment load reductions resulting from the use of LID practices varies by subwatershed, but is generally between 4 and 10 percent. The anticipated load reductions for nutrients and BOD are of a similar magnitude (Table 6-10).

Table 6-9. Anticipated Effectiveness of LID in Reducing Sediment Loads

Subwatershed	Existing Conditions (tons/yr)	Future Buildout Without LID Controls (tons/yr)	Future Buildout With LID Controls (tons/yr)	Load Reduction Due to LID Controls (%)
Bolton Notch Pond	48.8	53.3	51.4	3.5%
Clarks Brook	88.2	100.4	92.1	8.1%
Gages Brook	92.3	112.8	102.6	9.0%
Gages Brook South Trib.	82.7	93.3	88.7	4.8%
Lower Tankerhoosen River	45.0	52.9	47.9	8.9%
Middle Tankerhoosen River	199.0	220.2	203.5	7.3%
Railroad Brook	32.0	52.7	37.5	28.2%
Tucker Brook	86.1	98.4	89.0	9.1%
Upper Tankerhoosen River	73.2	80.2	76.7	4.2%
Walker Reservoir	52.6	65.6	58.0	11.1%



Table 6-10. Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads

Subwatershed	Future Buildout With LID Controls (tons/yr)		Load Reduction Due to LID Controls (%)			
	N	Р	BOD	N	Ρ	BOD
Bolton Notch Pond	1.1	0.18	4.1	2.0%	2.7%	2.1%
Clarks Brook	2.1	0.30	8.1	4.6%	6.4%	5.1%
Gages Brook	2.5	0.38	10.0	4.8%	7.4%	4.9%
Gages Brook South Tributary	2.0	0.31	7.5	2.7%	3.9%	2.9%
Lower Tankerhoosen River	1.1	0.16	4.0	5.8%	5.9%	7.2%
Middle Tankerhoosen River	4.7	0.66	18.0	4.4%	5.8%	5.2%
Railroad Brook	1.1	0.12	4.9	16.2%	20.5%	16.8%
Tucker Brook	2.2	0.28	8.8	5.6%	6.2%	6.4%
Upper Tankerhoosen River	1.8	0.26	7.1	2.6%	4.3%	2.9%
Walker Reservoir	1.3	0.20	4.8	6.5%	9.5%	7.8%

Note that sediment loads (Table 6-9) under the future buildout scenario, even with the implementation of LID controls alone, are slightly higher than existing sediment loads in all of the subwatersheds. This result suggests that other source controls/pollution prevention, stormwater retrofits, and watershed restoration practices are necessary to maintain existing pollutant loads or to achieve net reductions in pollutant loads under a future buildout scenario.

The pollutant loading model was then used to estimate the effectiveness of implementing stormwater retrofits in existing developed areas (commercial, industrial, institutional and roadway land uses) to treat runoff from a portion of each subwatershed. Ideally, the entire area watershed could be retrofitted to achieve maximum pollutant load reductions. In practice, stormwater retrofits can be difficult to implement in an urbanized watershed due to a variety of physical constraints and other factors. Therefore, stormwater retrofits are typically limited to treating runoff from some percentage of the total developed area in a subwatershed.

The pollutant loading model was then used to estimate the anticipated pollutant load reductions, compared to existing conditions, for stormwater retrofits applied to between 5 and 30 percent of the developed area (commercial, industrial, institutional and roadway land uses) in each subwatershed. Table 6-11 summarizes the results of this evaluation for sediment, which indicate that even modest applications of watershed-wide stormwater retrofits (20 to 30 percent of the area retrofitted), can result in significant pollutant load reductions (10 to 20 percent sediment load reductions).

Table 6-11. Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area

Subwatershed	Sediment Load (tons/yr)							
	Existing Conditions	With Retrofits (5% of (10% of Watershed Area) With Retrofit (10% of Area)		With Retrofits (20% of Watershed Area)	With Retrofits (30% of Watershed Area)			
Bolton Notch Pond	48.8	47.2	45.5	42.2	38.9			
Clarks Brook	88.2	85.9	83.5	78.9	74.2			
Gages Brook	92.3	89.8	87.2	82.1	77.0			
Gages Brook South Trib.	82.7	80.4	78.2	73.7	69.2			



Table 6-11. Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area

Subwatershed	Sediment Load (tons/yr)						
	Existing Conditions	With Retrofits (5% of Watershed Area)	With Retrofits (10% of Watershed Area)	With Retrofits (20% of Watershed Area)	With Retrofits (30% of Watershed Area)		
Lower Tankerhoosen R.	45.0	43.5	42.0	39.1	36.2		
Middle Tankerhoosen R.	199.0	193.9	188.8	178.6	168.5		
Railroad Brook	32.0	31.6	31.3	30.6	29.8		
Tucker Brook	86.1	84.3	82.5	78.9	75.3		
Upper Tankerhoosen R.	73.2	71.7	70.2	67.1	64.1		
Walker Reservoir	52.6	50.9	49.2	45.8	42.4		

Finally, the potential effectiveness of 1) new LID controls for future development and redevelopment activity in the watershed and 2) stormwater retrofits at existing developed land uses were evaluated collectively to determine the minimum treatment area required for stormwater retrofits in each subwatershed to maintain existing pollutant loads under future buildout conditions. This approach provides a target stormwater retrofit treatment area (which varies by pollutant) for each subwatershed to meet the overall goal of "no net increase in watershed pollutant loads". Table 6-12 lists these minimum retrofit area targets.

Additional retrofits, source controls/pollution prevention, and other watershed restoration practices described in this plan could be implemented to achieve net reductions in future pollutant loads or to maintain existing loads if the target stormwater retrofit treatment areas are not feasible.

Table 6-12. Minimum Retrofit Area (Percent of Subwatershed)
Necessary to Maintain Existing Pollutant Loads

Nitrogen	Phosphorus	Sediment
25%	15%	10%
35%	15%	10%
50%	40%	25%
50%	25%	15%
40%	15%	15%
30%	15%	5%
50%	15%	10%
50%	50%	15%
50%	35%	20%
	25% 35% 50% 50% 40% 30% 50% 50%	25% 15% 35% 15% 35% 40% 50% 25% 40% 15% 30% 15% 50% 15% 50%

^{*} No commercial, industrial, institutional land use and only 17 acres of transportation land use in this subwatershed.



6.5 Plan Implementation

6.5.1 Schedule and Milestones

Table 6-13 is a proposed implementation schedule, including actions/milestones, anticipated timeline, products, and evaluation criteria. This table should be revised as necessary to reflect future changes to the watershed plan and implementation activities.

Table 6-13. Proposed Implementation Schedule

Actions	Lead Entity	Timeline	Products	Evaluation Criteria		
Objective 1. Build a Foundation for Implementing the Plan						
Form coalition	Friends of HRLP	1-2 yrs	and grant	Grant applications submitted		
Adopt plan	Towns					
Identify potential funding sources	Coalition		applications			
Submit grant applications	Coalition/Towns					
Objective 2. Enhance In-Stream and Riparian Habitat						
Conduct fish passage assessments	Coalition	1-2 yrs	Assessment findings			
Revise local stream crossing & stormwater design standards	Towns	1-2 yrs	Revised standards			
Belding Pond Dam removal feasibility evaluation	NRCS, DEP	1-2 yrs	Evaluation findings			
Conduct aquatic invasive species study	Coalition, Towns	1-2 yrs	Study findings			
Priority stream restoration projects	Coalition, Towns	2-10 yrs	Completed projects	Photos, # sites, WQ monitoring		
Objective 3. Protect/Restore Riparia						
Priority riparian buffer restoration projects	Coalition	2-10 yrs	Completed projects	Photos, # sites, WQ monitoring		
Adopt stream buffer regulations, pending enabling legislation	Towns	2-4 yrs	Adopted regulations			
Revise riparian buffer recommendations (Tolland)	Towns	1-2 yrs	Revised recommend.			
Objective 4. Identify and Eliminate II	licit Discharges					
Targeted illicit discharge investigations	Towns	1-2 yrs	Investigation findings	# discharges removed		
Implement municipal IDDE programs	Towns	2-4 yrs				
Priority stream cleanup efforts	Coalition	1-2 yrs	Trash removed	# cleanups		
Develop education/outreach materials	Coalition, Towns	1-2 yrs	Educational materials	Number of participants & feedback		
Deliver education/outreach to the public	Coalition, Towns	2-4 yrs				
Objective 5. Residential Management Practices						
Increase watershed stewardship signage in residential areas	Towns	2-4 yrs	New signage	# signs		
Encourage disconnection of rooftop runoff	Towns	2-4 yrs	Rain barrels, disconnections	# participants		
Develop education/outreach materials	Coalition, Towns	1-2 yrs	Educational materials	Number of participants & feedback		
Deliver education/outreach to the public	Coalition, Towns	2-4 yrs				
Objective 6. Municipal and Business	Management Prac	tices				
Review municipal facility compliance	Towns	1-2 yrs	Review findings	Improved BMPs		



Table 6-13. Proposed Implementation Schedule

Actions	Lead Entity	Timeline	Products	Evaluation Criteria
Improve municipal stormwater management programs	Towns	1-4 yrs	Revised SWMPs	
Implement street sweeping and catch basin cleaning	Towns, DOT	2-4 yrs	Sweeping and CB cleaning	Frequency
Develop education/outreach materials	Coalition, Towns	1-2 yrs	Educational materials	Number of participants &
Deliver education/outreach to the public	Coalition, Towns	2-4 yrs		feedback
Increase watershed stewardship signage in commercial areas	Towns	2-4 yrs	New signage	# signs
Objective 7. Implement Water Quality		m		
Develop and implement long-term monitoring program	Coalition	1-2 yrs	Monitoring data, report	Review results with
LID demonstration monitoring	Coalition	2-4 yrs		agencies
Objective 8. Protect Open Space				
Priority land acquisitions	Towns	1-4 yrs	Protected land	#sites/ acres
Continue to implement municipal open space plans	Towns	1-4 yrs		protected
Seek alternative funding sources for open space acquisition	Towns	1-4 yrs		
Promote use of open space through trail maps and events	Coalition	1-2 yrs	New maps and events sponsored	# events
Develop and implement invasive species management plan	Coalition	2-4 yrs	Management plan	
Objective 9. Promote LID and Sustai	nable Site Design			
Monitor effectiveness of LID regulations (Tolland)	Town	1-4 yrs	LID measures installed	Photos, WQ monitoring, 3 rd party reviews
Revise Inland Wetland regulations for consistency (Tolland)	Town	1-2 yrs	Revised regulations	
Develop and implement new stormwater/LID regulations (Vernon) Form advisory committee	Town	1-2 yrs	New SW/LID regulations, revised existing	
Develop Town stormwater/LID manual and/or guidance Update existing zoning,			regulations	
subdivision, wetlands regulations				
Priority stormwater retrofits	Coalition	2-10 yrs	Completed projects	Photos, # sites, WQ monitoring
Incorporate LID into Town projects	Town	2-4 yrs	LID measures	Photos, WQ
LID demonstration projects (green roads, public works, schools)	Town	1-2 yrs	installed	monitoring
Develop education/outreach materials	Coalition, Towns	1-2 yrs	Educational materials	Number of participants &
Deliver education/outreach to the public	Coalition, Towns	2-4 yrs		feedback
Objective 10. Assess Additional Sub	watersheds		•	
Perform stream and upland assessments	Coalition	1-2 yrs	Inventory findings	# projects identified



6.5.2 Funding Sources

A variety of local, state, and federal sources are potentially available to provide funding for the implementation of this watershed management plan, in addition to potential funds contributed by local grassroots organizations and concerned citizens. Table 6-14 is a list of potential funding sources that has been developed by DEP and NRCS, and further refined through this planning process. The funding entities and grant programs listed in the table is not intended to be an exhaustive list; the table can be used as a starting point to seek funding opportunities for implementation of the recommendations in this watershed plan. The information presented in this watershed management plan and the supporting study documentation will support future grant proposals by demonstrating a comprehensive, scientifically-based approach for addressing identified concerns consistent with EPA's recommended watershed-based approach. The table of potential funding sources is intended to be a living document that should be updated periodically to reflect the availability of funding or changes to the funding cycle, and to include other funding entities or grant programs.

Table 6-14. Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Application s Open	Deadline				
DEP Watershed Funding Website									
http://www.ct.gov/dep/cwp/view.asp?a=2719&q=335494&depNav_GID=1654&pp=12&n=1 Index of many potential									
funding sources for funding watershed-b	ased planning pro	ojects.	-						
DEP CT Landowner Incentive Program	Up to \$25,000	At least 25%							
http://www.ct.gov/dep/cwp/view.asp?a=2	2723&q=3257348	kdepNav_GID=1	<u>655</u>						
DEP Long Island Sound License Plate Program	\$25,000			January	March				
http://www.ct.gov/dep/cwp/view.asp?a=2	2705&q=3237828	kdepNav_GID=1	635						
DEP Open Space and Watershed Land Acquisition				March	June				
860-424-3016 david.stygar@ct.gov http	://www.ct.gov/dej	o/cwp/view.asp?	a=2706&q=32383	34&depNav_GID=	<u>1641</u>				
DEP Recreation and Natural Heritage Trust Program									
http://www.ct.gov/dep/cwp/view.asp?a=2	2706&q=323840&	kdepNav_GID=1	641						
Eastman Kodak / Nat'l Geographic American Greenways Awards optional Program	\$2500	\$300	Optional	April	June				
jwhite@conservationfund.org, Jen White	9								
EPA Healthy Communities Grant Program	\$35,000	\$5,000	Optional, up to 5%	March	May				
617-918-1698 Padula.Jennifer@epa.go	V								
Northeast Utilities Environmental Community Grant Program	\$250	\$1,000			April 15				
http://www.nu.com/environmental/grant.a	asp Cash incenti	ves for non-profi	t organizations						



Table 6-14. Potential Funding Sources

EPA Targeted Watershed Grants Program 25% of total project costs (non-federal) http://www.epa.gov/twg/ Requires Governor nomination.	ding Source D	ximum Oollar nount	Minimum Dollar Amount	Required Match	Application s Open	Deadline
Program project costs (non-federal) http://www.epa.gov/hwg/ Requires Governor nomination. DEP CWA Section 319 NPS		ilount	7 tillouit	25% of total		
http://www.epa.gov/twg/ Requires Governor nomination. DEP CWA Section 319 NPS						
DEP CWA Section 319 NPS				(non-federal)		
Nonpoint Source Management http://www.ct.gov/dep/nps 20-25 projects targeting both priority watersheds and statewide issues. DEP Section 6217 Coastal IMPS http://www.ct.gov/dep/cwp/view.asp?a=2705&g=323554&depNav. GID=1709 Section 6217 of the CZARA of 1990 requires the State of Connecticut to implement specific management measurent IMPS pollution in coastal waters. Management measures are economically achievable measures that refibest available technology for reducing nonpoint source pollution. DEP Hazard Mitigation Grant Program Attention of projects that reduce or eliminate the long-term risk to human life and property from the efficient of the state of the	gov/twg/ Requires Governor no	mination.				
Nonpoint Source Management http://www.ct.gov/dep/nps 20-25 projects targeting both priority watersheds and statewide issues. DEP Section 6217 Coastal NPS N/A http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323554&depNav_GID=1709 Section 6217 of the CZARA of 1990 requires the State of Connecticut to implement specific management measures are economically achievable measures that reflects available technology for reducing nonpoint source pollution. DEP Hazard Mitigation Grant Town Mitigation Grant DEP Hazard Mitigation Grant Town Mitigation Grant Town Mitigation Grant DEP Hazard Mitigation Grant Town Mitigation Grant American Rivers - NOAA Community- Based Restoration Program Partnership Departmentship Dep	tion 319 NPS					October
Nonpoint Source Management http://www.ct.gov/dep/nps 20-25 projects targeting both priority watersheds and statewide issues. DEP Section 6217 Coastal NPS						15
20-25 projects targeting both priority watersheds and statewide issues. DEP Section 6217 Coastal NPS N/A http://www.ct.gov/dep/cwpt/view.asp?a=2705&q=323554&depNav_GID=1709 Section 6217 of the CZARA of 1990 requires the State of Connecticut to implement specific management measures control NPS pollution in coastal waters. Management measures are economically achievable measures that refl best available technology for reducing nonpoint source pollution. DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program 1 25% Local http://www.ct.gov/dep/cwpt/view.asp?a=2720&q=325654&depNay_GID=1654 Provides financial assistance to slocal governments for projects that reduce or eliminate the long-term risk to human life and property from the efficial natural hazards. American Rivers - NOAA Community-Based Restoration Program Partnership				(non-federal)		10
DEP Section 6217 Coastal NPS http://www.ct.gov/dep/cwpt/view.asp?a=2705&q=323554&depNav_GID=1709 Section 6217 of the CZARA of 1990 requires the State of Connecticut to implement specific management measures control NPS pollution in coastal waters. Management measures are economically achievable measures that reflects available technology for reducing nonpoint source pollution. DEP Hazard Mitigation Grant						
http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323554&depNav_GID=1709 Section 6217 of the CZARA of 1990 requires the State of Connecticut to implement specific management measures are economically achievable measures that refl best available technology for reducing nonpoint source pollution. DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grant Program DEP Hazard Mitigation Grants DEP H				N1/A		
Section 6217 of the CZARA of 1990 requires the State of Connecticut to implement specific management measures control NPS pollution in coastal waters. Management measures are economically achievable measures that refl best available technology for reducing nonpoint source pollution. DEP Hazard Mitigation Grant Program						
control NPS pollution in coastal waters. Management measures are economically achievable measures that reflect best available technology for reducing nonpoint source pollution. DEP Hazard Miligation Grant Program 75% Federal / 25% Local 75% Local 75% Federal / 25% Local 75% Local 75% Federal / 25% Local 75%	ov/dep/cwp/view.asp?a=2705&d	η=3235548	kdepNav_GID=	<u>1709</u>		
best available technology for reducing nonpoint source pollution. DEP Hazard Mitigation Grant Program 175% Federal / 25% Local http://www.ct.gov/dep/cwp/view.asp?a=2720&q=325654&depNav. GID=1654 Provides financial assistance to slocal governments for projects that reduce or eliminate the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient attraction and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and the long-term risk to human life and property from the efficient and property from the efficient and the long-term risk to human li						
DEP Hazard Mitigation Grant Program Pr				nomically achievab	le measures that	reflect the
Program 25% Local http://www.ct.gov/dep/cwp/view.asp?a=2720&q=325654&depNav_GID=1654_Provides financial assistance to stocal governments for projects that reduce or eliminate the long-term risk to human life and property from the efficial traditional program partnership. American Rivers - NOAA Community-Based Restoration Program Partnership http://www.amrivers.org/feature/restorationgrants.htm These grants are designed to provide support for local communities that are utilizing dam removal or fish passag restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory fishAmerica Foundation Average Conservation Grants \$7,500 Municipal Flood & Erosion Control \$7,500 Municipal Flood & Erosion Control \$7,500 Municipal Flood & Erosion Control \$6,000 \$1,000 Optional (non-federal) NFWF Long Island Sound Futures \$6,000 \$1,000 Optional (non-federal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (non-federal) Fund Small Grants \$1,000 Sing Optional (non-federal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (non-federal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (non-federal) Fund Large Grants \$1,000 Sing Optional (non-federal) NFWF Long Island Sound Futures \$150,000 Sing Optional (non-federal) NFWF Long Island Sound Futures \$150,000 Sing Optional (non-federal) Fund Large Grants \$1,000 Sing Optional (non-federal) NFCS Conservation Reserve Program		t source po	mution.	75% Federal /		
http://www.cl.gov/dep/cwp/view.asp?a=2720&q=325654&depNav_GID=1654 Provides financial assistance to slocal governments for projects that reduce or eliminate the long-term risk to human life and property from the efficial or natural hazards. American Rivers - NOAA Community-Based Restoration Program Partnership http://www.amrivers.org/feature/restorationgrants.htm These grants are designed to provide support for local communities that are utilizing dam removal or fish passag restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory restored and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory restored and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory restored and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory restored and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory restored and improve freshwater habitats important to migratory restored and improve freshwater habitats important to migratory restored and improve freshwater habitats important to migratory restored and improve freshwater habitats important to migratory restored and improve freshwater habitats important to migratory restored and improve freshwater habitats important to migratory resourced and improve freshwater habitats important removal or fish passage resourced and improve freshwater habitats important to migratory	ugation Grant					
local governments for projects that reduce or eliminate the long-term risk to human life and property from the efforatural hazards. American Rivers - NOAA Community- Based Restoration Program Partnership These grants are designed to provide support for local communities that are utilizing dam removal or fish passar restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory FishAmerica Foundation Conservation Grants FishAmerica Foundation Average Sonservation Grants FishAmerica Foundation Average Conservation Grants FishAmerica Foundation Conservation Grants FishAmerica Foundation FishAmerica Foundati	ov/dep/cwp/view.asp?a=2720&c	g=3256548	kdepNav_GID=	1654 Provides fina	ancial assistance	to state and
American Rivers - NOAA Community-Based Restoration Program Partnership http://www.amrivers.org/feature/restorationgrants.htm These grants are designed to provide support for local communities that are utilizing dam removal or fish passar restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory FishAmerica Foundation Average \$7,500 FishAmerica Foundation Average \$7,500 Municipal Flood & Erosion Control 1/3 project cost Cost NFWF Long Island Sound Futures \$6,000 \$1,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10,000 Optional (nonfederal) December \$10	nts for projects that reduce or e	liminate the	e long-term risk	to human life and	property from the	effects from
Based Restoration Program Partnership These grants are designed to provide support for local communities that are utilizing dam removal or fish passage restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory FishAmerica Foundation Conservation Grants FishAmerica Foundation Average Conservation Grants FishAmerica Foundation Average Conservation Grants FishAmerica Foundation Conservation Grants FishAmerica Foundation Average Conservation Grants FishAmerica Foundation FishAmerica Foundation Average Some Some Some Some Some Some Some Some						
Partnership http://www.amrivers.org/feature/restorationgrants.htm These grants are designed to provide support for local communities that are utilizing dam removal or fish passag restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory FishAmerica Foundation Conservation Grants FishAmerica Foundation Average Conservation Grants FishAmerica Foundation Average Conservation Grants FishAmerica Foundation Average Conservation Grants FishAmerica Foundation Average Conservation Grants FishAmerica Foundation FishAmerica Foundation Average Conservation Grants FishAmerica Foundation Fis	s - NOAA Community-					
http://www.amrivers.org/feature/restorationgrants.htm These grants are designed to provide support for local communities that are utilizing dam removal or fish passage restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory FishAmerica Foundation Average S7,500 FishAmerica Foundation Average S7,500 Municipal Flood & Erosion Control Soard Cost Cost Cost Cost NFWF Long Island Sound Futures S6,000 \$1,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 S10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 S10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 S10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 S10,000 Optional (nonfederal) NFWF Long Island Sound Futures S150,000 Optional (nonfederal) NFWF Long Island S00 Optional (nonfederal) NFWF Long Island S00 Optional (nonfederal) NFWF Long Island S00 Optional (nonfederal) NFWF Long Island S000 Optional (nonfederal) N	ion Program					
These grants are designed to provide support for local communities that are utilizing dam removal or fish passage restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory? FishAmerica Foundation						
Conservation Grants \$7,500 Municipal Flood & Erosion Control Board 1/3 project cost NFWF Long Island Sound Futures \$6,000 \$1,000 NFWF Long Island Sound Futures \$150,000 \$10,000 Fund Small Grants \$150,000 \$10,000 NFWF Long Island Sound Futures \$150,000 \$10,000 NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (nonfederal) NFWF Long Island Sound Futures \$150,000 Optional (nonfederal) NFWF Long Island Sound Futures \$1,000 Optional (nonfederal)	e designed to provide support f tect the ecological integrity of th	or local colleir rivers a	mmunities that nd improve fres	are utilizing dam re shwater habitats im	emoval or fish pas aportant to migrate	ssage to ory fish.
Municipal Flood & Erosion Control Board Municipal Flood & Erosion Control Board NFWF Long Island Sound Futures Fund Small Grants NFWF Long Island Sound Futures NFWF Long Island Sound Fut						
Municipal Flood & Erosion Control Board NFWF Long Island Sound Futures Fund Small Grants NFWF Long Island Sound Futures Fund Small Grants \$6,000 \$1,000 Optional (nonfederal) Pecember Fund Large Grants 631-289-0150 Lynn Dwyer Lynn.Dwyer@nfwf.org NRCS Conservation Reserve Program Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov NRCS Wildlife Habitat Incentives Program (WHIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program						
Board cost cost Cost	(247 fishamerica@asafishing.or	<u>'g</u>				
Board cost cost Cost	& Erosion Control 1/3	project	2/3 project			
Fund Small Grants \$6,000 \$1,000 federal) NFWF Long Island Sound Futures \$150,000 \$10,000 Optional (non-federal) 631-289-0150 Lynn Dwyer Lynn.Dwyer@nfwf.org NRCS Conservation Reserve Program Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov NRCS Wildlife Habitat Incentives Program (WHIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program						
NFWF Long Island Sound Futures Fund Large Grants \$150,000 \$10,000 Optional (non-federal) Brund Large Grants \$150,000 \$10,000 Optional (non-federal) Brund Large Grants NRCS Conservation Reserve Program Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov NRCS Wildlife Habitat Incentives Program (WHIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program		5,000	\$1,000		December	March
Fund Large Grants \$150,000 \$10,000 federal) 631-289-0150 Lynn Dwyer Lynn.Dwyer@nfwf.org NRCS Conservation Reserve Program	and Sound Futures					
NRCS Conservation Reserve Program Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov NRCS Wildlife Habitat Incentives Program (WHIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program		50,000	\$10,000		December	March
NRCS Wildlife Habitat Incentives Program (WHIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program		.org		,		
NRCS Wildlife Habitat Incentives Program (WHIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program	ation Reserve Program					
Program (WHIP) \$50,000/year \$1,000 25% Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) \$50,000/year 25-50% Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program	360) 871-4018 http://www.ct.nrc	s.usda.gov	<u>v</u>			
Program (WHIP) \$50,000/year \$1,000 25% Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) \$50,000/year 25-50% Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program						
Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program		Monar	\$1,000	25%		
For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program Program		•		2570		
NRCS Environmental Quality Incentives Program (EQIP) Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program 25-50% 25-50%	60) 871-4018 http://www.ct.nrc	:s.usda.go\	<u>v</u>			
Incentives Program (EQIP) \$50,000/year 25-50% Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program	nancement, maintenance of wil	diite habita	at; for privately o	owned lands.		-
Jan Dybdahl, (860) 871-4018 http://www.ct.nrcs.usda.gov For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program		000/year		25-50%		
For implementation of conservation measures on agricultural lands. NRCS Healthy Forests Reserve Program	Iaiii (EQIP)	•				
NRCS Healthy Forests Reserve Program	nup://www.ct.nro	<u>.s.usua.go\</u> on agricultı	<u>v</u> ural lands.			
For restoring and enhancing forest ecosystems http://www.nrcs.usda.gov/programs/HFRP/ProgInfo/Index.htm						
	id enhancing forest ecosystems	http://wwv	v.nrcs.usda.go\	v/programs/HFRP/	ProgInfo/Index.ht	m
NRCS Wetlands Reserve Program	s Reserve Program					



Table 6-14. Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Application s Open	Deadline				
Nels Barrett, (860) 871-4015 http://www.ct.nrcs.usda.gov For protection, restoration and enhancement of wetlands									
USFS Watershed and Clean Water Action and Forestry Innovation Grants									
http://www.na.fs.fed.us/watershed/gp_ir Foresters to implement a challenge gran restoration and protection efforts.									
Corporate Wetlands Restoration Partnership (CWRP)	Typically \$20,000	Typically \$5,000	3 to 1	April and August					
http://www.ctcwrp.org/9/ Can also apply	y for in-kind servi	ces, e.g. surveyi	ng, etc.						
DEP 319 NPS Watershed Assistance Small Grant			40% of total project costs (non-federal)						
860-361-9349 rivers@riversalliance.org									
Trout Unlimited Embrace A Stream	\$5,000								
USFWS National Coastal Wetlands Conservation Grant Program	\$1 million		50%						
Ken Burton 703-358-2229 Only states of	an apply.								
YSI Foundation	\$60,000		Optional	March	April				
937-767-7241 x406 Susan Miller Susan	Miller smiller@y	si.com							

Other Financial Opportunities

Private Foundation Grants and Awards

http://www.rivernetwork.org Private foundations are potential sources of funding to support watershed management activities. Many private foundations post grant guidelines on websites. Two online resources for researching sources of potential funding are provided in the contact information.

Congressional Appropriation - Direct Federal Funding

Congressman Larson, Courtney, DeLauro, Shays, Murphy

State Appropriations - Direct State Funding

http://www.cga.ct.gov/

Membership Drives

Membership drives can provide a stable source of income to support watershed management programs.

Donations

Donations can be a major source of revenue for supporting watershed activities, and can be received in a variety of ways.

User Fees, Taxes, and Assessments

Taxes are used to fund activities that do not provide a specific benefit, but provide a more general benefit to the community.

Rates and Charges

Alabama law authorizes some public utilities to collect rates and charges for the services they provide.

Stormwater Utility Districts

A stormwater utility district is a legal construction that allows municipalities to designated management districts where storm sewers are maintained in order to the quality of local waters. Once the district is established, the municipality may assess a fee to all property owners.

Impact Fees

Impact fees are also known as capital contribution, facilities fees, or system development charges, among other names.



Table 6-14. Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Application s Open	Deadline
----------------	-----------------------------	-----------------------------	-------------------	--------------------	----------

Special Assessments

Special assessments are created for the specific purpose of financing capital improvements, such as provisions, to serve a specific area.

Sales Tax/Local Option Sales Tax

Local governments, both cities and counties, have the authority to add additional taxes. Local governments can use tax revenues to provide funding for a variety of projects and activities.

Property Tax

These taxes generally support a significant portion of a county's or municipality's non-public enterprise activities.

Excise Taxes

These taxes require special legislation, and the funds generated through the tax are limited to specific uses: lodging, food, etc.

Bonds and Loans

Bonds and loans can be used to finance capital improvements. These programs are appropriate for local governments and utilities to support capital projects.

Investment Income

Some organizations have elected to establish their own foundations or endowment funds to provide long-term funding stability. Endowment funds can be established and managed by a single organization-specific foundation or an organization may elect to have a community foundation to hold and administer its endowment. With an endowment fund, the principal or actual cash raised is invested. The organization may elect to tap into the principal under certain established circumstances.

Emerging Opportunities For Program Support Water Quality Trading

Trading allows regulated entities to purchase credits for pollutant reductions in the watershed or a specified part of the watershed to meet or exceed regulatory or voluntary goals. There are a number of variations for water quality credit trading frameworks. Credits can be traded, or bought and sold, between point sources only, between NPSs only, or between point sources and NPSs.

Mitigation and Conservation Banking

Mitigation and Conservation banks are created by property owners who restore and/or preserve their land in its natural condition. Such banks have been developed by public, nonprofit, and private entities. In exchange for preserving the land, the "bankers" get permission from appropriate state and federal agencies to sell mitigation banking credits to developers wanting to mitigate the impacts of proposed development. By purchasing the mitigation bank credits, the developer avoids having to mitigate the impacts of their development on site. Public and nonprofit mitigation banks may use the funds generated from the sale of the credits to fund the purchase of additional land for preservation and/or for the restoration of the lands to a natural state.

Source: Coginchaug River Watershed Based Plan, NRCS, July 2008.



7 References

Bair, Brian (2000). *Stream Restoration Cost Estimates*. Salmon Habitat Restoration Cost Workshop Proceedings, NOAA National Marine Fisheries Service.

Baystate Environmental Consultants, Inc. (2004). Watershed Management Plan for Tankerhoosen Lake.

Bell, M. (1985). *The Face of Connecticut*. Connecticut Geological and Natural History Survey of Connecticut. Bulletin 110. Hartford, Connecticut.

Center for Watershed Protection (2005 rev). *Urban Subwatershed Restoration Manual No.* 10: Unified Stream Assessment: A User's Manual (Version 2.0)

Center for Land Use Education and Research (2007) *The Status of Connecticut's Coast Riparian Corridors: Research Summary.*

Charlotte — Mecklenburg Storm Water Services (2008). BMP Design Standards Manual.

Civco, D. (2005). *Hockanum River Watershed Percent Imperviousness by Basin.* Department of Natural Resources Management and Engineering at the University of Connecticut. GIS Map prepared by J. Bolton. March 2005.

Comins, Patrick (1999). *Breeding Landbird Survey Freja Park/Bolton Notch State Park*. Town of Bolton Conservation Commission.

Connecticut Department of Environmental Protection. (2002). *Surface Water Quality Standards (Effective December 17, 2002). Ground Water Quality Standards (Effective April 12, 1996).*

Connecticut Department of Environmental Protection (2006). 2006 Listing of Connecticut Waterbodies Not Meeting Water Quality Standards.

Connecticut River Watch Program (My 2004). *Hockanum River Rapid Bioassessment Summary Report*. Middletown, Connecticut.

Connecticut River Watch Program (March 2005). *Hockanum River Rapid Bioassessmet Summary Report.* Middletown, Connecticut.

Connecticut River Watch Program (May 2000). *Hockanum River Stream Walk Summary Report*. Middletown, Connecticut.

Connecticut River Watch Program (September 2001). *Hockanum River Stream Walk Summary Report*. Middletown, Connecticut.

Fuss & O'Neill, Inc. (2005). The Hockanum River State of the Watershed Report. Prepared for the North Central Conservation District, Inc. December 2005.



Fuss & O'Neill, Inc. (2007). *Tankerhoosen River Watershed Water Quality Monitoring Study*. Prepared for the Friends of the Hockanum River Linear Park of Vernon, Inc. March 2007.

Fuss & O'Neill, Inc. (2008). *Baseline Watershed Assessment, Tankerhoosen River Watershed.* May 28, 2008.

Fuss & O'Neill, Inc. (2008). Watershed Field Inventories and Land Use Regulatory Review, Tankerhoosen River Watershed. October 2008.

Gibbons, J. and Gibbons, G. (1992). *The Coginchaug River Greenway — Proposed Management Plan.* University of Connecticut Cooperative Extension System. Haddam, Connecticut.

Goetz, S.J., R.K. Wright, A.J. Smith, E. Zineckerb and E. Schaubb. 2003. *IKONOS imagery for resource management: Tree cover, impervious surfaces, and riparian buffer analyses in the mid-Atlantic region.* Remote Sensing of Environment 88 (2003) 195 208.

NEH-654 (2007). *Stream Restoration Design.* Unites States Department of Agriculture Natural Resources Conservation Service National Engineering Handbook, Washington, D.C.

NQQD (2004). Findings from the National Stormwater Quality Database, Research Progress Report. Prepared by the Center for Watershed Protection.

NURP (1983). *Results of the Nationwide Urban Runoff Program.* U.S. Environmental Protection Agency Water Planning Division, PB 84-185552, Washington, D.C.

Prisloe, Michael, Emily Hoffhine Wilson, Chester Arnold (2003). *Refinement of Population-Calibrated Land-Cover-Specific Impervious Surface Coefficients for Connecticut*. Final Report, DEP Project 01-08 Task #6. University of Connecticut Middlesex County Extension Center, Haddam, CT. Accessed at http://www.nemo.uconn.edu/tools/impervious_surfaces/ literature.htm on March 12, 2008.

Sexton, Karen (1993). Vascular Plant Inventory of the Valley Falls/Bolton Notch Watershed.

Seymour, Jane and Friends of the Hockanum River Linear Park of Vernon, Inc. (2004). Wildlife Surveys at Selected Locations within the Tankershoosen Watershed. Vernon, Connecticut.

Sleavin, William J., Daniel L. Civco, Sandy Prisloe, Laurie Giannotti, (2000). *Measuring Impervious Surfaces for Non-Point Source Pollutant Modeling*. Proceedings of the 2000 ASPRS Annual Convention. Accessed at http://www.nemo.uconn.edu/tools/impervious_surfaces/literature.htm on March 12, 2008.

Tetra Tech., Inc. *Spreadsheet Tool for the Estimation of Pollutant Load (STEPL)*. Version 4.0. Developed for the U.S. EPA



United States Environmental Protection Agency (EPA). 2005. *Waste Cleanup & Reuse in New England: Precision Plating Corp.* URL: www.epa.gov/region1/superfund/sites/precision.

University of Connecticut Center for Land Use Education and Research (CLEAR). *Connecticut's Changing Landscape — Statewide Land Cover.* URL: www.clear.uconn.edu/projects/landscape/statewide_landcover.htm.

WTM (2001). Watershed Treatment Model User's Guide - Version 3.1. Prepared by the Center for Watershed Protection.



Appendix A

Baseline Watershed Assessment Watershed Field Inventories and Land Use Regulatory Review (CD-ROM)

Baseline Watershed Assessment Tankerhoosen River Watershed

Friends of the Hockanum River Linear Park of Vernon, Inc.

In Association With:

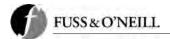
Town of Vernon North Central Conservation District Rivers Alliance of Connecticut Hockanum River Watershed Association Belding Wildlife Trust

Vernon, CT

May 28, 2008



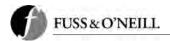
Fuss & O'Neill, Inc. 78 Interstate Drive West Springfield, MA 01089



BASELINE WATERSHED ASSESSMENT Tankerhoosen River Watershed

TABLE OF CONTENTS

<u>SECT</u>	<u>ION</u>		<u>PAGE</u>
1.0	INTR	ODUCTION	2
2.0	BACk	KGROUND	2
3.0	DEVI	ELOPMENT OF THE BASELINE ASSESSMENT	2
4.0	GEO 4.1 4.2 4.3 4.4	LOGIC AND HISTORICAL PERSPECTIVE Geology Population and Industry Recreation Resources Watershed Restoration Efforts	2 2 2
5.0	NATU 5.1 5.2 5.3 5.4	JRAL RESOURCES Hydrology Water Quality 5.2.1 Classifications and Impairments 5.2.2 Tankerhoosen River Watershed Water Quality Monitoring Stud Wetlands Fish and Wildlife Resources 5.4.1 Fisheries 5.4.2 Birds 5.4.3 Amphibians & Reptiles 5.4.3 Threatened and Endangered Species	
6.0	WAT 6.1 6.2 6.3	ERSHED MODIFICATIONS Dams, Impoundments, & Water Supply Wastewater Discharges Regulated Sites	2 2
7.0	T.1	O USE AND LAND COVER Current Conditions 7.1.1 Land Use 7.1.2 Zoning 7.1.3 Land Cover 7.1.4 Impervious Cover Future Conditions 7.2.1 Land Use 7.2.2 Impervious Cover	2 2 2 2 2
8.0	POLL	UTANT LOADING	2
9.0	COM 9.1 9.2	PARATIVE SUBWATERSHED ANALYSIS Priority Subwatersheds for Conservation Priority Subwatersheds for Restoration	2
10.0	REFE	RENCES	2



BASELINE WATERSHED ASSESSMENT Tankerhoosen River Watershed

TABLE OF CONTENTS (continued)

<u>TABL</u>	<u>ES</u>	<u>PAGE</u>
1-1	Distribution of Municipalities in the Tankerhoosen River Watershed	1
1-2	Profile of the Tankerhoosen River Watershed	3
5-1	Tankerhoosen River Subwatersheds	10
5-2	Connecticut Inland Surface Water Quality Classifications	12
5-3	Tankerhoosen River Watershed Impaired Waters	13
5-4	Wetland Soils Coverage in the Tankerhoosen River Subwatersheds	19
5-5	Areas Providing Habitat for Valuable or Unique Natural Resources	22
5-6	Fish Species	23
5-7	Endangered, Threatened, and Special Concern Species	25
6-1	Major Drinking Water Supplies	27
6-2	NPDES Regulated Facilities	30
6-3	Summary of Regulated Sites	31
7-1	Current Land Use — Tankerhoosen River Watershed	33
7-2	Land Cover — Tankerhoosen River Watershed	38
7-3	Forest Cover — Tankerhoosen River Watershed	41
7-4	Forest Cover in Riparian Areas in the Tankerhoosen River Subwatersheds	42
7-5	Percent Impervious Cover — Tankerhoosen Watershed	44
7-6	Developable Land — Tankerhoosen Watershed	46
7-7	Assigned Future Land Use Category	48
7-8	Existing and Future Land Use — Tankerhoosen Watershed	48
7-9	Percent Impervious Cover — Existing and Future Conditions	49
7-10	Impervious Cover/Riparian Zone Metric — Existing and Future Conditions	50
8-1	Projected Pollutant Loading Rate and Load Increases	52
9-1	Summary of Subwatershed Vulnerability Metrics	54
9-2	Results of Subwatershed Vulnerability Analysis	55
9-3	Summary of Subwatershed Restoration Potential Metrics	56
9-4	Results of Subwatershed Restoration Potential Analysis	57
<u>FIGU</u>	<u>RES</u>	PAGE
1-1	Tankerhoosen River Watershed	2
4-1	Population Trends in the Tankerhoosen River Watershed	7
5-1	Tankerhoosen River Subwatersheds	11
5-2	DEP Water Quality Classifications	14
5-3	Turbidity — Tankerhoosen River Watershed	15
5-4	Dissolved Copper — Tankerhoosen River Watershed	16
5-5	Lead — Tankerhoosen River Watershed	16
5-6	Nitrogen Species — Tankerhoosen River Watershed	17
5-7	Phosphorus — Tankerhoosen River Watershed	18
5-8	Wetland Soils — Tankerhoosen River Watershed	21
5-9	CTDEP Natural Diversity Database Areas — Tankerhoosen River Watershed	26
6-1	CTDEP Regulated Dams — Tankerhoosen River Watershed	28



BASELINE WATERSHED ASSESSMENT Tankerhoosen River Watershed

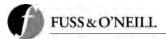
TABLE OF CONTENTS (continued)

FIG l	<u>JRES</u>	<u>PAGE</u>
6-2	CTDEP Aquifer Protection Areas — Tankerhoosen River Watershed	29
6-3	Sewer Service Areas — Tankerhoosen River Watershed	32
7-1	Current Land Use — Tankerhoosen River Watershed	34
7-2	Committed Open Space — Tankerhoosen River Watershed	36
7-3	Zoning — Tankerhoosen River Watershed	37
7-4	Land Cover — Tankerhoosen River Watershed	40
7-5	Relationship Between Watershed Imperviousness and Stream Health	43
7-6	Current Impervious Cover — Tankerhoosen River Watershed	45
7-7	Developable Land — Tankerhoosen River Watershed	47
7-8	Future Impervious Cover — Tankerhoosen River Watershed	49

APPENDICES END OF REPORT

Species List —Belding Wildlife Management Area Pollutant Loading Evaluation

В



1.0 INTRODUCTION

The Friends of the Hockanum River Linear Park of Vernon, Inc. (the "Friends") has retained Fuss & O'Neill to prepare a Watershed Management Plan for the Tankerhoosen River watershed. The Watershed Management Plan will be developed through a collaborative effort with a Technical Advisory Committee consisting of the Friends, the Town of Vernon (Planning Department and Conservation Commission), the North Central Conservation District, the Hockanum River Watershed Association, Rivers Alliance of Connecticut, and the Belding Wildlife Trust. The first part of the plan will consist of an assessment of existing conditions in the watershed, an evaluation of pollutant sources in the watershed to prioritize watershed protection and restoration strategies, as well as prioritization of action items that could be adopted by governmental agencies and private groups to protect and improve the health of the Tankerhoosen River watershed. The recommended plan will be developed to address the priorities and issues identified in previous phases of the plan development, with participation by the Technical Advisory Committee.

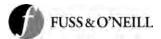
2.0 BACKGROUND

The Tankerhoosen River watershed is a small but very important 12.85 square-mile sub-regional basin within the Hockanum River watershed (<u>Figure 1-1</u>). Approximately 70% of the watershed is located within the Town of Vernon, with the remaining portions within the Towns of Tolland, Bolton, and Manchester (<u>Table 1-1</u>).

Table 1-1: Distribution of Municipalities in the Tankerhoosen River Watershed

Town Name	Town Acreage	Acreage in Watershed	% of Town in Watershed	% of Watershed
Manchester	17,408	461	2.7	5.6
Vernon	11,904	5,572	46.8	67.9
Tolland	25,856	1,547	5.9	18.6
Bolton	9,920	646	6.5	7.9
Totals	65,088	8,226		100.0

A basic profile of the watershed is provided in <u>Table 1-2</u>. Later sections of this document provide more detailed information on these watershed characteristics.



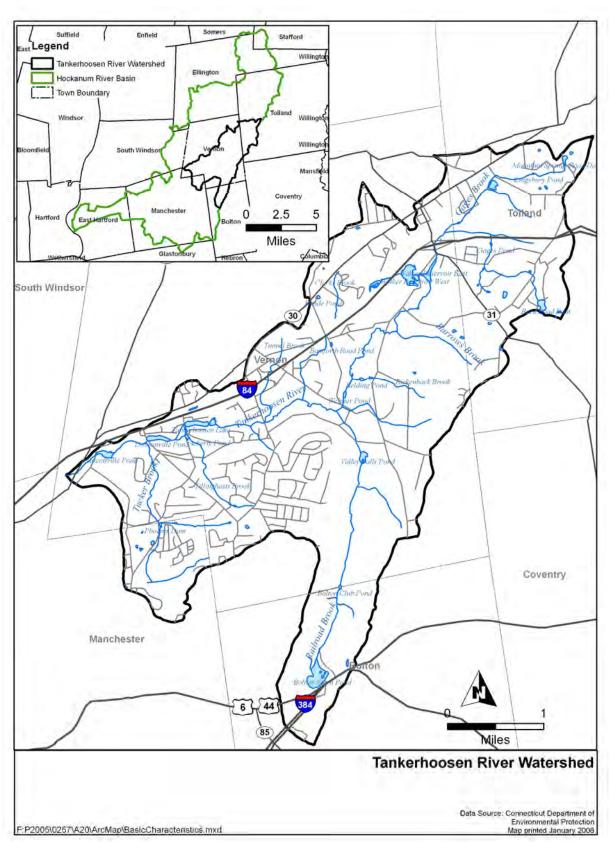


Figure 1-1: Tankerhoosen River Watershed

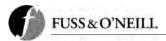


Table 1-2: Profile of the Tankerhoosen River Watershed

Area	С	12.85 square miles (8,226 acres)
Stream Length	С	approximately 17.2 miles
Subwatersheds	С	10 subwatersheds
Jurisdictions	С	4 towns and cities
Water Quality	С	2006 DEP Impaired Waters List for habitat for fish and
		other aquatic life
Current Impervious Cover	С	9.8%
Subwatersheds Selected for	С	Clarks Brook
Detailed Assessment based	C	Gages Brook
on Vulnerability Assessment	С	Gages Brook South Tributary
	С	Lower Tankerhoosen River
	С	Walker Reservoir
Subwatersheds Selected for	С	Clarks Brook
Detailed Assessment based	С	Gages Brook
on Restoration Potential	C	Lower Tankerhoosen River
	C	Middle Tankerhoosen River
	C	Tucker Brook
Major Transportation Routes	С	Interstates 84 and 384
	С	U.S. Routes 6 and 44
	C	State Routes 30 and 31
Significant Natural and	С	Belding Wildlife Management Area
Historic Features	С	Valley Falls Park
	С	Northern Connecticut Land Trust
	С	Bolton Notch Pond
	С	Walker Reservoir
	C	Talcottville Historic District

The high water quality (classified as A) in the upper regions of the Tankerhoosen River sustain a significant natural resource of the State of Connecticut —the Belding Wild Trout Management Area, one of only two Class I wild trout areas east of the Connecticut River. The importance of these small, high quality watersheds to the downstream health of the larger river basins, and therefore to Long Island Sound, is well recognized. Of utmost importance to these high quality watersheds is protection of the headwaters regions.

The headwaters region of the Tankerhoosen River is bisected by Interstate 84. Recent development pressure in this headwaters region at the Exit 67 interchange in Vernon poses a major threat to the long-term health of the watershed. Further stresses on the headwaters have been created by development of an industrial park in Tolland through which a key headwater stream flows, as well as the presence of the highway itself, which continues to generate increasing traffic loads from development along the I-84 corridor. There has also been declining water quality in the lower reaches of the Tankerhoosen River in recent years. The lower region of the watershed is classified as "B", and was cited as impaired in the DEP's most recent "List of Connecticut Waterbodies Not Meeting Water Quality Standards".



The importance of protecting the pristine upper region of the Tankerhoosen is recognized by both local and state agencies. The 2000-2004 State Plan of Conservation and Development identifies the riverway as a proposed preservation and conservation area. The Vernon Open Space Plan proposes a greenway plan of 2000 preserved acres along the Tankerhoosen. Most recently, the Nature Conservancy has identified several key watersheds in the state that it considers particularly important to the future protection of Long Island Sound, including the Tankerhoosen River watershed. The need for local decision-makers to give utmost consideration to the environmental consequences of development proposals that would impact the River, has been expressed by The Nature Conservancy (TNC) and by the Connecticut Department of Environmental Protection (DEP).

To address these very real and immediate threats, the Friends began a watershed assessment for the Tankerhoosen River in March 2007. The objective of this initial assessment was to describe and understand the overall health, quality and flow of waters within the watershed and to identify potential threats to water quality in the watershed. The assessment included water quality monitoring and natural resource inventories to begin establishing baseline conditions against which future monitoring can be measured. The next step in the watershed planning process is to develop a comprehensive management plan that will provide guidance to local decision-makers and to serve as an educational tool and reference document for those interested in protection of the Tankerhoosen River.

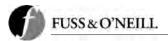
3.0 DEVELOPMENT OF THE BASELINE ASSESSMENT

The initial task in developing a Watershed Management Plan for the Tankerhoosen River is to develop an understanding of baseline, or existing conditions in the watershed. To accomplish this, the following tasks were completed:

- Reviewed existing watershed data, studies, and reports;
- Compiled and analyzed available Geographic Information System (GIS) data for the watershed;
- Consulted with the Technical Advisory Committee, the watershed municipalities, and the regional planning agency regarding available land use information, mapping, and land use planning regulations;
- Identified and delineated subwatersheds within the over Tankerhoosen River watershed: and
- Conducted a comparative subwatershed analysis to prioritize watershed field inventories and management plan recommendations.

The results of this watershed inventory are presented in this document, including a description of current watershed conditions for the following categories:

- Geological and historical perspective;
- Natural resources including hydrology, water quality, wetlands and watercourses, fish and wildlife resources and habitat:
- Watershed modifications including dams, water supply, wastewater discharges, and regulated sites; and
- Land use and land cover.



In addition, the results of a comparative subwatershed analysis are also presented.

4.0 GEOLOGIC AND HISTORICAL PERSPECTIVE

4.1 Geology

The State of Connecticut is comprised of three distinct geologic units divided longitudinally across the state. These three units are known as the Western Uplands, the Central Valley, and the Eastern Uplands. The Western and Eastern Uplands are comprised of metamorphic rocks —rocks subjected to intense heat and pressure of the Earth's interior —while the Central Valley is a younger unit comprised of sedimentary rocks. The Central Valley began forming about 225 million years ago when the super-continent Pangaea began to break apart. A large rift formed a long, narrow valley through the middle of the state, eventually filling with sediments from the eroding hills to the east and west (presently known as the Eastern and Western Uplands). The sediments were compacted into soft, easily eroded, red and brown sandstones through which the Connecticut Rivers flows.

The Tankerhoosen River watershed is almost entirely within the Eastern Uplands. The westernmost portion of the watershed is located within the Central Valley. The boundary between the Central Valley and the Eastern Uplands is located near the Vernon-Manchester town line and known as the Bolton Range. The Bolton Range was formed as a result of the different rates of erosion of the less resistant sediments of the Central Valley creating an abrupt rise into the resistant rocks of the Eastern Uplands.

Drastic changes in the surficial geology have occurred within Connecticut since the formation of these geologic regions. Above the sandstone of the Central Valley and the metamorphic bedrock of the Eastern Uplands lie extensive glacial deposits, or "glacial till," left as the large glaciers receded. Melting glacier ice formed rivers which sorted glacial till into layers of sand and gravel, or "stratified drift." The Tankerhoosen River flows through hills of glacial till in the steep Eastern Uplands and then drops into the stratified drift of the Central Valley (Bell, 1985).

4.2 <u>Population and Industry</u>

Beginning about 10,000 years ago, as the last glacial ice retreated from New England, Native American populations settled Connecticut and the areas along the Tankerhoosen River. The river was used by Native Americans as a source of fish and a travel route to the Connecticut River (Hockanum River Watershed Association, 1998). The Podunks of East Hartford and Manchester, the Nipmucks of Ellington and Tolland were among the tribes that farmed corn in the fertile river floodplains of the Tankerhoosen River. In addition to agriculture, the tribes used the land within the watershed for hunting, gathering, and fishing.

European settlers brought a marked change in land use to Connecticut. Land was cleared and agriculture was the primary use through the Revolutionary War era. However, the availability of more fertile lands in western New York, northern Ohio, and Pennsylvania led to the great migration of Connecticut farmers during the 1800s. Those who stayed worked in the many factories that arose along the rivers and streams, and manufacturing became a major economic force (Gibbons et al., 1992).

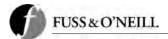


The Tankerhoosen River was no exception to the development patterns across Connecticut. From the headwaters at Gages Brook, the elevation drop of the Tankerhoosen River was ideally suited to power a wide variety of mills. During the eighteenth and nineteenth centuries, several mills associated with the textile, cotton-wool, energy, and paper industries were built near these waterfalls and in other areas in the watershed. The Talcottville Historical District is located in southwestern portion of the Tankerhoosen River watershed near the confluence with the Hockanum River. One of the first cotton mills in America was built by Peter Dobson in the early 1800's in Talcottville. The mill burned down in 1909, not to be rebuilt. Peter Dobson is also famous for early observations that ice may have played a role in the erosion and transport of rock in the region.

The Vernon Depot, located within the watershed on Church Street, was an active transportation center during the early part of the twentieth century. The Hartford, Providence and Fishkill Railroad ran seven times a day at the Depot, with connections to Rockville. The Keystone Arch on Tunnel Road (also known as the Keystone Tunnel) was constructed circa 1850 to allow trains to traverse Tunnel Road without disrupting street traffic toward Vernon Center. The 108-foot long tunnel is constructed of 30 arches, each of which consists of a center keystone with nine stones forming the curves on either side. The tunnel is considered by historians to be a fine piece of historic architecture and as a monument to the integrity and skilled workmanship of its builders.

Valley Falls was the site of the first industry in Vernon, a saw mill, in 1740. Valley Falls Park hosted a small mill complex for flaxseed oil and cotton between 1850 and 1877. Beginning in the mid-1800s until the mid-1900s the property was converted into farmland for producing corn, hay, oats, butter, and cheese. In 2001, the historic farmhouse and six outbuildings were purchased by the Friends of Valley Falls, Inc. to ensure preservation of the historical complex. Alternate forms of manufacturing power put most of the mills out of business by the late 1950s. Dozens of the mill buildings and their associated dams remain an integral component of the river.

Rapid population growth in the post-war era of the 1950s and 1960s slowed significantly as developable land became scare (see <u>Figure 4-1</u>). Today, the population of the Tankerhoosen River watershed is approximately 16,000, which is more than double the population of the watershed in the 1950s. Commercial and residential development has occurred in the watershed since the 1970s, with a continued decline in industrial uses. Significant commercial development along the major transportation corridors and residential development in the watershed has increased watershed impervious coverage and contributed to degraded water quality in portions of the Tankerhoosen River and its tributaries. Numerous historical impoundments within the watershed also continue to serve as barriers to fish passage along the Tankerhoosen River and its tributaries.



20,000 18.000 16,000 14,000 12,000 10.000 8.000 6.000 4.000 2.000 1950 1960 1970 1980 1990 2000 2010 2020

Watershed Population

Source: Connecticut Population Projections, Series 95.1, Office of Policy and Management, September 1995

Census Year

Figure 4-1: Population Trends in the Tankerhoosen River Watershed

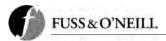
4.3 Recreation Resources

The Tankerhoosen River provides many opportunities for recreational activities, such as fishing, swimming, and limited boating. Along the river, there are both town and state lands that are preserved for parks, wildlife sanctuaries and rail-trails. Recreational activities in these areas include hiking, biking, cross-country skiing, ice skating, nature observation, and aesthetic enjoyment.

Some of the prominent recreational centers in the watershed include the Walker Reservoir East, the Belding Wildlife Management Area, Valley Falls Park, Bolton Notch Pond, Freja Park, the Rails-to-Trails, and Phoenix Mill Park. Each of these areas provides parking, picnicking, and trails for walking and cross-country skiing. The Belding Wildlife Management Area was the location of the first Class I Trout Management Area in Connecticut. Recreational areas that also have historical significance include the Dobsonville Pond and Talcottville Pond. Additionally, the area associated with the confluence of the Tankerhoosen and Hockanum Rivers includes a privately owned recreational facility and is the starting point for the annual Manchester Canoe and Kayak Race.

4.4 <u>Watershed Restoration Efforts</u>

The Connecticut River Watch Program (CRWP), a volunteer water quality monitoring, protection, and improvement program for the Connecticut River and its tributaries, is working closely with the Hockanum River Watch Program (HRWA) and North Central Conservation District to develop and support a community-based river monitoring and assessment program in the Tankerhoosen River watershed. The CRWP monitoring program has included stream



walk surveys and rapid bioassessments (cost-effective biological survey techniques) along the Tankerhoosen River, as well as other areas of the larger Hockanum River watershed. The Connecticut DEP also conducts routine ambient water quality and benthic monitoring at approximately twelve locations along the Hockanum and Tankerhoosen Rivers. The data assist in documenting the chemical and biological quality of surface waters within the watershed and will be used to support the development of a Total Maximum Daily Load (TMDL), which will address sources of water quality impairment in the Hockanum and Tankerhoosen Rivers.

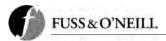
Baystate Environmental Consultants, Inc. (BEC) conducted a feasibility study in 2002 for the dredging of Tankerhoosen Lake and subsequently prepared a Watershed Management Plan for Tankerhoosen Lake in 2004. The plan identified watershed factors that have directly affected or have the potential to affect the water quality and overall health of Tankerhoosen Lake. The project recommended a Town-wide approach for reducing the quantity of pollutants, specifically sediment and nutrients, reaching Tankerhoosen Lake. BEC personnel conducted field observations of the major contributing watercourses and impoundments in the Tankerhoosen Lake watershed to identify point sources of sediment and nutrients as well as nonpoint source pollutants. BEC recommended that the Town of Vernon require the implementation of stormwater best management practices (BMPs) that maximize to the extent practicable, the removal of total suspended solids and nutrients. In addition to the lake dredging project recommended in the feasibility study, BEC also recommended several structural and nonstructural elements, including a sediment trap at the inlet of Tankerhoosen Lake, installation of deep sump catch basins at key locations, maintenance of cross-culverts and drainage structures, and grass swales and vegetated filter strips. None of the BEC recommendations has been implemented to date.

5.0 NATURAL RESOURCES

5.1 <u>Hydrology</u>

The Tankerhoosen River watershed is 12.85 square-miles, with the majority of the watershed (approximately 70 percent) located within the Town of Vernon (Figure 1-1). Gages Brook and its associated southern tributary comprise the headwaters region of the watershed, eventually flowing into Walker Reservoir East. Gages Brook is located in the northwest portion of the Town of Vernon and within the western portion of neighboring Tolland. A few small impoundments are located within the Gages Brook watershed. The brook receives drainage from the I-84 corridor near the Vernon-Tolland town boundary. In Tolland, Gages Brook flows through an industrial park and residential areas.

Walker Reservoir is no longer an active public water supply but rather a recreational resource that attracts hikers, fisherman, and ice skaters. The Tankerhoosen River, which is a moderately sized (16 feet wide) upland stream, originates at the outlet of Walker Reservoir East and bisects the Town of Vernon on the south side of Interstate 84. The river flows southwest for approximately five miles to the Hockanum River in the Talcottville section of Vernon.



Barrows Brook, Rickenback Brook, and several other small tributaries drain the eastern portion of the upper Tankerhoosen River watershed between Walker Reservoir and the confluence with Railroad Brook near Webster Pond. Barrows Brook is the furthest upstream tributary to the Tankerhoosen River and flows through undeveloped, privately owned land. Rickenback Brook flows east to west through a relatively undeveloped portion of Vernon and discharges to the Tankerhoosen River approximately 0.4 miles upstream of the river's confluence with Railroad Brook. Portions of this brook are within the Belding Wildlife Management Area and have been established for catch and release trout fishing (BEC, 2004).

Railroad Brook drains the southern portions of the watershed, beginning at Bolton Notch Pond in Bolton, and flows north through Valley Falls Park and the Belding Wildlife Management Area before joining the Tankerhoosen River. Valley Falls Pond is located along Railroad Brook within the confines of the Valley Falls Park property. Railroad Brook flows through primarily undeveloped land and discharges to the Tankerhoosen River approximately 1.6 miles upstream of Tankerhoosen Lake (BEC, 2004).

Clarks Brook and Tunnel Brook join the Tankerhoosen River in the middle portion of the watershed prior to the river's confluence with the DEP-owned Tankerhoosen Lake, the first of three DEP-owned run-of-river ponds. Clarks Brook originates north of I-84 and drains primarily industrial/commercial and undeveloped land within the Town of Vernon. Clarks Brook discharges to the Tankerhoosen River approximately 0.5 miles upstream of the river's confluence with Tunnel Brook. Tunnel Brook is located in the central portion of Vernon, flowing north to south and crossing the I-84 corridor. The brook empties into the Tankerhoosen River approximately 0.65 miles upstream of the inlet to Tankerhoosen Lake (BEC, 2004).

Dobsonville Pond is located just downstream of Tankerhoosen Lake. Tucker Brook, which drains the southeastern portion of the watershed and a residential section of the Town of Manchester, joins the Tankerhoosen River immediately upstream of Dobsonville Reservoir dam. Further downstream is Talcottville Pond and the confluence with the Hockanum River near the Vernon/Manchester town line.

Overall the Tankerhoosen River is comprised of a large percentage of first and second order (i.e., headwater) streams according to the Strahler Stream Order classification system. Stream hydrology and water quality in headwater streams are important components of ecosystem health because they are a critical food source for the entire river, influence downstream conditions, and support biodiversity.

Ten subwatersheds within the Tankerhoosen River watershed have been delineated for the purposes of this assessment. The subwatershed delineations are based on the CTDEP local basin delineations, modified slightly based on surface water hydrology and grouped accordingly to facilitate assessment and development of watershed management plan recommendations. <u>Figure 5-1</u> depicts the subwatersheds identified in this assessment, and <u>Table 5-1</u> summarizes the basic characteristics of the identified subwatersheds.

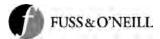


Table 5-1: Tankerhoosen River Subwatersheds

Subwatershed	Acronym	Area (acres)	Area (square miles)
Bolton Notch Pond	BNP	344	0.54
Clarks Brook	СВ	647	1.01
Gages Brook	GB	695	1.09
Gages Brook South Tributary	GBST	680	1.06
Lower Tankerhoosen River	LTR	321	0.50
Middle Tankerhoosen River	MTR	1,578	2.46
Railroad Brook	RB	1,208	1.89
Tucker Brook	ТВ	934	1.46
Upper Tankerhoosen River	UTR	1472	2.30
Walker Reservoir	WR	347	0.54
Tankerhoosen River Watershed		8,226	12.85

The Tankerhoosen River Watershed is located in an area with a temperate and humid climate. Based on historical climate information available from the NOAA National Weather Service weather station in Harford/Bradley International Airport in Windsor Locks, Connecticut, precipitation is generally well-distributed throughout the year with the wettest conditions in August and November and driest in February (worldclimate.com for Hartford/Bradley International Airport, Hartford County). In Windsor Locks, the mean annual precipitation over a 41-year period of record is 44.4 inches, and the 24-hour average temperature ranges from a high of 73.6°F in July to a low of 24.6°F in January.

Generally, the designated 100-year floodplain of the Tankerhoosen River is confined along a narrow corridor (<500 feet wide) surrounding the river. The entire length of the Tankerhoosen River is within the Federal Emergency Management Agency (FEMA) designated 100-year floodplain, with the exception of a small reach near the river's headwaters, between Reservoir Road and Fish and Game Road. The lower reach of Railroad Brook (below Valley Falls Pond including the pond) is also within the 100-year floodplain. Walker Reservoir West and East and portions of Gages Brook also lie within the designated 100-year floodplain (BEC, 2004).



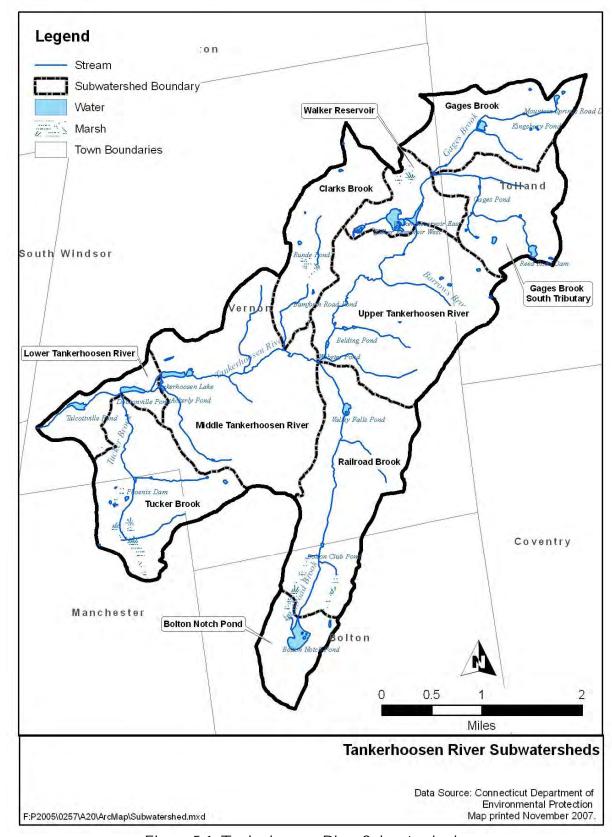
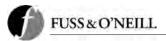


Figure 5-1: Tankerhoosen River Subwatersheds



5.2 Water Quality

5.2.1 Classifications and Impairments

The Federal Clean Water Act (CWA) was developed to protect the nation's surface waters. Through authorization of the CWA, the United States Congress declared as a national goal "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water wherever attainable". Connecticut Water Quality Standards are established in accordance with Section 22a-426 of the Connecticut General Statutes and Section 303 of the CWA. The Water Quality Standards are used to establish priorities for pollution abatement efforts. Based on the Water Quality Standards, Water Quality Classifications establish designated uses for surface and ground waters and identify the criteria necessary to support these uses. The Water Quality Classification system classifies inland surface waters into four different categories ranging from Class AA to D. Table 5-2 summarizes the Connecticut Surface Water Quality Classifications.

Table 5-2: Connecticut Inland Surface Water Quality Classifications

Designated Use	Class AA	Class A	Class B	Class C	Class D	
Existing/proposed drinking water supply	•					
Potential drinking water supply	•	•				
Fish and wildlife habitat	•	•	•	Class C and D waters may be suitable for certain fish and wildlife		
Recreational use	•	•	•	habitat, certain recreational activities, industrial use, and navigation		
Agricultural and industrial use	•	•	•			

Source: DEP Surface Water Quality Standards, December 17, 2002

<u>Figure 5-2</u> depicts the Water Quality Classifications of surface waters in the Tankerhoosen River watershed. Surface waters throughout the Tankerhoosen River watershed are classified as Class A with the exception of the Tankerhoosen Lake, Dobsonville Pond, and Talcottville Pond which are classified as Class B/A.

The CWA (Federal Clean Water Act) requires states to:

- 1. Adopt Water Quality Standards,
- 2. Assess surface waters to evaluate compliance with Water Quality Standards,
- 3. Identify those waters not currently meeting Water Quality Standards, and
- 4. Develop Total Maximum Daily Load (TMDL) analysis and other management plans to bring water bodies into compliance with Water Quality Standards.

A portion of the Tankerhoosen River does not meet Water Quality Standards for at least one of the designated uses. The impaired segment consists of the lower 1.51 miles of the Tankerhoosen River from Tankerhoosen Lakes to its confluence with the Hockanum River. The impaired uses include habitat for fish, other aquatic life, and wildlife. The causes and sources of impairment in the lower reaches of the Tankerhoosen River have not been identified and are currently listed as "unknown." TMDLs provide the framework to restore impaired waters by establishing the maximum amount of a pollutant that a water body can



assimilate without adverse impact to aquatic life, recreation, or other public uses. The 2006 List of Connecticut Waterbodies Not Meeting Water Quality Standards includes a priority ranking system for development of a TMDL specific to the contaminants in each impaired segment: high (H), medium (M), low (L), or under study (T). DEP has identified the impaired segment of the Tankerhoosen River as a high priority for development of a TMDL to restore the impairment. Table 5-3 summarizes the location and nature of the impairment.

Table 5-3: Tankerhoosen River Watershed Impaired Waters

Location Description	Waterbody Segment Length	Impaired Designated Use	Use Support	Cause	TMDL Priority	Potential Source
From mouth at Hockanum River , upstream to Tankerhoosen Lake	1.51 miles	Habitat for Fish, Other Aquatic Life and Wildlife	Р	Impairment Unknown	Н	Source Unknown

Source: DEP, 2006

H — high priority for which there is assessment information that suggests that a TMDL may be needed to restore the water quality impairment.

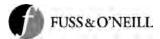
P – partially supporting

5.2.2 Tankerhoosen River Watershed Water Quality Monitoring Study

A water quality monitoring study was conducted in October and November 2006 to establish current baseline water quality conditions in the watershed, identify water quality impacts, and begin to develop a water quality database for the watershed (Fuss & O'Neill, 2007). Chemical water quality monitoring and biological assessments were conducted during dry and wet weather conditions. Samples were collected from fourteen locations throughout the watershed on four occasions (Figure 5-2). A variety of parameters were measured including pH, temperature, dissolved oxygen, and conductivity, which all reported values within normal ranges. These results indicate that the water quality of the watershed is generally good. However, some of the measured parameters including turbidity, metals, nitrogen, phosphorus, and bacteria highlighted some of water quality issues in the watershed. A brief discussion of the water quality parameters and identified issues is provided below:

Turbidity

Based on the wet weather monitoring results, excessive turbidity is a water quality issue in the Tankerhoosen River and its tributaries, particularly Gages Brook (Figure 5-3). Stream channel erosion and stormwater runoff from impervious surfaces and construction sites are potential sources of the observed turbidity during large precipitation events such as the August 2006 wet weather monitoring event, although it is difficult to attribute the turbidity excursions to a particular source. During the August 2006 wet weather monitoring event, turbidity measurements generally exhibited a declining trend from upstream to downstream within the watershed. Elevated levels of indicator bacteria (total coliform and *E. coli*) were measured at all monitoring locations during the October 2006 wet weather monitoring event, suggesting stormwater runoff and other non-point sources (pet waste, waterfowl, septic systems, etc.) as likely contributors of elevated pathogen levels in the Tankerhoosen River and its tributaries.



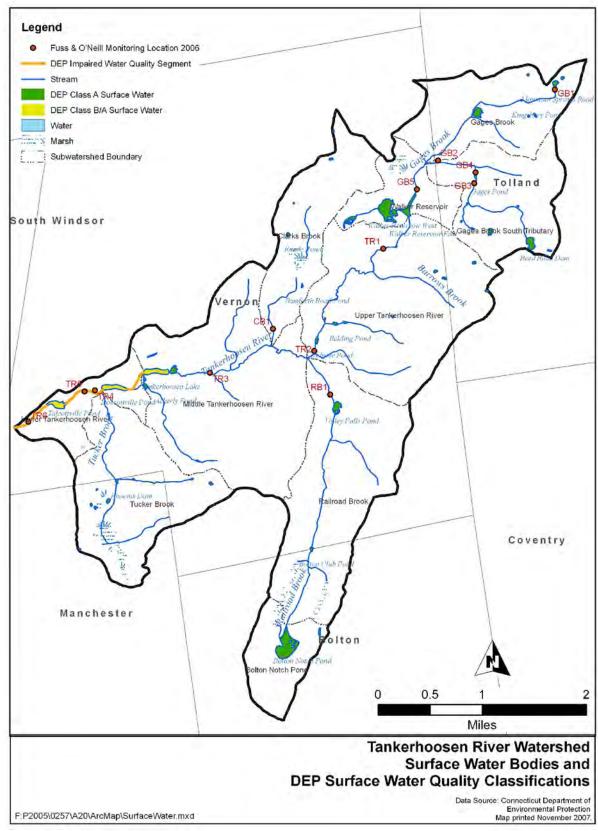
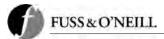


Figure 5-2: DEP Water Quality Classifications



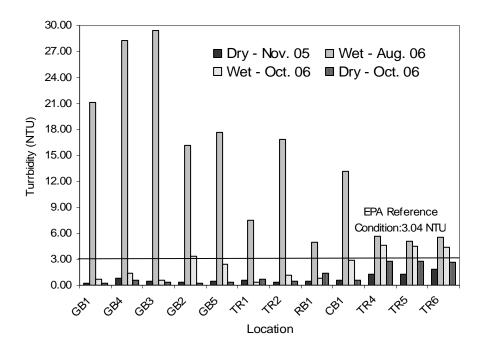


Figure 5-3: Turbidity – Tankerhoosen River Watershed

Metals

The monitoring data suggest a wet weather source of metals to Gages Brook (Figure 5-4 and Figure 5-5). Results from the August 2006 monitoring event indicate a wet weather source of metals close to the I-84 crossing of Gages Brook, as the dissolved copper concentration was consistently below detection limits at the Gages Brook headwaters monitoring location (GB1) and in excess of the chronic aquatic life criterion at several of the downstream Gages Brook locations. The highest wet weather lead concentration was measured in the Gages Brook monitoring location immediately downstream of I-84, which further suggests that highway runoff is a likely source of metals to Gages Brook. Exceedances of the CT WQS for lead were also measured along the Tankerhoosen River at the Fish and Game Road. (TR1) and Bolton Road (TR2) monitoring locations. Elevated dissolved copper and lead concentrations were also measured at the Clarks Brook monitoring location. The data suggest that metals are a potential source of impairment in Gages Brook, Clarks Brook, and the Tankerhoosen River during wet weather. The November 2005 results also indicate dry weather sources of dissolved copper to Gages Brook between the headwaters monitoring location (GB1) and the monitoring location behind the Tolland Agricultural Center (GB2).



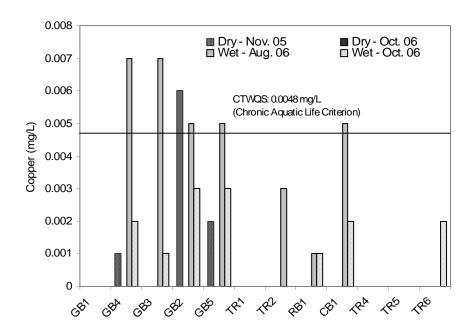


Figure 5-4: Dissolved Copper — Tankerhoosen River Watershed

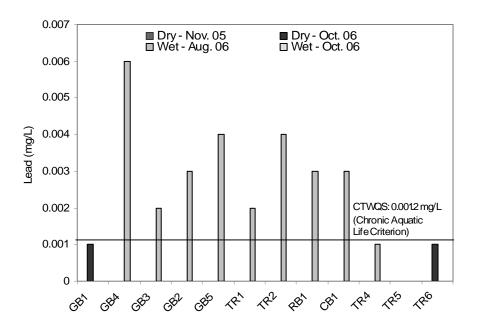
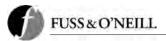


Figure 5-5: Lead — Tankerhoosen River Watershed



Nitrogen & Phosphorus

Many of the monitoring locations exceeded the EPA recommended Total Nitrogen criterion for rivers in Ecoregion XIV of 0.71 mg/L (Figure 5-6). Nitrogen concentrations were consistently higher at the Gages Brook monitoring locations than the other monitoring locations in both wet and dry weather.

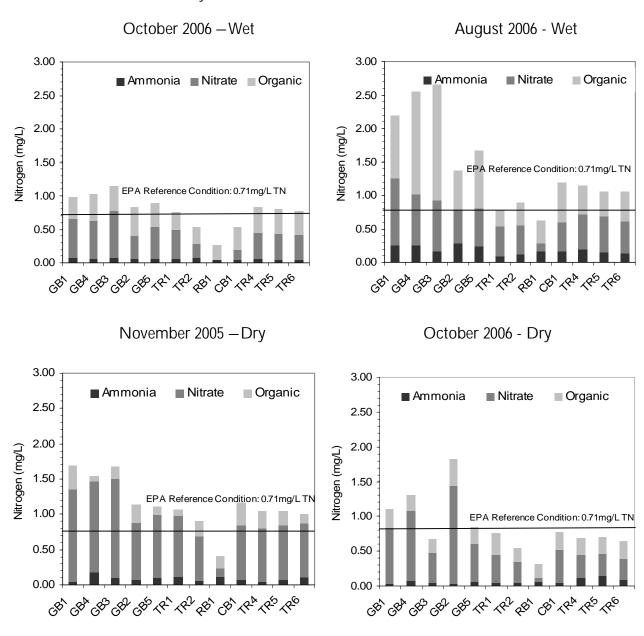


Figure 5-6: Nitrogen Species – Tankerhoosen River Watershed



Phosphorus concentrations measured during the wet and dry weather events significantly exceeded the CT WQS and EPA criterion at most locations (<u>Figure 5-7</u>). The elevated phosphorus levels are an indicator of potential organic enrichment and algal growth in water bodies along the Tankerhoosen River and its tributaries, which could impair aquatic life support and contact recreation under certain conditions.

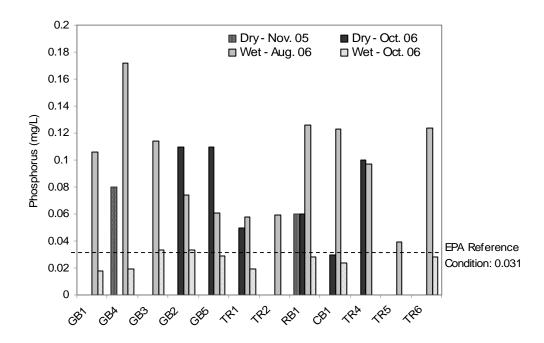


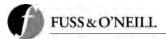
Figure 5-7: Phosphorus – Tankerhoosen River Watershed

Indicator Bacteria

Elevated levels of indicator bacteria (total coliform and *E. coli*) were measured at all monitoring locations during the October 2006 wet weather monitoring event, suggesting stormwater runoff and other non-point sources (pet waste, waterfowl, septic systems, etc.) as likely contributors of elevated pathogen levels in the Tankerhoosen River and its tributaries. Dry weather indicator bacteria concentrations were much lower than wet weather. Natural sources of indicator bacteria such as waterfowl or wildlife may have contributed to several dry weather exceedances of the CT WQS for total coliform at the Gages Brook monitoring location behind the Tolland Agricultural Center and at the Tankerhoosen River monitoring location just upstream of Fish and Game Road.

Bioassessment Results

The 2006 bioassessment data (RBV and Fuss & O'Neill data collectively) vary considerably by site, but generally indicate very good water quality at most of the monitoring locations, with the exception of the lower Tankerhoosen River near the confluence with the Hockanum River and downstream of Dobsonville Pond. This finding is consistent with previous impairments identified in the lower reaches of the Tankerhoosen River by the CTDEP. Despite the water quality issues identified in Gages Brook, Clarks Brook, and in certain reaches of the



Tankerhoosen River (i.e., heavy metals, turbidity and suspended solids, and potential nutrient enrichment), the 2006 bioassessment data indicate little or no impairment to the benthic communities at the monitored locations.

5.3 Wetlands

Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Wetlands and buffer zones between watercourses and developed areas help to preserve stream water quality by filtering pollutants, encouraging infiltration of stormwater runoff, and protecting against stream bank erosion.

Wetlands in Connecticut are designated by soil classification. <u>Figure 5-8</u> depicts the extent and distribution of wetland soils in the Tankerhoosen River watershed based on Natural Resources Conservation Service soil classifications. <u>Figure 5-8</u> also depicts wetland mapping available from the U.S. Fish & Wildlife Service National Wetlands Inventory. Wetlands soils comprise 11.3% of the overall watershed (approximately 926 acres), while 4% of the watershed area (approximately 320 acres) is mapped as freshwater emergent wetlands or freshwater forested/shrub wetlands. The concentration of wetland soils is generally higher in the undeveloped portions of the watershed. Mapped wetland soils are generally located in riparian and floodplain areas along the Tankerhoosen River and its major tributaries. <u>Table 5-4</u> summarizes wetland soils coverage by subwatershed.

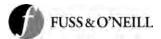
Table 5-4: Wetland Soils Coverage in the Tankerhoosen River Subwatersheds

Subwatershed Name	Wetland Soils Area (ac)	% of Subwatershed	
Bolton Notch Pond	20	5.8 %	
Clarks Brook	101	15.5 %	
Gages Brook	111	15.9 %	
Gages Brook South Tributary	34	5.1 %	
Lower Tankerhoosen River	7	2.3 %	
Middle Tankerhoosen River	188	11.9 %	
Railroad Brook	136	11.3 %	
Tucker Brook	109	11.7 %	
Upper Tankerhoosen River	193	13.1 %	
Walker Reservoir	27	7.6 %	
Tankerhoosen River Watershed	926	11.3%	



At least twenty vernal pools have been identified within the Tankerhoosen watershed by certified scientists (see <u>Figure 5-8</u>). The majority of these were cited by Mr. Ed Pawluk of Connecticut Ecosystems, LLC in a study conducted for the Vernon Conservation Commission. Several of these pools are considered exemplary vernal pools, and as such merit the highest possible level of protection and conservation (Connecticut Ecosystems, LLC, 2005).

In 1993, a comprehensive survey of plant life was conducted in the 1,400-acre watershed from Valley Falls Park in Vernon to Bolton Notch State Park in Bolton (Sexton, 1993). The study was sponsored by the Town of Bolton Conservation Commission and the Town of Vernon Conservation Commission. A total of 345 species representing 82 families were identified. A small band of marble exists a short distance north and south of the cut at Bolton Notch. A plant species unique to this area includes the Yellow Lady's Slipper. Marble is rare east of the Connecticut River and supports additional plants preferring more basic soil including the purple cliff-brake and maidenhair fern (Sexton, 1993).



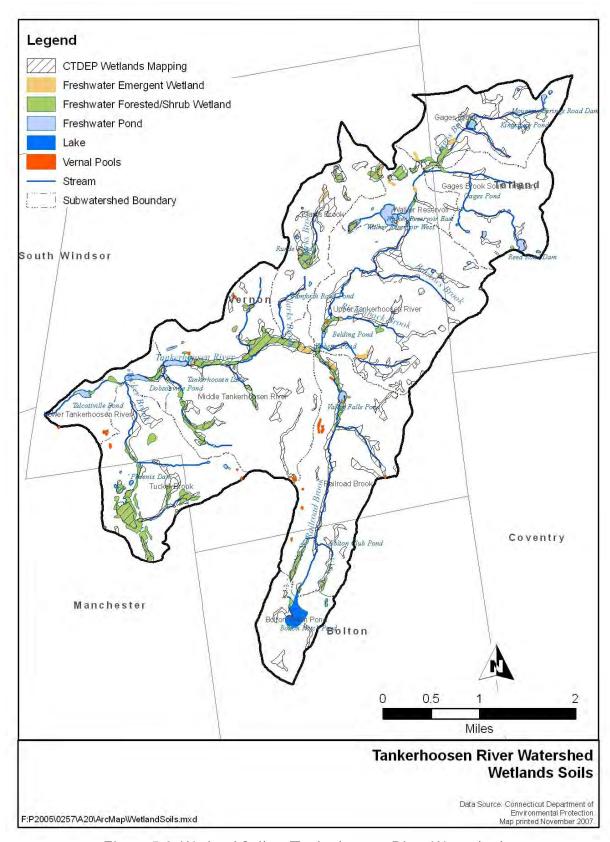
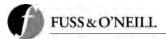


Figure 5-8: Wetland Soils — Tankerhoosen River Watershed



5.4 Fish and Wildlife Resources

Portions of the Tankerhoosen River have abundant habitats supportive of a variety of fish and wildlife. Various waterbodies, wetlands, and upland areas provide habitat to fish, mammals, amphibians, and birds.

Particularly notable is the 282-acre Belding Wildlife Management Area located in the central portion of the Tankerhoosen River watershed. The Belding Wildlife Management Area is a significant natural resource of undeveloped land owned by the State of Connecticut and managed by the DEP. A 1.4-mile section of the Tankerhoosen River within the Belding Wildlife Management Area is managed as a Class 1 Wild Trout Management Area and is one of only two such areas in eastern Connecticut. This section of stream is characterized by natural reproduction sufficient to produce robust populations of native brook trout (up to 8-10 inches) and wild brown trout (up to 10-11 inches) exhibiting above average growth rates (DEP correspondence, 2003).

Areas in the Tankerhoosen River watershed that provide significant habitat are summarized in <u>Table 5-5</u>. These areas provide habitat for some of the most valuable or unique natural resources or ecosystems in their respective communities. Other open space areas are described in the Land Use and Land Cover section of this report.

Table 5-5: Areas Providing Habitat for Valuable or Unique Natural Resources

Town	Areas		
Vernon	 Vernal Pools on Box Mountain Tancanhoosen LLC Parcel Talcottville Gorge Belding Wildlife Management Area Belding Wild Trout Management Area Valley Falls Park Rambling Ridge Property Northern Connecticut Land Trust Properties 		
Tolland	Tolland and Charter Marshes		
Bolton Freja Park Bolton Notch State Park			

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

Freja Park is a 21-acre, wooded town-owned area located west of Bolton Notch Pond. Freja Park serves as a gateway for the 1,400-acre Bolton Notch/Valley Falls watershed area. The town of Bolton originally acquired the property in 1968, but the park suffered from abuse and neglect. Beginning in March 1998, restoration efforts have been underway including numerous Earth Day Clean-up events with the help of volunteers, Boy Scouts, Conservation Commission members. A total of over two tons of litter have been removed from the park.



5.4.1 Fisheries

The Tankerhoosen River historically hosted large runs of many anadromous fish species. Development of the river with dams from 1700 to the 1920s created barriers to fish migration, which extirpated the salmon run and severely limited the upstream habitat for shad and river herring. Despite these obstacles, the Tankerhoosen River and its tributaries support a variety of fish species as detailed in <u>Table 5-6</u>.

The Tankerhoosen River is a cold water stream starting only a short distance below Walker Reservoir. The generally cold water temperatures in the Tankerhoosen are the result of extensive spring water inputs (DEP correspondence, 2008).

As indicated previously, the Belding Wild Trout Management Area in the upper portions of the Tankerhoosen River watershed is a Class 1 Wild Trout Management Area with self-sustaining native trout populations that rank among the best of their kind in the state. Portions of the remainder of the Tankerhoosen River are stocked annually by the DEP Inland Fisheries Division. Valley Falls Park Pond is stocked in the spring and winter with about 4,400 rainbow trout and generates between 7,500-8,000 angler hours of fishing annually. Walker Reservoir, upstream of the Belding Wildlife Management Area, is stocked each spring with over 1,800 adult brown and rainbow trout (DEP correspondence, 2003).

Table 5-6: Fish Species

	Bolton	Gages	Lower	Middle	Upper	Railroad
	Notch Pond	Brook	Tankerhoosen River	Tankerhoosen River	Tankerhoosen River	Brook
	Portu		Rivei			
American Eel				X	X	Х
Brown Bullhead	Х					Χ
Black Crappie	Х				X	
Blacknose Dace		Χ		Χ	Х	X
Brook Trout		Х		X	Х	Х
Brown Trout			Χ	Х	Х	Х
Bluegill	Х		Х	Х	X	Χ
Chain Pickerel	Х		Х	Х		
Common Shiner				Х	X	X
Creek Chub				X	X	
Fallfish				Х	Х	
Fathead Minnow		Х				
Golden Shiner	X			X	X	
Longnose Dace				Х	Х	
Largemouth Bass		Х	Х	X	Х	Х
Pumpkinseed	Х	Х	Х	Х	Х	Х
Sunfish	^	^	^	^	^	^
Rainbow Trout				Х	X	X
Rockbass			X			
Smallmouth Bass			Х			
Tessellated Darter			Х	X	Х	
White Sucker		Χ		Х	Х	Χ
Yellow Perch	Х			Х		Χ
Tiger Trout					Stocked in Pond	
Golden Trout					Stocked in Pond	



5.4.2 Birds

Bird surveys were conducted in 2004 at the Tancanhoosen LLC property, within Valley Falls Park, and at various Town of Vernon properties, including areas around Walker Reservoir East and on the Connecticut Light & Power line site.

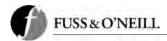
Eighty bird species were detected during the 2004 surveys. Seventy four species were counted during standardized bird counts at 24 count points, and 6 more were detected as incidental observations. The greatest number of species occurred at Walker Reservoir, while the former gravel pit on the Tancanhoosen LLC property contained the most uncommon birds. Prairie warbler, field sparrow, brown thrasher and eastern towhee were detected on the Tancanhoosen LLC property throughout the breeding season. Populations of these species are declining and brown thrasher is on Connecticut's list of Species of Special Concern. These birds are dependent on early successional habitats such as grassland and shrubland. These habitat types have been lost to reforestation and human development. The gravel pit is at an early successional stage with open, grassy habitat and short, scattered pine trees. This site will eventually revert to a forested habitat unless actively managed to maintain early successional habitat. Once the site is reforested, early successional species will disappear from this site (Seymour, 2004).

The Tankerhoosen River watershed also supports a wide range of bird of species. Surveys performed in 2003 and 2004 reported evidence of great blue heron, wood duck, willow flycatcher, hermit thrush, black-throated blue warbler, broad-winged hawk, hairy woodpecker, pileated woodpecker, olive-sided flycatcher, yellow-throated vireo, red-breasted nuthatch, bluegray gnatcatcher, Nashville warbler, pine warbler, blackpoll warbler, blackburnian warbler, cerulean warbler, worm-eating warbler, and Canada warbler. European starling and house sparrow, two introduced invasive species, were also identified (Seymour, 2004). A complete species list is provided in Appendix A.

During 1999, a bird survey was completed to determine the species diversity and the relative abundance of breeding landbirds within Freja Park and Bolton Notch State Park (Comins, 1999). Of the total 55 species were recorded, 51 were likely nesting species and four were probably non-nesting visitors or migrants. An additional fourteen species were not recorded on the survey, but were identified as likely to occur during the nesting season. Another twentynine species have reasonable possibility of occurring in the nesting season from time to time or could be attracted to the area. Two Connecticut State Species of Special Concern were recorded; six species were listed as National Audubon Society Watch List High Conservation Priority species in Connecticut were recorded; an additional six species not listed as watch species were listed by Partners in Flight as High Conservation Priority Species in Connecticut; fourteen species that were uncommon nesters in the Hartford area were recorded (Comins, 1999). See report for additional listing of specific species.

5.4.3 Amphibians & Reptiles

Amphibian and reptile surveys were conducted in 2004 within the Tankerhoosen River watershed, including the Belding Wildlife Management Area, Barrows Brook, and Railroad Brook. Some of the species identified included Northern redback salamander, Northern two-lined salamander, Spotted salamander, American toad, Northern spring peeper, Gray treefrog,



Wood frog, Green frog, Pickerel frog, Painted turtle, and Garter snake. The most abundant amphibian species detected during this study was the northern redback salamander. A complete list of the identified amphibian and reptile species is included as <u>Appendix A</u>. A previously undocumented vernal pool was discovered between Reservoir Road and Walker Reservoir West. Additional vernal pools were identified on Bolton Road and above Valley Falls Park (Seymour, 2004).

5.4.3 Threatened and Endangered Species

The DEP Natural Diversity Data Base (NDDB) maintains information on the location and status of endangered, threatened, and special concern species in Connecticut. Figure 5-9 displays the generalized areas of endangered, threatened, and special concern species in the Tankerhoosen River watershed. The areas represent a buffered zone around known species or community locations. The locations of species and natural community occurrences depicted on the NDDB mapping are based on data collected over the years by the Environmental and Geographic Information Center's Geologic and Natural History Survey, other units of the DEP, conservation groups, and the scientific community. Approximately ten such areas were identified throughout the watershed. Because new information is continually being added to the Natural Diversity Database and existing information updated, the areas are reviewed on an annual basis by the DEP. Areas can be removed or added based upon the results of the review.

Table 5-7: Endangered, Threatened, and Special Concern Species

Common Name	Scientific Name	Status				
	Flora					
Climbing fern	Lygodium palmatum	Special Concern				
Sphagnum	Sphagnum pulchrum					
Beaked sedge	Carex rostrata					
Leatherleaf	Chamaedaphne calyculata					
	Fauna					
Eastern pearlshell	Margaritifera margaritifera	Special Concern				
Brown thrasher	Toxostoma rufum	Special Concern				
Southern bog lemming	Synaptomys cooperi	Special Concern				
Wood turtle	Clemmys insculpta	Special Concern				
Purple martin	Progne subis	Threatened				
Eastern box turtle	Terrapene c. carolina	Special Concern				
Habitats						
Medium fen						
Subacidic rocky summit/outcrop						

Source: DEP Natural Diversity Data Base, 2008.

- "Endangered Species" means any native species documented by biological research and inventory to be in danger of extirpation (local extinction) throughout all or a significant portion of its range within Connecticut and to have no more than five occurrences in the state.
- "Threatened Species" means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within Connecticut and to have no more than nine occurrences in the state.
- "Species of Special Concern" means any native plant or any native nonharvested wildlife species documented to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population, or has become locally extinct in Connecticut.



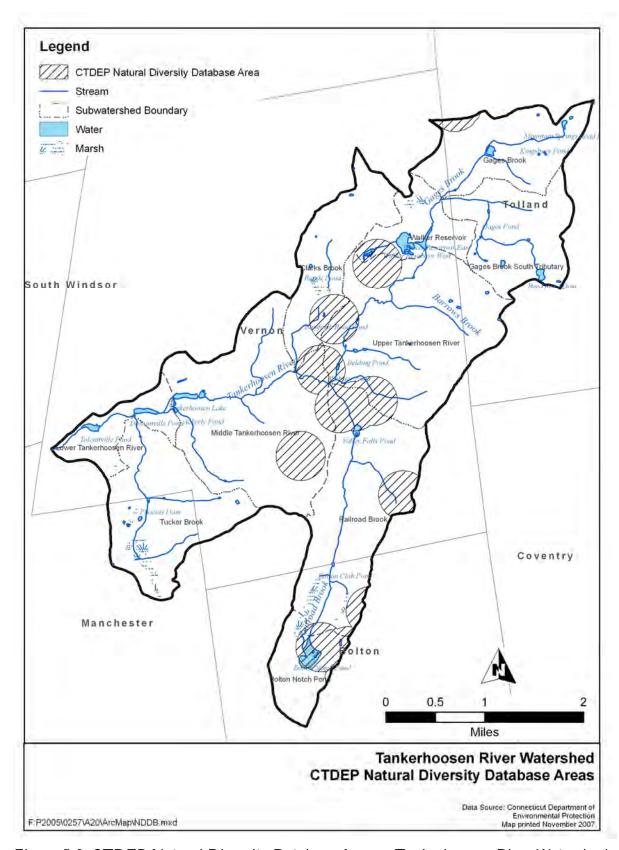
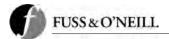


Figure 5-9: CTDEP Natural Diversity Database Areas — Tankerhoosen River Watershed F:\P2005\0257\A20\Baseline Watershed Assess Figures.doc



6.0 WATERSHED MODIFICATIONS

6.1 <u>Dams, Impoundments, & Water Supply</u>

The historical industrial use of the Tankerhoosen River and its major tributaries has left behind many small dams and impoundments. Most of this infrastructure is no longer used for power generation, and many of these impoundments currently provide aquatic and wildlife habitat and recreational opportunities. Many of the dams in the watershed are also an impediment to fish migration.

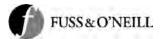
According to the DEP Dam Safety Regulations, the hazard classification of a dam is based on the damage potential from failure of the structure. <u>Figure 6-1</u> shows the location and hazard classification of the identified dams within the watershed. Some of the dams which no longer serve an integral function to industry or public use have fallen into disrepair and pose a potential hazard to downstream properties.

<u>Table 6-1</u> lists the major drinking water supplies within the Tankerhoosen River watershed which are regulated under the DEP Water Diversion program.

Name Name of Diversion **MGD** Town Vernon Well #1 0.1728 Vernon Vernon Well #2 0.1728 Vernon Connecticut Water Vernon Well #3 0.1440 Vernon Company Vernon Well #4 0.1728 Vernon Vernon Well #5 0.4320 Vernon Manchester Water New Bolton Well Various Bolton Department Field, Well #1,2,3

Table 6-1: Major Drinking Water Supplies

The DEP, with Cooperation from the Connecticut Water Company, has identified two preliminary (Level B) Aquifer Protection Areas associated with these wells within the Tankerhoosen River watershed, as shown in Figure 6-2. Aquifer Protection Areas are designated around active well fields in sand and gravel aquifers that serve more than 1,000 people. Level B mapping identifies the general area of aquifer contribution/recharge based primarily on topography. The watershed communities are required to establish land use regulations for these areas to limit potential contamination to public groundwater supplies. Private groundwater supply wells are also prevalent throughout areas of the watershed that are not served by public water supplies.



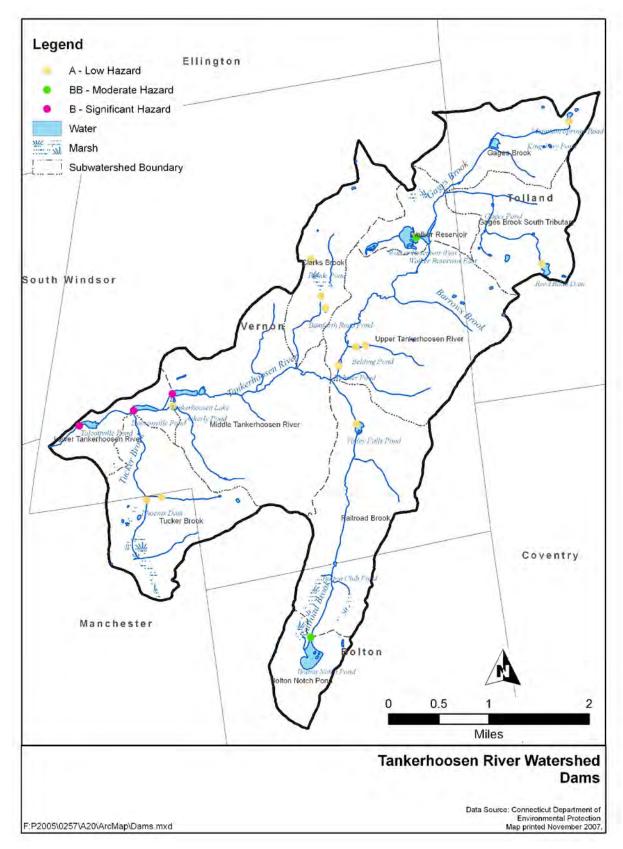
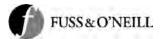


Figure 6-1: CTDEP Regulated Dams — Tankerhoosen River Watershed



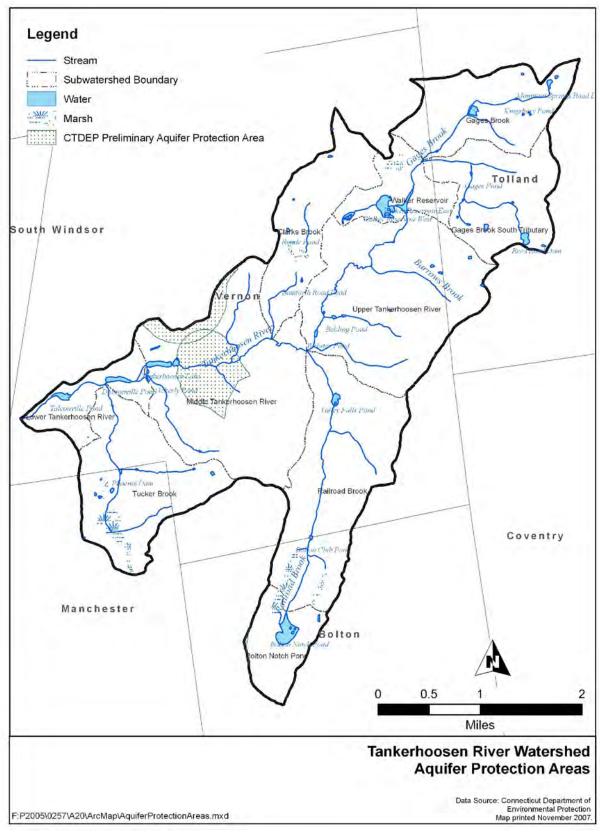


Figure 6-2: CTDEP Aquifer Protection Areas - Tankerhoosen River Watershed



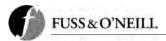
6.2 <u>Wastewater Discharges</u>

As summarized in <u>Table 6-2</u>, there are number of industrial, commercial, and municipal facilities in the Tankerhoosen River Watershed with surface water discharges regulated under the National Pollutant Discharge Elimination System (NPDES) permit program, which is administered by the Connecticut DEP. The facilities listed in <u>Table 6-2</u> have either permitted wastewater or stormwater discharges to surface waters. The majority of these facilities are located in Vernon. There are no municipal wastewater treatment plants located within the Tankerhoosen River watershed.

Table 6-2: NPDES Regulated Facilities

Town	Facility	Location	Permit Number
Vernon	Carpenter's Mobil	447 Hartford Turnpike	GVS000915
	Company 1 Firehouse	724 Hartford Turnpike	GVM000592
	Connecticut Golfland	95 Hartford Turnpike	GPL000108
	First Student	25 Whitney Ferguson	GSI001217
		Road	
	Motiva Enterprises LLC	444 Hartford Turnpike	GGR001404
	Moore's Automotive	1245 Hartford	GVM000806
		Turnpike	
	Mount Vernon	1120 Hartford	GVS000863
	Apartments	Turnpike	
	Oakland Meadows	1158 Hartford	GSN001098
		Turnpike	
	Tighitco, Inc.	101-77 Industrial Park	GSI001599
		Road	
	Vernon Maintenance	37 Campbell Avenue	GVS000988
			GS1000074
	VMS Construction	120 Bolton Road	GVM000980
	Company		
Bolton	Transportation Facility	326 Boston Turnpike	GSI001179
	Hull's Autobody	299-301 Boston	GVM000800
		Turnpike	
Tolland	Dari Farms	Gerber Drive	GSN000814
	Mr. Sparkle Car Wash	157 Hartford Turnpike	GVM000646
	Connecticut Light &	45 Tolland Stage Road	GVS001027
	Power Co.		
	Gerber Scientific Inc.	24 Industrial Park Road	GSI000914
		West	
	Standard Register Co.	259 Hartford Turnpike	GPP000152
			GPH000345
	CNC Software Inc.	671 Old Post Road	GSN000070
Course DED Door	Belvedere Ridge	601 Old Post Road	GSN001308

Source: DEP December 2007



<u>Figure 6-3</u> depicts sewer service areas in the watershed. Areas outside of the mapped sewer service areas are presumed to be on individual sewage disposal (i.e., septic) systems. Approximately 23% of the overall Tankerhoosen River watershed area is served by municipal sanitary sewers.

6.3 Regulated Sites

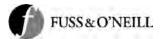
Historical and current industrial and commercial development within the Tankerhoosen River watershed poses a potential threat to surface water and groundwater supplies in the watershed. Illegal waste disposal, improper use and disposal of chemicals such as used oil, pesticides, and herbicides, and chemical spills are potential sources of contaminants from industrial and commercial facilities. As summarized in the following table, several hazardous waste generators and other regulated sites are located within the watershed. These facilities are located in both Vernon and Tolland in the central and upper portions of the watershed.

Table 6-3: Summary of Regulated Sites

Site Type	Number of sites			
Site Type	Vernon	Tolland		
Hazardous Waste Generator	5	6		
Air Emissions	1	2		
CERCLA Site	1 (1 on Final NPL)	0		

Source: epa.gov/region1/superfund/sites/precision, accessed Nov. 2007.

There is one site that is listed as potential hazardous waste site that EPA has evaluated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), otherwise known as "Superfund." This site, Precision Plating Corporation, is located in the Hillside Industrial Park in Vernon and is currently on the Final National Priorities List (NPL). Chromium contaminated groundwater at the site is being remediated under the direction of the DEP.



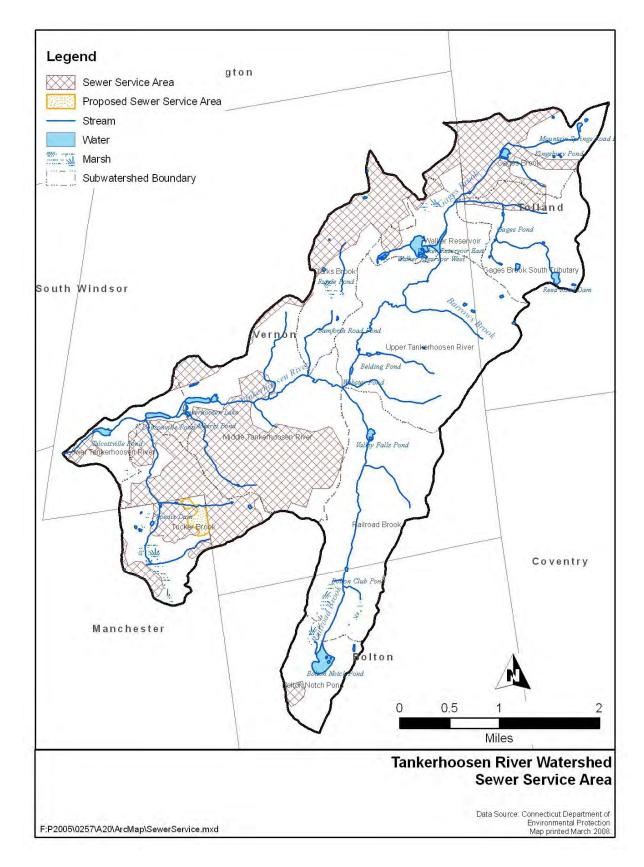
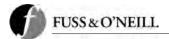


Figure 6-3: Sewer Service Areas — Tankerhoosen River Watershed



7.0 LAND USE AND LAND COVER

The type and distribution of land use within a watershed have direct impact on nonpoint sources of pollution and water quality. This section describes the land use and land cover patterns in the Tankerhoosen River watershed.

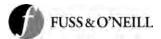
7.1 Current Conditions

7.1.1 Land Use

Figure 7-1 depicts general land use patterns in the Tankerhoosen River watershed. The data in Figure 7-1 are parcel-based land use categories for the watershed communities, provided by the Capital Region Council of Governments (CRCOG). The land uses in the watershed include 20 land use categories (Table 7-1). Approximately 60% of the watershed consists of developed land uses, with single-family residential comprising the largest percentage (40%). Highway and other road right-of-ways comprise approximately 9% of the watershed area. Approximately 30% is classified as resource/recreation land use, which includes committed and uncommitted open space. Major portions of the riparian areas adjacent to the Tankerhoosen River and its tributaries are located within resource/recreation areas. Areas in the northern portion of the watershed are more commercialized and have a greater retail and industrial use, with commercial, retail, and industrial land uses comprising approximately 4% of the watershed area. The majority of the commercial, industrial, and retail areas are located in headwater regions adjacent to the major transportation corridors of I-84/Route 30 and I-384.

Table 7-1: Current Land Use — Tankerhoosen River Watershed

Land Use Type	Acres	Percent of Watershed
Agriculture	103	1 %
One Family	3160	38 %
Two Family	48	<1 %
Three Family	2	<1 %
Multi Family	39	<1 %
Condominium	165	2 %
Group Quarters	12	<1 %
Commercial	110	1 %
Retail	88	1 %
Mixed Use	3	<1 %
Industrial	183	2 %
Government/Non-Profit	102	1 %
School	26	<1 %
Cemetery	22	<1 %
Health/Medical	6	<1 %
Resource/Recreation	2398	29 %
Undeveloped	851	10 %
Right-of-way	770	9 %
Water	77	<1 %
Unknown	61	<1 %



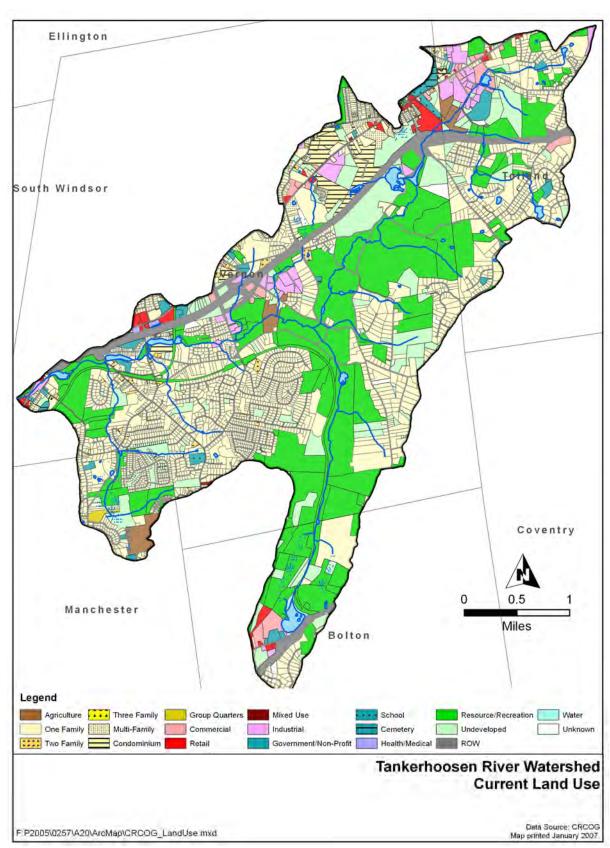


Figure 7-1: Current Land Use — Tankerhoosen River Watershed

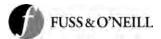


In the Tankerhoosen River watershed, several tracts of potentially developable land have been permanently preserved as "committed" open space. Committed open space parcels in the Town of Vernon and the Town of Bolton were identified through available land use mapping and confirmed by members of the Technical Advisory Committee and the Bolton Conservation Commission. Committed open space parcels in Tolland and Manchester were determined through available mapping from each Town's Plan of Conservation and Development (POCD) and from the Connecticut Office of Policy and Management Municipal Plans of Conservation and Development. In general, the committed open space areas include deeded open space that is privately owned, parcels owned by land trusts, land owned by the State of Connecticut as well as parks owned by the Town of Vernon and Town of Bolton, including the Hop River State Park Trail, Valley Falls Park, Freja Park, and Bolton Notch State Park. This land is protected against future development and is generally located in the central and southern portion of the watershed. Figure 7-2 identifies the committed open space land in the watershed.

In addition, several parcels within the watershed are designated for agricultural or forestry use under Public Act 490. While development is not prohibited on this land, this program reduces the tax burden on this land, thereby relieving some of the pressure to develop the land and allows it to continue to serve as open space.

7.1.2 Zoning

<u>Figure 7-3</u> depicts parcel-based zoning designations in the Tankerhoosen River watershed, as provided by CRCOG. The majority of the Tankerhoosen River watershed is zoned for residential uses. Commercial and industrial zones associated with the I-384 and I-84 corridors are located in the southern and northern portions of the watershed, respectively.



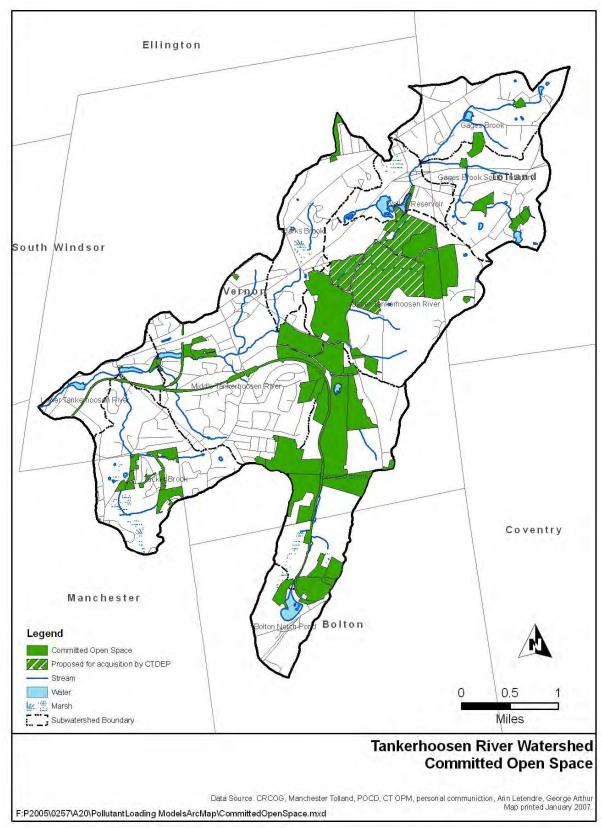
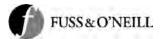


Figure 7-2: Committed Open Space — Tankerhoosen River Watershed



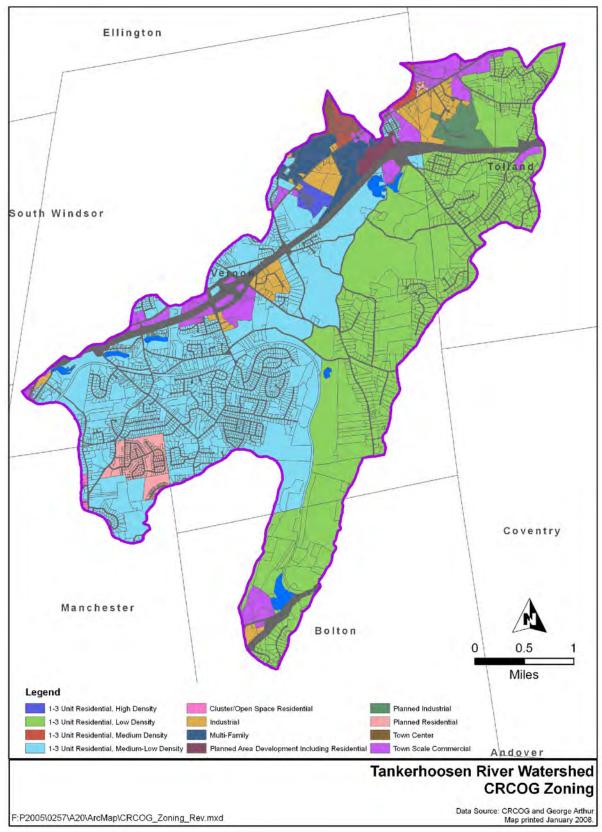


Figure 7-3: Watershed Zoning as Defined by CRCOG – Tankerhoosen River Watershed



7.1.3 Land Cover

<u>Figure 7-4</u> depicts the general land cover in the Tankerhoosen River watershed. Data shown in <u>Figure 7-4</u> are land cover categories derived from 2002 Landsat satellite imagery with ground resolution of 30 meters. The land cover data in the watershed are summarized into ten categories (<u>Table 7-2</u>). These ten categories are those used in the Connecticut Land Cover Map Series and are described following the table (University of Connecticut Center for Land Use Education and Research).

Table 7-2: Land Cover — Tankerhoosen River Watershed

	1985		2002		Relative	Relative
Land Cover Type	Acres	Percent of	Acres	Percent of	Percent	Rate of
		Watershed		Watershed	Change ¹	Change ²
Barren	91	1 %	162	2 %	1%	78%
Coniferous Forest	454	6 %	430	5 %	-1%	-5%
Deciduous Forest	4581	56 %	4085	50 %	-6%	-11%
Developed	1793	22 %	2201	27 %	5%	23%
Forested Wetland	192	2 %	175	2 %	0	-9%
Non-forested	2	< 1 %	19	<1 %	0	912%
Wetland						
Other grasses and	551	7 %	603	7 %	0	9%
agriculture						
Turf and grass	448	5 %	447	5 %	0	0%
Utility Right of Way	19	< 1 %	17	<1 %	0	-12%
Water	95	2 %	88	1 %	1%	-7%

¹Calculation = % land cover 2002 - % land cover 1985

²Calculation = (acres land cover 2002 – acres land cover 1985) / acres land cover 1985

	19	985	2002		Relative	Relative
Land Cover Type	Acres	Percent	Acres	Percent	Percent	Rate of
		of Basin		of Basin	Change ¹	Change ²
Barren	91	1	162	2	1%	78%
Coniferous Forest	454	6	430	5	-1%	-5%
Deciduous Forest	4581	56	4085	50	-6%	-11%
Developed	1793	22	2201	27	5%	23%
Forested Wetland	192	2	175	2	0	-9%
Non-forested Wetland	2	< 1	19	<1	0	912%
Other grasses and	551	7	603	7	0	9%
agriculture						
Turf and grass	448	5	447	5	0	0%
Utility Right of Way	19	< 1	17	<1	0	-12%
Water	95	2	88	1	1%	-7%

¹Calculation = % land cover 2002 - % land cover 1985

²Calculation = (acres land cover 2002 – acres land cover 1985) / acres land cover 1985

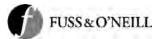
Source: University of Connecticut's Center for Land Use Education and Research (CLEAR)



- Barren Mostly non-agricultural areas free from vegetation, such as sand, sand and gravel operations, bare
 exposed rock, mines, and quarries. Also includes some urban areas where the composition of construction
 materials spectrally resembles more natural materials. Also includes some bare soil agricultural fields.
- Coniferous Forest Includes Southern New England mixed softwood forests. May include isolated low density residential areas.
- Deciduous Forest Includes Southern New England mixed hardwood forests. Also includes scrub areas characterized by patches of dense woody vegetation. May include isolated low density residential areas.
- Developed High density built-up areas typically associated with commercial, industrial and residential activities
 and transportation routes. These areas contain a significant amount of impervious surfaces, roofs, roads, and
 other concrete and asphalt surfaces.
- Forested Wetland Includes areas depicted as wetland, but with forested cover. Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.
- Non-forested Wetland —Includes areas that predominantly are wet throughout most of the year and that have a
 detectable vegetative cover (therefore not open water). Also includes some small watercourses due to spectral
 characteristics of mixed pixels that include both water and vegetation.
- Other Grasses and Agriculture Includes non-maintained grassy areas commonly found along transportation routes and other developed areas and also agricultural fields used for both crop production and pasture.
- Turf & Grass A compound category of undifferentiated maintained grasses associated mostly with developed areas. This class contains cultivated lawns typical of residential neighborhoods, parks, cemeteries, golf courses, turf farms, and other maintained grassy areas. Also includes some agricultural fields due to similar spectral reflectance properties.
- Utility Includes utility rights-of-way. This category was manually digitized on-screen from rights-of-way visible in the Landsat satellite imagery. The class was digitized within the deciduous and coniferous categories only.
- Water Open water bodies and watercourses with relatively deep water.

Forest Cover

Forested areas are the predominant land cover type in the Tankerhoosen River watershed. Approximately 55% of the watershed consists of deciduous and coniferous forests, primarily in the central and southern portions of the watershed. Table 7-3 compares the total acres and percent forest cover by subwatershed. The percent forest cover in each subwatershed ranges from approximately 31% in the Walker Reservoir subwatershed to approximately 86% in the Railroad Brook subwatershed. Based on a literature threshold values documented in several studies (CLEAR, 2007), watershed forest cover of 65% or greater is the minimum needed for a healthy aquatic invertebrate community. Only two of the ten subwatersheds, Railroad Brook and the Upper Tankerhoosen River, exceed the threshold value of 65%. Based on a recommendation of the American Forests organization, 40% forest cover is a reasonable threshold goal for urban areas. All but two subwatersheds, Clarks Brook (34.8 %) and Walker Reservoir (31.3 %), both of which are located in the northern and most developed portion of the watershed, meet this goal.



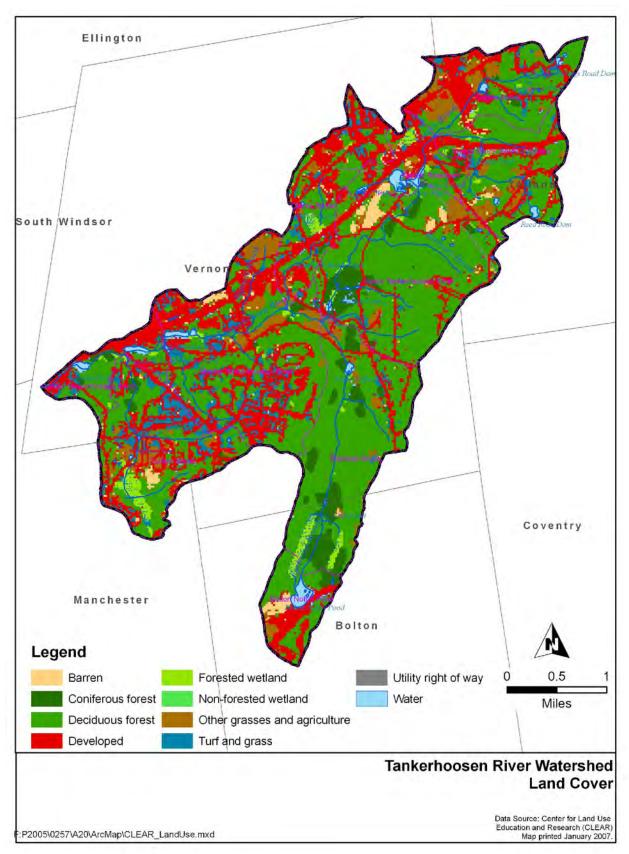


Figure 7-4: Land Cover — Tankerhoosen River Watershed



Table 7-3: Forest Cover — Tankerhoosen River Watershed

Subwatershed Name	Forest Cover in Subwatershed (acres)	Percent Forest Cover in each Subwatershed	Developable Forest Cover in Subwatershed (acres)	Percent of Forest Cover that is Developable
Bolton Notch Pond	171	49.6 %	41	24.0 %
Clarks Brook	226	34.8 %	70	30.9 %
Gages Brook	314	45.2 %	134	42.6 %
Gages Brook South Tributary	395	58.1 %	171	43.3 %
Lower Tankerhoosen River	149	46.6 %	82	54.9 %
Middle Tankerhoosen River	625	39.6 %	122	19.6 %
Railroad Brook	1043	86.3 %	346	33.2 %
Tucker Brook	374	40.0 %	119	31.8 %
Upper Tankerhoosen River	1110	75.4 %	278	25.0 %
Walker Reservoir	109	31.3 %	54	49.2 %
Tankerhoosen River Watershed	4515	54.9 %	1416	31.4 %

<u>Table 7-3</u> also includes a comparison of the amount of forest cover in each subwatershed that could potentially be developed in the future (i.e., "developable"). Refer to Section 7.2.1 for a discussion of the determination of "developable" areas and watershed buildout scenario. The percent of forest cover that is developable for each subwatershed ranges from approximately 20% in the Middle Tankerhoosen River subwatershed and up to approximately 55% in the Lower Tankerhoosen River subwatershed. These results suggest that future development within the watershed has the potential to significantly reduce forest cover and, in some subwatersheds, to below recommended thresholds.

Riparian Vegetation

Riparian, or streamside, corridors are critical areas important to stream stability, pollutant removal, and wildlife habitat. These areas are also sometimes called "buffer" areas, but are not to be confused with regulatory review zones, which are often also called buffers (CLEAR 2007). A stream walk survey of the Tankerhoosen River conducted in 1999 revealed that riparian buffers of 100 feet are common between the river and developed areas. However, some areas along the lower reaches of the Tankerhoosen River were identified as having stream buffers of less than 25 feet, according to the results of a 2000 stream walk survey of the Tankerhoosen River.

In order to assess the status and of the riparian corridors in the Tankerhoosen River watershed, the acreage of forest cover within the riparian area (defined as a 200-foot buffer on both sides of streams and a 200-foot buffer from waterbody shorelines) was calculated for each of the ten subwatersheds based on the 2002 Center for Land Use Education and Research (CLEAR) forest land cover classes (coniferous and deciduous forest). The results are provided in

Table 7-4.

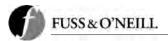


Table 7-4: Forest Cover in Riparian Areas in the Tankerhoosen River Subwatersheds

Subwatershed Name	Forest Cover in 200- foot Riparian Corridor	Percent of 200-foot Riparian Corridor that is	
	(acres)	Forested	
Bolton Notch Pond	19	34.9 %	
Clarks Brook	42	46.3 %	
Gages Brook	85	61.4 %	
Gages Brook South Tributary	93	62.3 %	
Lower Tankerhoosen River	31	35.8 %	
Middle Tankerhoosen River	99	41.8 %	
Railroad Brook	167	87.2 %	
Tucker Brook	92	51.8 %	
Upper Tankerhoosen River	216	80.7 %	
Walker Reservoir	21	23.1 %	
Tankerhoosen River Watershed	866	58.3%	

Forest cover within the 200-foot riparian corridor for the overall Tankerhoosen River Watershed is nearly 60%, although the amounts vary considerably by subwatershed. Railroad Brook (87.2%) and the Upper Tankerhoosen River (80.7%) subwatersheds have the highest percentage of forest cover within the 200-foot riparian corridor. Walker Reservoir (23.1%) and Bolton Notch Pond (34.9%) have the lowest percentage of forest cover within the 200-foot riparian corridor. These results indicate that large portions of the watershed streams and waterbodies are well-protected by intact riparian forest cover, although several subwatersheds have significantly lower riparian forest cover.

Developed Areas

Developed areas are also a dominant land cover type in the Tankerhoosen River watershed. Approximately 27% of the watershed consists of commercial, industrial, residential, and transportation land cover types (i.e. "developed" category) that follow the major transportation corridors, regional retail and commercial areas, and population centers. Approximately 7% of the watershed consists of other grass and agriculture, although only a small portion of this (approximately 1%) consists of land in active agricultural use.

A comparison of watershed land cover data between 1985 and 2002 (<u>Table 7-2</u>) shows a moderate increase in watershed development during this period (5% increase in developed cover types) and a corresponding loss of coniferous (1% decrease) and deciduous forest (6% decrease).

7.1.4 Impervious Cover

Impervious cover has emerged as a measurable, integrating concept used to assess the overall condition of a watershed. Numerous studies have documented the cumulative effects of urbanization on stream and watershed ecology (Center for Watershed Protection, 2003; Schueler et al., 1992; Schueler, 1994; Schueler, 1995; Booth and Reinelt, 1993, Arnold and Gibbons, 1996; Brant, 1999; Shaver and Maxted, 1996). Research has also demonstrated similar



effects of urbanization and watershed impervious cover on downstream receiving waters such as lakes, reservoirs, estuaries, and coastal areas.

The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. Although well-defined imperviousness thresholds are difficult to recommend, research has generally shown that when impervious cover in a watershed reaches between 10 and 25 percent, ecological stress becomes clearly apparent. Between 25 and 60 percent, stream stability is reduced, habitat is lost, water quality becomes degraded, and biological diversity decreases (NRDC, 1999). Watershed imperviousness in excess of 60 percent is generally indicative of watersheds with significant urban drainage. Figure 7-5 illustrates this effect. These research findings have been integrated into a general watershed planning model known as the impervious cover model (ICM) (CWP, 2003). The ICM has also been confirmed locally in Connecticut by the CTDEP, which has determined a statewide impervious cover threshold of 12 percent for aquatic life impairment (Belucci, CTDEP, 2007).

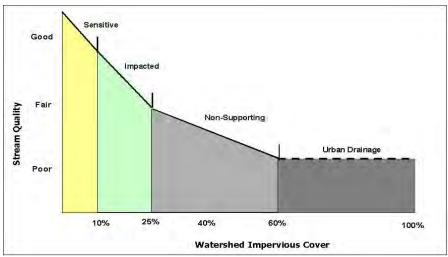
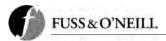


Figure 7-5: Relationship Between Watershed Imperviousness and Stream Health Source: www.cwp.org

A GIS-based impervious cover analysis was performed for the Hockanum River watershed and including the Tankerhoosen River watershed by staff from the Department of Natural Resources Management and Engineering at the University of Connecticut (Civco, 2005). The satellite-derived land cover data described previously were used in the analysis. This technique, known as "direct impervious surface modeling", extracted impervious surface data directly from 2002 Landsat imagery to estimate the amount of impervious surface within each pixel. The DEP GIS basin layer was used to calculate the percent of imperviousness by basin. Figure 7-5 graphically summarizes the results of this analysis.

The overall imperviousness of the Tankerhoosen River watershed is estimated at approximately 9.7% (<u>Table 7-5</u>). This level of impervious cover is slightly below the CTDEP aquatic life impairment threshold of approximately 12%, where ecological stress and stream impacts become apparent. As shown in <u>Figure 7-6</u>, impervious cover in much of the central and southern portions of the watershed (Upper Tankerhoosen River and Railroad Brook



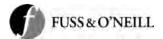
watersheds) is less than 5%, consistent with the high percentage of forest cover and conservation land in these areas. The headwater tributaries of the Tankerhoosen River, specifically Gages Brook, are estimated to have approximately 11.5% impervious cover, while localized subwatershed areas around Bolton Notch Pond, Walker Reservoir, and Dobsonville Pond have impervious cover near or above 20%.

Table 7-5: Percent Impervious Cover – Tankerhoosen Watershed

Subwatershed	Percent Impervious Cover
Bolton Notch Pond	16.6 %
Clarks Brook	17.2 %
Gages Brook	11.5 %
Gages Brook South Tributary	11.3 %
Lower Tankerhoosen River	15.8 %
Middle Tankerhoosen River	12.9 %
Railroad Brook	1.7 %
Tucker Brook	8.1 %
Upper Tankerhoosen River	4.5 %
Walker Reservoir	19.9 %
Total	9.7 %

The results of this analysis provide an initial diagnosis of potential stream and receiving water quality within the watershed study area. The analysis method and ICM are based on several assumptions and caveats, which limits its application to screening-level evaluations. Some of the assumptions of the ICM include:

- Requires accurate estimates of percent impervious cover, which is defined as the total
 amount of impervious cover over a subwatershed area. The resolution of the land cover
 data used in the evaluation is relatively coarse, although sufficient for screening analysis.
- Predicts potential rather than actual stream quality.
- Does not predict the precise score of an individual stream quality indicator but rather predicts the average behavior of a group of indicators over a range of impervious cover.
- The 10 and 25 % thresholds are approximate transitions rather than sharp breakpoints.
- The ICM has not been validated for lakes, reservoirs, aguifers, and estuaries.
- Does not currently predict the impact of watershed best management practices (treatment or non-structural controls).
- Does not consider the geographic distribution of the impervious cover relative to the streams and receiving waters. Effective impervious cover (impervious cover that is hydraulically connected to the drainage system) has been recommended as a better metric, although determining effective impervious cover requires extensive and often subjective judgment as to whether it is connected or not.
- Impervious cover is a more robust and reliable indicator of overall stream quality beyond the 10 percent threshold. The influence of impervious cover on stream quality is relatively weak compared to other potential watershed factors such as percent forest cover, riparian community, historical land use, soils, agriculture, etc. for impervious cover less than 10 percent.



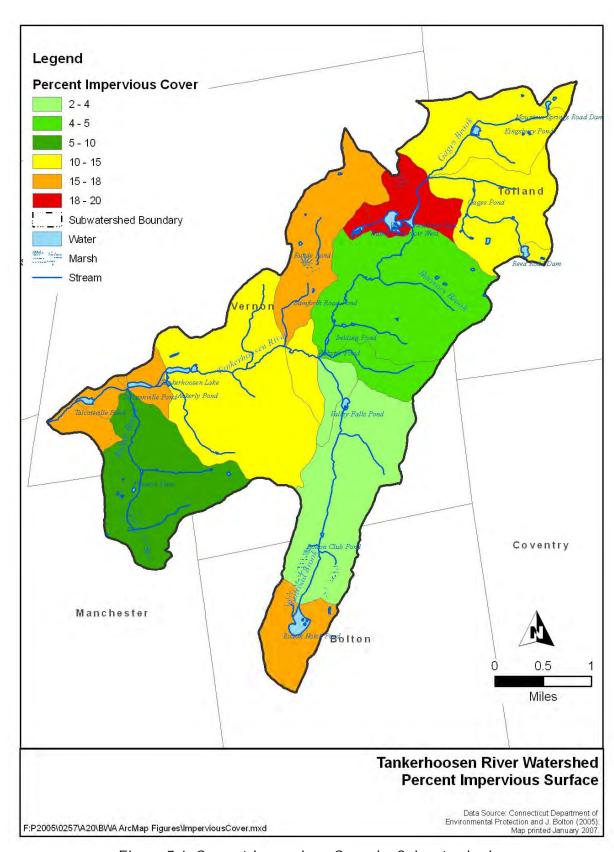
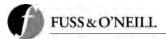


Figure 7-6: Current Impervious Cover by Subwatershed



7.2 Future Conditions

A watershed buildout analysis was also conducted as part of this assessment to assist in the identification of subwatersheds with the highest restoration potential as well as the greatest vulnerability. The purpose of the analysis is to estimate the future land use and impervious cover conditions of the watershed as a result of maximum development allowed by the current zoning within the watershed.

7.2.1 Land Use

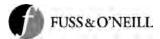
Watershed lands that could be developed in the future (i.e., "developable" land) were subdivided into two categories, based on the CRCOG parcel-based land use data:

- New Development areas that are currently undeveloped and could become new developments in the future. Land designated as "new development" includes those parcels that are designated as "undeveloped" and "resource/recreation" in the CROCG land use data and not identified as committed open space.
- Redevelopment areas that are currently underdeveloped and could be redeveloped
 with a higher intensity land use in the future. Land designated for "redevelopment"
 were limited to single-family residential parcels in the CRCOG land use data that could
 be subdivided and/or redeveloped in the future.

Areas having the following physical and/or regulatory constraints were also removed from consideration for future development or redevelopment: water bodies, wetland soils, and soils whose slope characteristics defined by NRCS exceed 15% (i.e., steep slope soils). Resulting fragments of land smaller than ¼-acre in size for new development and 3 acres in size for redevelopment were also removed from the analysis. <u>Table 7-6</u> and <u>Figure 7-7</u> summarize the amount of developable land by subwatershed, including the new development and redevelopment categories.

Table 7-6: Developable Land — Tankerhoosen Watershed

Subwatershed	New Development (acres)	New Development Percent in Subwatershed	Redevelopment (acres)	Redevelopment Percent in Subwatershed
Bolton Notch Pond	49	14.3 %	11	3.2 %
Clarks Brook	57	8.8 %	52	8.1 %
Gages Brook	129	18.5 %	72	10.3 %
Gages Brook South Tributary	123	18.1 %	102	15.0 %
Lower Tankerhoosen River	91	28.5 %	17	5.4 %
Middle Tankerhoosen River	127	8.0 %	141	8.9 %
Railroad Brook	212	17.6 %	172	14.3 %
Tucker Brook	122	13.1 %	89	9.5 %
Upper Tankerhoosen River	238	16.1 %	150	10.2 %
Walker Reservoir	108	31.3 %	13	3.8 %
Total	1257	15.3 %	820	10.0 %



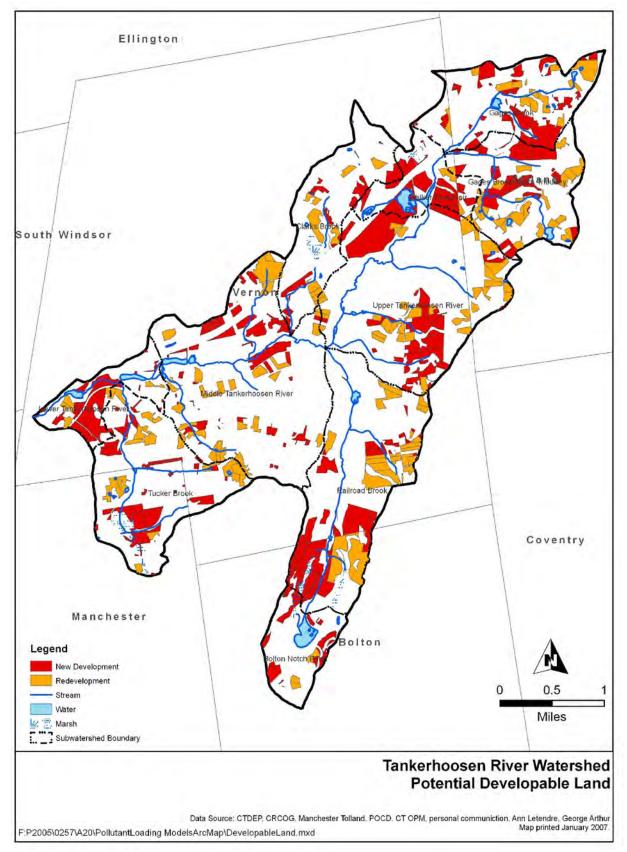


Figure 7-7: Developable Land — Tankerhoosen River Watershed



The future land use buildout scenario was estimated by assigning new land uses to developable areas (See Section 7.2.1), while maintaining the existing land uses for developed and unbuildable land (wetland soils, steep slope soils, etc.). The developable areas were assigned a future land use based on maximum degree of development allowed by the existing zoning category. Table 7-7 presents the future land use category assigned to each developable parcel based on the zoning category. This analysis assumes development of Act 490 parcels consistent with the underlying zoning and does not account for future zone changes or future land development regulatory changes.

Table 7-7: Assigned Future Land Use Category

Zoning Category	Assigned Future Land Use
1-3 Unit Residential, High Density	Condominium
1-3 Unit Residential, Medium Density	Three Family
1-3 Unit Residential, Medium-Low Density	Two Family
1-3 Unit Residential, Low Density	One Family
Cluster/Open Space Residential	One-Family
Industrial	Industrial
Multi-Family	Multi-Family
Planned Area Development Including Residential	Mixed Use
Planned Industrial	Industrial
Planned Residential	Multi-Family
Town Center	Mixed Use
Town Scale Commercial	Commercial

The results of the buildout analysis are summarized in <u>Table 7-8</u>, which compares acreage of existing and future land use in the watershed. The most significant potential land use change is in the residential land use categories, which is predicted to increase by approximately 15% watershed-wide. The area of resource/recreation and undeveloped land is predicted to decrease by approximately 15% watershed-wide, while commercial and industrial land are predicted to increase by approximately 3%.

Table 7-8: Existing and Future Land Use — Tankerhoosen Watershed

Land Use Type	Acresexisting	Percent of Basin _{Existing}	Acres _{Future}	Percent of Basin _{Future}	Relative Percent Change
Agriculture	103	1 %	89	1 %	0
One Family	3160	38 %	3415	42 %	4%
Two Family	48	<1 %	811	10 %	10%
Three Family	2	<1 %	3	<1 %	0
Multi Family	39	<1 %	60	1 %	1%
Condominium	165	2 %	177	2 %	0
Group Quarters	12	<1 %	12	<1 %	0
Commercial	110	1 %	206	3 %	2%
Retail	88	1 %	88	1 %	0
Mixed Use	3	<1 %	33	<1 %	0
Industrial	183	2 %	270	3 %	1%



Land Use Type	Acresexisting	Percent of Basin _{Existing}	Acres _{Future}	Percent of Basin _{Future}	Relative Percent Change
Government/Non-Profit	102	1 %	102	1 %	0
School	26	<1 %	26	<1 %	0
Cemetery	22	<1 %	14	<1 %	0
Health/Medical	6	<1 %	6	<1 %	0
Resource/Recreation	2398	29 %	1787	22 %	-7%
Undeveloped	851	10 %	233	3 %	-7%
Right-of-way	770	9 %	770	9 %	0
Water	77	<1 %	77	<1 %	0
Unknown	61	<1 %	46	<1 %	0

7.2.2 Impervious Cover

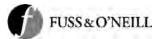
The watershed buildout analysis was used in conjunction with the existing conditions impervious cover analysis (Section 7.1.3) to estimate future impervious cover in the Tankerhoosen River subwatersheds. To complete this analysis, impervious cover was included as a parameter in the pollutant load model described in Section 8.1. Each urban land use type was assigned an impervious cover coefficient based on literature values (see Table 2 in Appendix B). Land use data for both existing and buildout conditions were then entered into the model to determine the change in impervious cover for each subwatershed. The predicted change in impervious cover was then added to the existing impervious cover estimates described in Section 7.1.3 to estimate future impervious cover.

<u>Table 7-9</u> presents estimates of existing and future impervious cover (<u>Figure 7-8</u>) by subwatershed. The shaded cells in the table highlight the subwatersheds in which future impervious cover is predicted to approach or exceed either the "sensitive" (10% to 12%) or "impacted" (25%) threshold values as described by the Impervious Cover Model.

Table 7-9: Percent Impervious Cover – Existing and Future Conditions

Subwatershed	Existing Percent Impervious Cover	Future Percent Impervious Cover	Percent Change (ICFuture — ICExisting)
Bolton Notch Pond	16.6 %	18.9 %	2.3 %
Clarks Brook	17.2 %	20.6 %	3.4 %
Gages Brook	11.5 %	14.2 %	2.7 %
Gages Brook South Tributary	11.3 %	13.5 %	2.2 %
Lower Tankerhoosen River	15.8 %	23.0 %	7.2 %
Middle Tankerhoosen River	12.9 %	15.5 %	2.6 %
Railroad Brook	1.7 %	3.4 %	1.7 %
Tucker Brook	8.1 %	10.3 %	2.2 %
Upper Tankerhoosen River	4.5 %	4.7 %	0.2 %
Walker Reservoir	19.9 %	29.13 %	9.2 %
Total	9.87 %	12.47 %	2.6 %

It is significant to note that, based on this analysis, the overall impervious cover in the Tankerhoosen River watershed is predicted to increase from less than 10% to greater than



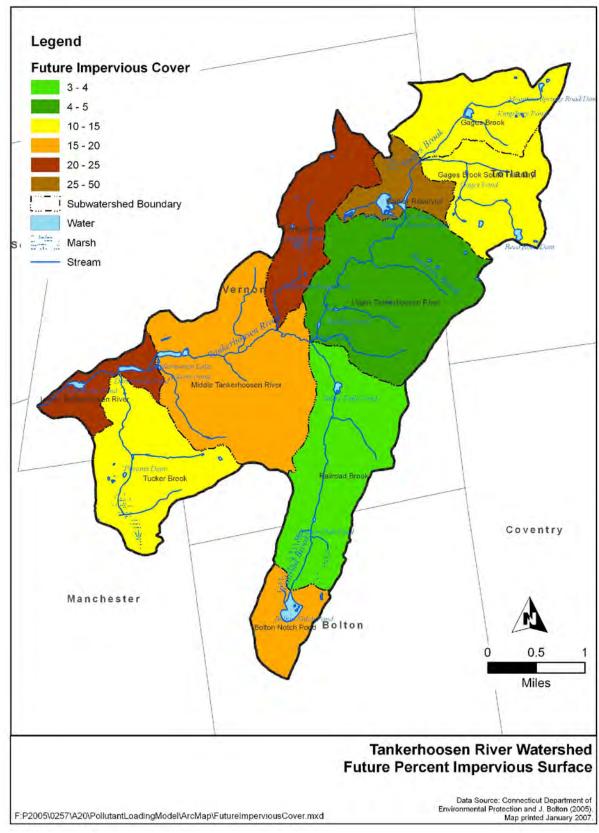


Figure 7-8: Future Impervious Cover — Tankerhoosen River Watershed



12%, which is considered impacted (see <u>Figure 7-5</u>). The largest change in impervious cover is predicted in the Walker Reservoir subwatershed, where imperviousness could increase from approximately 20%, or "impacted," to approximately 29%, or "non-supporting." Additionally, the impervious cover in Gages Brook and the associated Gages Brook South Tributary subwatersheds, both of which are important headwater streams, is predicted to cross the statewide 12% sensitive threshold value.

Another useful metric was developed by Goetz et al. (2003) for the Chesapeake Bay region, which combines subwatershed impervious cover and tree cover within the 100-foot stream buffer. Each of the subwatersheds within the Tankerhoosen River Basin was analyzed with regard to the combined impervious cover/riparian zone metric, which is summarized in the following matrix by Goetz et al. (2003).

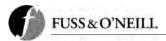
Stream Health	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer
Excellent	< = 6%	>=65%
Good	6-10%	60-65%
Fair	10-25%	40-60%
Poor	> 25%	<40%

Natural vegetation was determined using the CLEAR land cover data and included the deciduous forest, coniferous forest, forested wetland, and non-forested wetland categories. The following table presents the results from the combined impervious cover/riparian zone metric.

Table 7-10: Impervious Cover/Riparian Zone Metric – Existing and Future Conditions

	Exis	ting	Fut	ure
Subwatershed	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer
Bolton Notch Pond	16.6 %	40.4 %	18.9 %	39.8 %
Clarks Brook	17.2 %	51.9 %	20.6 %	38.0 %
Gages Brook	11.5 %	59.5 %	14.2 %	50.1 %
Gages Brook South Tributary	11.3 %	69.6%	13.5 %	40.2 %
Lower Tankerhoosen River	15.8 %	42.7 %	23.0 %	26.0 %
Middle Tankerhoosen River	12.9 %	49.7 %	15.5 %	41.8 %
Railroad Brook	1.7 %	89.4 %	3.4 %	73.7 %
Tucker Brook	8.1 %	65.5 %	10.3 %	49.6 %
Upper Tankerhoosen River	4.5 %	84.6 %	4.7 %	76.3%
Walker Reservoir	19.9 %	41.2 %	29.13 %	31.8 %

Overall, most of the Tankerhoosen River subwatersheds are currently categorized as "fair" to "good" based on the riparian zone metric published by Goetz et al. (2003), while several of the



key headwater streams, including Railroad Brook and the Upper Tankerhoosen River, fall into the highest category. Comparison between the existing and future ratings indicates that four of the ten subwatersheds (Clarks Brook, Gages Brook South Tributary, Lower Tankerhoosen River, and Tucker Brook) are predicted to experience a decline in stream health as a result of future development and, in particular, development within the riparian corridor.

8.0 POLLUTANT LOADING

A pollutant loading model was developed using the land use/land cover data described in <u>Section 7.0</u>. The model was used to compare existing nonpoint source (NPS) pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario. It is important to note that the results of this screening-level analysis are intended for the purposes of comparing existing and future conditions and not to predict future water quality. This section summarizes the methods and results of the analysis, which are presented in greater detail in <u>Appendix B</u>.

The Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), Version 4.0, was used for this analysis. This model was developed for US EPA by Tetra Tech in EPA Region 5 and has since been modified for use in other areas of the country. The model calculates watershed pollutant loads for sediment and nutrients based on land use-related pollutant sources, including urban runoff, septic system failures, stream bank erosion, and agricultural activities. The model also allows simulation of best management practices (BMPs) and Low Impact Development (LID) practices to reduce pollutant loads.

Data obtained as part of the Land Use/Land Cover analysis presented in <u>Section 7.0</u> were used to generate model inputs. Several other model parameters were specified for each pollutant and subwatershed, including:

- Event Mean Concentrations (EMCs), which are literature values for the mean concentration of a pollutant in stormwater runoff for each land use, and
- Curve Number (CN), which is a measure of the runoff potential of the land surface and is a function of soil type, cover condition, and slope.

The model was applied to each subwatershed to estimate pollutant loads for each subwatershed under existing land use and future land use scenarios, as described in <u>Section 7.0</u>. The existing and future pollutant loads were compared to assess anticipated changes in loads for each subwatershed. <u>Table 8-1</u> presents the results of this analysis. Results are shown in terms of increase in pollutant loading rate (the mass of pollutant to be discharged from each acre of land in a watershed) and percent increase in pollutant load (based on the total pollutant discharge from each of the watersheds).

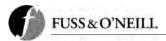


Table 8-1: Projected Pollutant Loading Rate and Load Increases

	Loading Rate Increase (Load Increase per Acre, mass [lb or ton]/ac-yr)					Load Increase (%) (Total for Each Watershed)				
Watershed	N P BOD Sediment					Р	BOD	Sediment		
Bolton Notch Pond (318 ac)	0.66	0.10	2.7	0.012	9.6%	8.0%	10.9%	7.7%		
Clarks Brook (647 ac)	0.91	0.13	3.9	0.017	14.1%	12.9%	16.1%	11.7%		
Gages Brook (695 ac)	1.29	0.19	5.6	0.027	19.4%	17.0%	21.5%	16.7%		
Gages Brook South Tributary (680 ac)	0.73	0.11	3.1	0.014	12.2%	10.2%	14.1%	10.5%		
Lower Tankerhoosen River (306 ac)	1.31	0.10	6.3	0.022	20.0%	8.9%	27.6%	14.7%		
Middle Tankerhoosen River (1570 ac)	0.63	0.07	3.1	0.008	10.6%	7.6%	14.2%	5.8%		
Railroad Brook (1203 ac)	0.89	0.06	4.3	0.015	56.8%	20.3%	69.8%	46.4%		
Tucker Brook (934 ac)	0.67	0.04	3.3	0.012	14.1%	5.3%	18.0%	9.4%		
Upper Tankerhoosen River (1472 ac)	0.24	0.05	1.1	0.003	9.3%	11.1%	11.2%	6.0%		
Walker Reservoir (322 ac)	1.86	0.28	8.6	0.036	25.8%	23.3%	34.6%	21.6%		
Total (8149 ac)	0.77	0.09	3.5	0.013	16.0%	11.4%	19.9%	12.0%		

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario. These include:

- Gages Brook. The existing conditions pollutant load model indicates that this
 subwatershed is characterized by both relatively high total pollutant loads and pollutant
 loading rates, with approximately 70% urban land use, the largest amount of industrial
 land use, and the second-highest commercial land use composition in the entire
 watershed. The buildout condition of this watershed is projected to result in a 19%
 increase in urban land use with a corresponding decrease in forest; and the new urban
 land is likely to consist of new residential and industrial development. As such,
 relatively large loads and loading rate increases may occur.
- Lower Tankerhoosen River. The existing conditions pollutant load model for this subwatershed predicts relatively small loads (since the watershed area is small) and moderate loading rates. Under a buildout scenario, this subwatershed is projected to result in more than a 20% increase in nitrogen and BOD loads. The resulting loading rates for these parameters are projected to be the second highest of the Tankerhoosen River subwatersheds.
- Railroad Brook. The projected buildout pollutant loadings in this subwatershed for nitrogen and BOD are anticipated to increase by approximately 57% and 70%, respectively. Significant increases are also anticipated in phosphorus and sediment loads. Currently, the Railroad Brook sub watershed is heavily forested, with comparatively little development. Several large tracts of land within this subwatershed are potentially available for future development, especially in Bolton and South Vernon,



- which makes this watershed vulnerable to potentially significant pollutant load increases.
- Walker Reservoir. The existing conditions pollutant loading model suggests that this
 subwatershed has some of the highest levels of pollutant loads within the overall
 Tankerhoosen River watershed. Potential land use changes in this subwatershed include
 significant areas of new residential and mixed-use development, much of which is
 located adjacent to Walker Reservoir. These changes are predicted to result in the
 greatest increases in pollutant loading rates for all of the parameters evaluated.

9.0 COMPARATIVE SUBWATERSHED ANALYSIS

A Comparative Subwatershed Analysis was performed for the Tankerhoosen River subwatersheds to identify the subwatersheds with the greatest vulnerability and restoration potential. Subwatershed "metrics" were used to conduct this analysis. Metrics are numeric values that characterize the relative vulnerability and restoration potential of a subwatershed. The results of this analysis will be used to prioritize field assessment efforts in future phases of this study and to guide plan recommendations.

The analysis involves a screening level evaluation of selected subwatershed metrics that are derived by analyzing available GIS layers and other subwatershed data sources. The basic approach used to conduct the Comparative Subwatershed Analysis consisted of:

- 1. Delineation of subwatershed boundaries and review of available metric data.
- 2. Selection and calculation of metrics that best describe subwatershed vulnerability and restoration potential. (The metrics used to rank subwatershed vulnerability were selected separately from the metrics used to rank subwatershed restoration potential.)
- 3. Developing weighting and scoring rules to assign points to each metric.
- 4. Computing aggregate scores and developing initial subwatershed rankings.

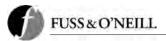
Subwatersheds with higher aggregate "vulnerability" scores are more sensitive to future development and should be the focus of watershed conservation efforts to maintain existing high-quality resources and conditions. Subwatersheds with higher aggregate "restoration potential" scores are more likely to have been impacted and have greater potential for restoration to improve upon existing conditions. This approach enables watershed planners to allocate limited resources on subwatershed where restoration and conservation efforts have the greatest chances of success. The subwatersheds used in this analysis are those identified in Section 5.1 of this document.

The following sections describe the metrics used and the rationale for their selection, how the various metrics were calculated, and the results of the evaluation. Available GIS and other data were used to compute the value of each metric.



Table 9-1: Summary of Subwatershed Vulnerability Metrics

	Τ		T
Subwatershed Metric	How Metric is Measured	Indicates Higher Vulnerability Potential When	Metric Points
1. Impervious Cover Change	% increase in impervious cover in subwatershed	Increase in IC is high, suggesting greater development potential and stream impacts	Award 1 pt for each 1% increase in impervious cover
2. Impervious Cover Threshold	Comparison of current and future IC relative to ICM threshold	Predicted IC crosses "impacted" (12%) threshold, development could result in significant stream impacts	Award 5 pts for each exceedance of the 12% threshold
3. Stream Order	% of subwatershed consisting of 1 st or 2 nd order streams	Subwatershed consists of more lower order streams, vulnerability of headwater streams for habitat and water quality protection	Award 6 pts if 100% of streams are 1st and 2nd order; 4 pts if 50% are 1st and 2nd order; 2 pts if 33% are 1st and 2nd order; 0 pts if 0% are 1st and 2nd order
4. Pollutant Loading	% increase in pollutant loading in subwatershed	Increase in pollutant loading is high, suggesting water quality impacts from future development	Award 1 pt for each pollutant loading parameter > 10% and 3 pts for each parameter > 20%
5. Industrial/ Commercial Land	% of subwatershed as industrial or commercial land	Industrial/commercial land is high, greater potential for water quality impacts from pollutant hot spot	Award 1 pt for each 2% of subwatershed classified as industrial or commercial/retail
6. Forest Cover	% of subwatershed with developable forest cover	Area of developable forest cover is high, potential for significant future reductions in forested land	Award 1 pt for each 5% of subwatershed with developable forest cover
7. Stream Corridor Forest Cover	% of stream corridor that is forested	Corridor forest cover is high, potential for significant future reductions in forested riparian areas if public ownership of corridor is low	Add 1 pt for each 10% increase in forest cover
8. Public Ownership of Stream Corridor	% of stream corridor that is publicly owned	Public ownership is low (see metric 7)	Add 1 pt for each 10% reduction of stream corridor in public ownership
9. Road Crossings	number of road crossings / square mile	Number of road crossings is high, greater potential for direct stormwater discharges from roadways	<1 = 0pts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13-15 = 7pt; >15 = 10 pts
10. Developed Areas with Septic	% of subwatershed served by septic	Area served by septic is high, indicating potential for pollutant loadings from failing septic systems	Award 1 pt for each 5% of subwatershed area served by septic
11. Drinking Water Resources	Acreage of developable land within a public drinking water supply area	Area of developable land is high, greater potential for impacts to sensitive surface and groundwater drinking water supplies	Award 3 pts for each subwatershed within an aquifer protection area



9.1 <u>Priority Subwatersheds for Conservation</u>

The results of the subwatershed vulnerability analysis are summarized in <u>Table 9-2</u>.

Table 9-2: Results of Subwatershed Vulnerability Analysis

Subwatershed	Impervious Cover Change	Impervious Cover Threshold	Stream Order	Pollutant Loading	Industrial/ Commercial Land	Developable Forest Cover	Stream Corridor Forest Cover	Public Ownership of Stream Corridor	Road Crossings	Developed Areas Served by Septic	Drinking Water Resources	Total
Bolton Notch Pond	2	10	6	1	7	2	3	3	0	5	0	41
Clarks Brook	3	10	6	4	7	2	5	5	1	4	0	47
Gages Brook	3	5	6	6	11	4	6	6	3	5	0	55
Gages Brook South Tributary	2	5	6	4	1	5	6	5	3	5	0	
Lower Tankerhoosen River	7	10	0	7	2	5	4	5	7	5	0	53
Middle Tankerhoosen River	3	10	2	2	2	2	4	5	3	3	3	38
Railroad Brook	2	0	6	12	0	6	9	0	5	1	0	40
Tucker Brook	2	0	6	2	0	3	5	6	3	2	0	28
Upper Tankerhoosen River	0	0	4	2	0	4	8	3	3	3	0	27
Walker Reservoir	9	10	4	4	2	3	2	5	10	6	0	56

As shown in <u>Table 9-2</u>, the following subwatersheds are considered most vulnerable to future development impacts and should be given highest priority for conservation efforts to maintain existing resource conditions:

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Walker Reservoir.



Table 9-3: Summary of Subwatershed Restoration Potential Metrics

Subwatershed Metric	How Metric is Measured	Indicates Higher Restoration Potential When	Metric Points
 Existing Impervious Cover 	% impervious cover in subwatershed	Current impervious cover is low, suggesting range of possible sites for storage retrofits and stream repairs	<10% = 10 pts; 10 to 15% = 5 pts; >15% = 1 pt
2. Publicly- owned land	% of subwatershed that is publicly owned	Public land ownership is high, providing range of potential sites for restoration practices	Award 1 pt for each 2.5% of subwatershed in public ownership
3. Industrial Land	% of subwatershed that is industrial land	Industrial land is high, suggesting potential for source controls, discharge prevention, and on-site retrofits	Award 1 pt for each 2% of subwatershed classified as industrial
4. Forest Cover	% forest cover in subwatershed	Forest cover is low, suggesting potential for upland and riparian reforestation	<35% = 7pts; 36 to 50% = 5 pts; 50 to 70% = 3 pts; >70% = 1pt
5. Wetland Cover	% of subwatershed that is wetlands	Wetland cover is high, suggesting potential for wetland and riparian restoration	Award 1 pt for each 2% of subwatershed area
6.Development Potential	% of developable land in subwatershed	No more development is expected; stable conditions increase feasibility of stream repairs and storage retrofits	30 to 35% = 1pts; 25 to 30% = 4 pts; 20 to 25% = 7 pts; 15 to 25% = 10pt
7. Stream Density	stream miles / square mile	Stream density is high, suggesting greater feasibility of corridor practices	Award 1 pt for each 10% increase in stream density from watershed average of 1.3 stream miles / square mile
8. Stream Corridor Forest Cover	% of stream corridor that is forested	Corridor forest cover is low, suggesting feasibility of riparian reforestation and stream repairs	Add 1 pt for each 10% reduction in forest cover
9. Public Ownership of Corridor	% of stream corridor that is publicly owned	Public corridor ownership is high, suggesting greater feasibility of corridor practices	Add 1 pt for each 10% of stream corridor in public ownership
10. Road Crossings	number of road crossings / square mile	Number of road crossings is high, suggesting greater potential for stream repairs, culvert modifications	<1 = 0pts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13-15 = 7pt; >15 = 10 pts
11. Developed Areas with Septic	% of subwatershed that is served by septic	Area served by septic is high, suggesting greater potential for septic system upgrades	Award 1 pt for each 5% of subwatershed area served by septic
12. Water Quality Impairments	number of water quality impairments / square mile	Number of water quality impairments is high, suggesting regulatory need to focus on WQ improvements	Award 3 pts for each water quality impairment identified



9.2 <u>Priority Subwatersheds for Restoration</u>

The results of the subwatershed restoration potential analysis are summarized in <u>Table 9-4</u>.

Table 9-4: Results of Subwatershed Restoration Potential Analysis

Table 7 4. Results of Subwatershed Restoration 1 oteritial Arialysis													
Subwatershed	Existing Impervious Cover	Publicly-owned Land	Industrial Land	Forest Cover	Wetland Cover	Development Potential	Stream Density	Stream Corridor Forest Cover	Public Ownership of Stream Corridor	Road Crossings	Developed Areas Served by Septic	Water Quality Impairments	Total
Bolton Notch Pond	1	1	1	5	3	10	0	6	6	0	5	0	38
Clarks Brook	1	10	5	7	8	10	0	4	11	1	4	0	60
Gages Brook	5	12	6	5	8	4	10	3	12	3	5	6	79
Gages Brook South Tributary	5	3	0	3	3	1	14	2	9	3	5	9	57
Lower Tankerhoosen River	1	6	1	5	1	1	15	5	11	7	5	6	64
Middle Tankerhoosen River	5	6	1	5	6	10	5	5	10	5	3	0	61
Railroad Brook	10	0	0	1	6	1	9	0	0	5	1	0	34
Tucker Brook	10	10	0	5	6	7	11	4	11	1	2	0	66
Upper Tankerhoosen River	10	3	0	1	7	4	12	1	6	3	3	3	52
Walker Reservoir	1	10	1	7	4	1	0	7	9	10	6	0	55

As shown in <u>Table 9-4</u>, the following subwatersheds should be given highest priority for restoration potential to improve upon existing conditions:

- Clarks Brook,
- Gages Brook,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook.

Based on the CSA results, the following subwatersheds are recommended for detailed assessment and planning:

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook,
- Walker Reservoir.



10.0 REFERENCES

Baystate Environmental Consultants, Inc. (2004). Watershed Management Plan for Tankerhoosen Lake.

Bell, M. (1985). *The Face of Connecticut*. Connecticut Geological and Natural History Survey of Connecticut. Bulletin 110. Hartford, Connecticut.

Center for Land Use Education and Research (2007) *The Status of Connecticut's Coast Riparian Corridors: Research Summary.*

Civco, D. (2005). *Hockanum River Watershed Percent Imperviousness by Basin.* Department of Natural Resources Management and Engineering at the University of Connecticut. GIS Map prepared by J. Bolton. March 2005.

Comins, Patrick (1999). Breeding Landbird Survey Freja Park/Bolton Notch State Park. Town of Bolton Conservation Commission.

Connecticut Department of Environmental Protection. (2002). Surface Water Quality Standards (Effective December 17, 2002). Ground Water Quality Standards (Effective April 12, 1996).

Connecticut Department of Environmental Protection (2006). 2006 Listing of Connecticut Waterbodies Not Meeting Water Quality Standards.

Connecticut Ecosystems, LLC (August 2005). Town of Vernon Vernal Pool Study.

Connecticut River Watch Program (May 2000). *Hockanum River Stream Walk Summary Report*. Middletown, Connecticut.

Connecticut River Watch Program (September 2001). *Hockanum River Stream Walk Summary Report*. Middletown, Connecticut.

Connecticut River Watch Program (May 2004). *Hockanum River Rapid Bioassessment Summary Report*. Middletown, Connecticut.

Connecticut River Watch Program (March 2005). *Hockanum River Rapid Bioassessmet Summary Report.* Middletown, Connecticut.

Fuss & O'Neill, Inc. (2005). *The Hockanum River State of the Watershed Report*. Prepared for the North Central Conservation District, Inc. December 2005.

Fuss & O'Neill, Inc. (2007). *Tankerhoosen River Watershed Water Quality Monitoring Study.*Prepared for the Friends of the Hockanum River Linear Park of Vernon, Inc. March 2007.

Gibbons, J. and Gibbons, G. (1992). *The Coginchaug River Greenway — Proposed Management Plan.* University of Connecticut Cooperative Extension System. Haddam, Connecticut.



Goetz, S.J., R.K. Wright, A.J. Smith, E. Zineckerb and E. Schaubb. 2003. *IKONOS imagery for resource management: Tree cover, impervious surfaces, and riparian buffer analyses in the mid-Atlantic region.* Remote Sensing of Environment 88 (2003) 195 208.

NQQD (2004). Findings from the National Stormwater Quality Database, Research Progress Report. Prepared by the Center for Watershed Protection.

Nationwide Urban Runoff Program (1983). *Results of the Nationwide Urban Runoff Program.* U.S. Environmental Protection Agency Water Planning Division, PB 84-185552, Washington, D.C.

Prisloe, Michael, Emily Hoffhine Wilson, Chester Arnold (2003). *Refinement of Population-Calibrated Land-Cover-Specific Impervious Surface Coefficients for Connecticut.* Final Report, DEP Project 01-08 Task #6. University of Connecticut Middlesex County Extension Center, Haddam, CT. Accessed at http://www.nemo.uconn.edu/tools/impervious_surfaces/literature.htm on March 12, 2008.

Sexton, Karen (1993). Vascular Plant Inventory of the Valley Falls/Bolton Notch Watershed.

Seymour, Jane and Friends of the Hockanum River Linear Park of Vernon, Inc. (2004). Wildlife Surveys at Selected Locations within the Tankershoosen Watershed. Vernon, Connecticut.

Sleavin, William J., Daniel L. Civco, Sandy Prisloe, Laurie Giannotti, (2000). *Measuring Impervious Surfaces for Non-Point Source Pollutant Modeling.* Proceedings of the 2000 ASPRS Annual Convention. Accessed at http://www.nemo.uconn.edu/tools/impervious_surfaces/literature.htm on March 12, 2008.

Tetra Tech., Inc. *Spreadsheet Tool for the Estimation of Pollutant Load (STEPL). Version 4.0.* Developed for the U.S. EPA

United States Environmental Protection Agency (EPA). 2005. Waste Cleanup & Reuse in New England: Precision Plating Corp. URL: www.epa.gov/region1/superfund/sites/precision.

University of Connecticut Center for Land Use Education and Research (CLEAR). Connecticut's Changing Landscape — Statewide Land Cover. URL: www.clear.uconn.edu/projects/landscape/statewide_landcover.htm.

Watershed Treatment Model (2001). Watershed Treatment Model User's Guide - Version 3.1. Prepared by the Center for Watershed Protection.



APPENDIX A

SPECIES LIST BELDING WILDLIFE MANAGEMENT AREA

APPENDIX A

FLORA OF BELDING WMA.

Club Mosses

<u>Club-moss family</u> (Lycopodiaceae) Tree club moss (*Lycopodium obscurum*) The state of the s

the beautiful to the same of t

Star Michael Charles and Carlot and Alexander

Burker Burk Berk Burk Berk Berk Berk

era in the property of the second section of the section of the sec

ordino trattica i control segment grapi di control Control se contra control segmenta di control di control segmenta di control di control di control di control

Committee of the State of State of

This form, being stone it is a real

t englisher tid grade tid selection of the leaf tid. The leaf tid selection is the leaf tid.

Caracter Control of Caracter C

a produce in the second of the

19. 海海滨水道12. 第一五次 ×

and the second

the resignation of the state of the

The second of the second of the

1、大型大型 (40.1 m) 1. 数14 (1.1 m) 1. (1.1 m) 1. (1.1 m)

AND THE STATE OF T

Charles the Carlotter than the Carlot

CHARLES WINDOWS AND SHOP

The Committee of the Same Sager

The American Street, and the Committee of

Ferns

Bracken Fern Family (Dennstaedtiaceae)
Hay-scented fern (Dennstaedtia punctilobula)
Bracken fern (Pteridium aquilinum)

Wood fern family (Dryopteridaceae)
Sensitive fern (Onoclea sensibilis)
Spinulose wood fern (Dryopteris spinulosa)
Christmas fern (Polystichum acrosticoides)
Rock polypody (Polypodium virginianum)

Royal fern family (Osmundaceae) Cinnamon fern (Osmunda cinnamomea) Interrupted fern (Osmunda claytoniana) Royal fern (Osmunda regalis)

Maidenhair Fern family (Pteridaceae)
Maidenhair fern (Adiantum pedatum)

<u>Marsh Fern family</u> (Thelypteridaceae) New York fern (*Thelypteris noveboracensis*)

Gymnosperms

Pine family (Pinaceae)
Eastern white pine (Pinus strobes)
Eastern red cedar (Juniperus virginiana)
Red pine (Pinus resinosa)
Pitch pine (Pinus rigida)
Eastern hemlock (Tsuga Canadensis)
Norway spruce (Picea abies)

Angiosperms (Flowering plants)

Magnolia family (Magnoliaceae)
Tulip tree (*Liriodendron tulipifera*)

<u>Laurel family</u> (Lauraceae) Northern spicebush (*Lindera benzoin*) Sassafras (*Sassafras albidum*)

Barberry family (Berberidaceae)

Japanese barberry (Berberis thunbergii)

Buttercup family (Ranunculaceae)

Wood anemone (Anemone quinquefolia)

Rue anemone(Thalictrum thalictroides)

Goldthread (Coptis groenlandica)

Kidneyleaf buttercup (Ranunculus abortivus)

American pokeweed (Phytolacca Americana)

Buckwheat family (Polygonaceae)

Arrow-leaf tearthumb (Polygonum sagittatum)

Witch-hazel family (Hamamelidaceae)

Witchhazel (Hamamelis virginiana)

Plane-tree family (Plantanaceae)

American sycamore (Platanus occidentalis)

Beech family (Fagaceae)

Black oak (Quercus velutina)

Red oak (Quercus rubra)

White oak (Quercus alba)

Scarlet oak (Quercus coccinea)

American chestnut (Castanea dentata)

American beech (Fagus grandifolia)

Birch family (Betulaceae)

Speckled alder (Alnus rugosa)

Black birch (Betula lenta)

Gray birch (Betula populifolia)

Paper birch (Betula papyrifera)

Yellow birch (Betula alleghaniensis)

Bayberry family (Myricaceae)

Sweetfern (Comptonia peregrina)

Walnut family (Juglandaceae)

Pignut hickory (Carya glabra)

Shagbark hickory (Carya ovata)

(Hypericaceae)

St. John's wort (hypericum perforatum)

Wintergreen family (Pyrolaceae)

Shinleaf (Pyrola elliptica)

Spotted wintergreen (Chimaphila maculata)

Indianpipe (Monotropa uniflora) Pinesap (Monotropa hypopithys)

Heath family (Ericaceae)

Eastern teaberry (Gaultheria procumbens)
Black huckleberry (Gaylussacia baccata)
Mountain laurel (Kalmia angustifolium)
Pinxter flower (Rhododendron nudiflorum)
Highbush blueberry (Vaccinium corymbosum)

And the second s

And the second of the second o

and the second of the second o

والمراجع والم

 $((x,y)_{t},y)_{t}\in \mathcal{I}(X_{t},y)_{t}\mapsto ((x,y)_{t},y)_{t}$

Control of the state of the sta

Andrew Committee

and the second section of the second section is a second section of the second section of the second section of the second section is a second section of the second section section is a second section of the second section section is a second section of the second section secti

and the second of the second s

Company of the Company

and the second of the second o

gradient in de la company de la company de la company de la company de la company de la company de la company

The second of the second of the second

Appropriate the contract of the second section of the second

Market (1997) of the Application of the Section of

en la reconstrucción de la construcción de la const

Lowbush blueberry (Vaccimium angustifolium)

Primrose family (Primulaceae)

Starflower (Trientalis borealis)

Whorled loosestrife (Lysimachia quadrifolia)

Violet family (Violaceae)

Common blue violet (*Viola papilionaceae*)
Northern white violet (*Viola pallens*)
Sweet white violet (*Viola blanda*)
Field violet (*Viola arvensis*)

Willow family (Salicaceae)

Quaking aspen (Populus tremuloides)

<u>Cucumber family</u> (Cucurbitaceae) Bur cucumber (echinocystis lobata)

Elm family (Ulmaceae)

American elm (Ulmus americana)

Rose family (Rosaceae)

White meadowsweet (Siriea latifolia)

Steeplebush (Spirea tomentosa)

Blackberry (Rubus allegheniensis)

Raspberry (Rubus occidentalis)

Multiflora Rose (Rosa multiflora)

Strawberry (Fragaria virginiana)

Black cherry (Prunus serotina)

Apple (Prunus malus)

Pea family

Hop clover (*Trifolium aureum*) Red clover (*Trifolium pretense*) Cow vetch (*Viccia cracca*)

Maple family

Sugar maple (Acer saccharum)
Red maple (Acer rubrum)

<u>Cashew family</u> (Anacardiaceae)

Staghorn sumac (Rhus typhina)

Poison ivy (Toxicodendron radicans)

<u>Touch-me-not Family</u> (Balsaminaceae)

Spotted touch-me-not (*Impatiens capensis*)

Milkwort family (Polygalaceae)

Fringed polygala (Polygala paucifolia)

Field milkwort (Polygala sanguinea)

Staff-tree family (Celastraceae)

Winged euonymus (Euonymus alatus)

Asiatic bittersweet (Celastrus orbiculatus)

Holly family (Aguifoliaceae)

Winterberry (*Ilex verticillata*)

Oleaster family (Eleagnaceae)

Autumn olive (*Eleagnus umbellate*)

Russian olive (*Eleagnus angustifolium*)

Grape family (Vitaceae)

Virginia creeper (Parthenocissus quinquefolia)

Fox Grape (Vitis labrusca)

Dogwood family (Cornaceae)

Silky dogwood (Cornus amomum)

Ginseng family (Araliaceae)

Ginseng (Panax quinquefolium)

Dwarf ginseng (Panax trifolium)

Carrot family (Apiaceae)

Queen Anne's Lace (Daucus carota)

Honeysuckle family (Caprifoliaceae)

Tartarian Honeysuckle (Lonicera tatarica)

Elderberry (Sambucus canadensis)

Maple-leaved viburnum (Viburnum acerifolium)

Arrowwood (Viburnum dentatum)

Aster family (Asteraceae)

Yarrow (Achillea millefolium)

New York Aster (Aster novi-belgii)

Oxeye daisy (Chrysanthemum lleucanthemum)

Bull thistle (Cirsium vulgare)

Joe-Pye weed (Eupatorium maculata) Black-eyed Susan (*Rudbeckia hirta*) Rough-stemmed goldenrod (Solidaga rugosa) Contraction of the section of the Common dandelion (Taraxacum officinale) Pineapple weed (Matricaria matricarioides) Horseweed (Erigeron canadensis) Barrier Barrie Bedstraw family (Rubiaceae) Contract the second of the Contract of the Second and the second of the second second Bluets (Houstonia caerulea) Partridgeberry (Mitchella repens) 医环状性 法国际 医皮膜上的骨柱上颌骨 Dogbane family (Apocynaceae) The second of the second Periwinkle (Vinca minor) Common milkweed (Asclepias syriaca) and the second of the second The Control of the State of the State of And the second of the second Nightshade family (Solanaceae) Bittersweet nightshade (Solanum dulcamara) Jimsonweed (Datura stramonium) and arms are stages again Olive family (Oleaceae) But the second of the second of the second of the second White ash (Fraxinus americana) But the second of the second Land the second of the second of the second Figwort family (Scrophulariaceae) and the second of the second o Blue toadflax (Linaria canadensis) Control of the second second second Butter-and-eggs (*Linaria vulgaris*) The same of the same of the same of Monkey flower (Mimulus ringens) A PART OF THE PROPERTY OF THE PROPERTY OF THE PARTY OF TH Common mullein (Verbascum thapsus) Control of the second of the second of the second Thyme-leaved speedwell (Verbascum serpyllifolia) e francisco de la compania de la compania de la compania de la compania de la compania de la compania de la co Mint family (Lamiaceae) Heal-all (Prunella vulgaris) والمعاود والمراجع والمراجع والمراجع والمراجع Wild mint (mentha arvensis) AND STATE OF A SECTION OF THE STATE OF Color of the Color of the Color of the Color Carlot Committee and Committee and Committee Melanthium family (Melanthiaceae) False hellebore (Veratrum nigrum) and the commence of the commen Burney Branch and American Street, and the second Trillium family (Trilliaceae) and the first of the second second Purple trillium (Trillium erectum) The state of the s Nodding trillium (Trillium cernuum) Commence of the second of the Burkey Commission Association and the second second second Lily family (Liliaceae) Canada Mayflower (*Maianthemum canadense*) False Solomon's seal (Smilacina racemosa) The state of the state of the state of Smooth Solomon's seal (*Polygonatum biflorum*) Trout lily (*Erythronium americanum*) and the second of the second of Indian cucumber root (Medeola virginiana)

Catbrier family (Smilaceae)

Greenbrier (Smilax rotundifolia)

Orchid family (Orchidaceae)

Nodding ladies' tresses (Spiranthes cernua)

Pink lady's slipper (Cypripedium acaule)

Rattlesnake plantain (Goodyera pubescens)

Asparagus family (Asparagaceae)

Asparagus (Asparagus officinalis)

Spiderwort family (Commelinaceae)

Asiatic dayflower

Rush family Juncaceae

Canadian rush (Juncus canadensis)

Common rush (Juncus effusus)

Poverty rush (Juncus tenuis)

Sedge family (Cyperaceae)

Yellow nutsedge (Cyperus esculentus)

Fringed sedge (Carex crinita)

Greater bladder sedge (Carex intumescens)

Shallow sedge (Carex lurida)

Pennsylvania sedge (Cares pensylvanica)

Tussock sedge (Carex stricta)

Green bulrush (Scirpus atrovirens)

Wool grass (Scirpus cyperinus)

Panicled bulrush (Scirpus microcarpus)

Fox sedge (Carex vulpinoidea) - Metzler

Grass family (Poaceae)

Orchard grass (Dactylis glomerata)

Crabgrass (Digitaria sanguinalis)

Witch grass (Panicum capillare)

Reed canary grass (*Phalaris arundinaceae*)

Green foxtail (Setaria viridis)

Velvet grass (Holcus lanatus) - Metzler

Timothy (*Phleum pretense*) – Metzler

Cheatgrass (Bromus tectorum) - Metzler

Sweet vernal grass (Anthoxanthum odoratum) - Metzler

Water plantain family Alismataceae

Arrowhead (Sagittaria latifolila)

Arum family (Araceae)

Skunk cabbage (Symplocarpus foetidus)

Jack-in-the-pulpit (Arisaema triphyllum)

<u>Cat-tail family</u> (Typhacea) Common cattail (*Typha latifolia*)

FAUNA OF BELDING W MA.

INVERTEBRATES

Annelids

Earthworm (Oligochaeta)

Leech (Hirudinea)

Crustaceans

Crayfish (Decapoda)

Molluses

Pea clam (Sphaeriidae)

Eastern pearlshell (Margaritifera margaritifera)

Eastern elliptio (Elliptio complanata)

Lymnaid snail (Pseudosuccinea columella)

Planorbid snail (Helisoma)

Insects

Mayflies (Ephemeroptera)

Drunella (Ephemerellidae)

Flat-head mayfly (Heptageniidae:Epeorus)

Stenonema (Heptageniidae)

Baetidae

True flies (Diptera)

Midge (Chironomidae)

Dance fly (Empididae)

Sand fly (*Psychodidae*)

Black fly (Simuliidae)

Crane fly (*Tipulidae*)

Phantom crane fly (Ptychopteridae: Bittacomorpha clavipes)

Stoneflies (Plecoptera)

Chloroperlidae

Glossosomatidae

Nemouridae

Peltoperlidae

Perlidae

Perlodidae

<u>Caddisflies</u> (Trichoptera)

Contract the second section of

The second second second

A SANTA CONTRACTOR SANTA

All the second and the second and the second and the second and the second

and the contract of the contra

Chimarra Hydropsychidae Lepidostoma Limnephilidae Philopotamidae Rhyacophila

Dobsonflies and fishflies (Megloptera)

Corydalus Nigronia

Beetles (Coleoptera)

Predaceous diving beetle (Dytiscidae)

Water beetle (Elmidae)

Water scavenger beetle (Hydrophilidae)

Water penny beetle (Psephenidae)

Scarab beetle (Scarabaeidae)

Green tiger beetle (Cicindela sexguttata)

Burying beetle (Nicrophorus arbicollis)

ODONATA

Damselflies

River jewelwing (Calopteryx maculata)

Ebony jewelwing (Calopteryx aequibilis)

Elegant spreadwing (Lestes inaequalis)

Fragile forktail (Ischnura posita)

Dragonflies

Brown darner (Boyeria vinosa)

Common green darner (Anax junius)

Spangled skimmer (Libellula cyanea)

Yellow-legged meadowhawk (Sympetrum vicinum)

Banded-winged meadowhawk (Sympetrum semicinctum)

Cherry-faced meadowhawk(Sympetrum internum)

Clubtail (Gomphidae)

Lepidoptera

Butterflies

Peck's skipper (*Polites peckius*)

Crossline skipper (*Polites origenes*)

Delaware skipper (*Anatrytone logan*)

Tiger swallowtail (Papilio glaucus)

Spicebush swallowtail (Papilio Troilus)

Cabbage butterfly (Pieris rapae)

Clouded sulphur (Colias philodice)

Small copper (Lycaena phlaeas)

Eastern tailed blue (Everes comyntas)

Spring azure (Celastrina "ladon")

Red-spotted purple (*Limenitis arthemis*)

Great spangled fritillary (Speyeria cybele)

Pearl crescent (*Phyciodes tharos*)

Monarch (Danaus plexippus)

Viceroy (Limenitis archippus)

Moths

Garden tortrix (*Ptycholoma peritana*)

Lesser maple spanworm moth (Itame pustularia)

Blurry chocolate angle (Semiothisa transitaria)

Minor angle (Semiothisa minorata)

Four-spotted angle (Semiothisa quadrinotaria)

White spring moth (Lomographa vestaliata)

Lesser grapevine looper moth (*Eulithis diversilineata*)

Greater grapevine looper moth (Eulithis gracilineata)

Sweetfern geometer (*Cylophora pendulinaria*)

Cross-lined wave (Calothysanis amaturaria)

Red twin spot (*Xanthorhoe ferrugata*)

White-striped black (Trichodezia albovittata)

Brown bark carpet (Horisme intestinata)

Black-rimmed prominent (*Pheosia rimosa*)

Painted lichen moth (*Hypoprepia fucosa*)

Clymene moth (Haploa clymene)

Harnessed moth (Apantesis phalerata)

i) The second of the second Pink-shaded fern moth (Callopistria mollissima)

Copper underwing (Amphipyra pyramidoides)

Common pinkband (Ogdoconta cinereola)

Eight-spotted forester (Alypia octomaculata)

Pink-barred lithacodia (Lithacodia carneola)

Decorated owlet (Pangrapta decoralis)

Spotted grass moth (Rivula propingualis)

American idia (*Idia americalis*)

Common idia (Idia aemula)

Early zanclognatha (Zanclognatha cruralis)

And the second second second second

and the world and the second and the second and the second

A CONTRACTOR OF THE STATE OF THE STATE OF

** • **

A STANCE OF A PARTIES OF A SECTION OF MARKET

de trabajo par la como de espaçõe, trabajo de trabajo

September 1997 - The State of t

TO STATE OF THE ST

The second of the second of the second

Company of a Control of the second

The state of the s

and seeming the

The part of the property of the control of

Morbid owlet (*Chytolita morbidalis*)

Dark-spotted palthis (*Palthis angulalis*)

FISH

American Eel (Anguilla rostrata)

Bluegill (Lepomis macrochirus)

Brook Trout (Salvelinus fontinalis)

Blacknose Dace (Rhinichthys atratulus)

Brown Trout (Salmo trutta)

Chain Pickerel (Esox Niger)

Fallfish (Semotilus corporalis)

Golden Shiner (Notemigonus crysoleucas)

Longnose Dace (Rhinichthys cataractae)

Largemouth Bass (Micropterus salmoides)

Rainbow Trout (Oncorhynchus mykiss)

Tessellated darter (Etheostoma olmstedi)

White Sucker (Catostomus commersoni)

Yellow Perch (Perca flavescens)

AMPHIBIANS

American toad (Bufo americanus)

Gray treefrog (Hyla versicolor)

Northern spring peeper (Pseudacris c. crucifer)

Bullfrog (Rana catesbeiana)

Green frog (Rana clamitans melanota)

Pickerel frog (Rana palustris)

Wood frog (Rana sylvatica)

Northern Redback salamander (Plethodon cinereus)

Spotted salamander (Ambystoma maculatum)

Northern two-lined salamander (Eurycea bislineata)

Red-spotted newt (Notophthalmus v. viridescens)

REPTILES

Painted turtle (Chrysemys picta)

Eastern box turtle (Terrapene c. carolina)

Eastern milk snake (Lampropeltis t. triangulum)

Eastern garter snake (Thamnophis s. sirtalis)

BIRDS

Ciconiiformes

Great Blue Heron (Ardea herodias)

Turkey Vulture (Cathartes aura)

Falconiformes

Red-tailed Hawk (Buteo jamaicensis)

Broad-winged hawk (Butea platypterus)

Cooper's hawk (Accipiter cooperii)

Sharp-shinned hawk (Accipiter striatus)

Gallifomes

Wild Turkey (Meleagris gallopavo)

Charadriiformes

American woodcock (Scolopax minor)

Killdeer (Charadrius vociferus)

Columbiformes

Mourning Dove (Zenaida macroura)

Cuculiformes

Yellow-billed cuckoo (Coccyzus americanus)

Strigiformes

Barred Owl (Strix varia)

Great horned owl (Bubo virginianus)

Apodiformes

Chimney Swift (Chaetura pelagica)

Coraciiformes

Belted Kingfisher (Ceryle alcyon)

Piciformes

Downy Woodpecker (Picoides pubescens)

Hairy woodpecker (Picoides villosus)

Red-bellied Woodpecker (Melanerpes carolinus)

Pileated woodpecker (Dryocopus pileatus)

Yellow-shafted Flicker (Colaptes auratus)

Passeriformes

Tvrannidae

Eastern Wood-Pewee (Contopus virens)

Eastern Phoebe (Sayornis phoebe)

Great Crested Flycatcher (Myiarchus crinitus)

Olive-sided flycatcher (Nuttallornis borealis)

Eastern Kingbird (Tyrannus tyrannus)

Vireonidae

Red-eyed Vireo (Vireo olivaceus)

Warbling Vireo (Vireo gilvus)

Yellow-throated vireo (Vireo flavifrons)

Corvidae

Common raven (Corvus corax)

American Crow (Corvus brachyrhynchos)

Blue Jay (Cyanocitta cristata)

the first are so the side has an e-

And the second of the second second

entre entre en la contraction de la capación de la

医内侧性 医多种性性神经病

the programme of the second second second

And the second second second second

and the second of the second o

the property of the first of the control of the control of the

experience of the second section of the section of the s

Contraction of the State of the Contraction

switch in the self-term and self-term to be a few to

State of the American State of the State of

The second of the second of the second of

and the second of the second and a second of

Control of the Contro

Hirundidae

Tree Swallow (Iridoprocne bicolor)

Barn Swallow (Hirundo rustica)

Paridae

Black-capped Chickadee (Poecile atricapillus)

Tufted Titmouse (Baeolophus bicolor)

Sittidae

Red-breasted Nuthatch (Sitta carolensis)

White-breasted Nuthatch (Sitta Canadensis)

Certhiidae

Brown creeper (Certhia familiaris)

Troglodytidae

Carolina Wren (Thryothorus ludovicianus)

House Wren (Troglodytes aedon)

Turdidae

Eastern Bluebird (Sialia sialis)

Swainson's thrush (Catharus ustulatus)

Veery (Catharus fuscescens)

Wood Thrush (Hylocichla mustelina)

American Robin (Turdus migratorius)

Mimidae

Gray Catbird (Dumetella carolinensis)

Northern Mockingbird (Mimus polyglottos)

Brown Thrasher (Toxostoma rufum)

Bombycillidae

Cedar Waxwing (Bombycilla cedrorum)

Parulidae

Blue-winged Warbler (Vermivora pinus)

Nashville warbler (Vermivora ruficapilla)

Northern parula (Parula americana)

Yellow Warbler (Dendroica petechia)

Chestnut-sided warbler (Dendroica pensylvanica)

Yellow-rumped warbler (Dendroica coronata)

Black-throated green warbler (Dendroica virens)

Pine Warbler (Dendroica pinus)

Prairie warbler (Dendroica discolor)

Palm warbler (Dendroica palmarum)

Blackpoll warbler (Dendroica striata)

Blackburnian warbler (Dendroica fusca)

Cerulean warbler (Dendroica cerulean)

Black-and-white warbler (Mniotilta varia)

American redstart (Setophaga ruticilla)

Ovenbird (Seirus aurocapillus)

Louisiana waterthrush (Seiurus motacilla)

Common Yellowthroat (Geothlypis trichas)

Canada warbler (Wilsonia canadensis)

Thraupidae

Scarlet Tanager (Piranga olivacea)

Emberizidae

Eastern Towhee (Pipilo erythrophthalmus)

Chipping Sparrow (Spizella passerina)

White-throated sparrow (Zonotrichia albicollis)

Song Sparrow (Melospiza melodia)

Dark-eyed junco (Junco hyemalis)

Cardinalidae

Northern Cardinal (Cardinalis cardinalis)

Rose-breasted Grosbeak (Pheucticus ludovicianus)

Indigo Bunting (Passerina cyanea)

Icteridae

Red-winged Blackbird (Agelaius phoeniceus)

Common Grackle (Quiscalus quiscula)

Brown-headed Cowbird (Molothrus ater)

Baltimore Oriole (Icterus galbula)

Fringillidae

American Goldfinch (Carduelis tristis)

MAMMALS

Short-tailed shrew (Blarina brevicauda)

Red-backed vole (Clethrionomys gapperi)

Meadow vole (Microtus pennsylvanicus)

Deer mouse (Peromyscus leucopus)

Jumping mouse (Zapodidae)

Chipmunk (Tamiasciurus hudsonicus)

Gray squirrel (Sciurus carolinensis)

Red squirrel (Tamiasciurus hudsonicus)

Muskrat (Odontra zibethicus)

Porcupine (Erethizon dorsatum)

Eastern cottontail rabbit (Sylvilagus floridanus)

Gray fox (*Urocyon cinereoargenteus*)

Raccoon (Procyon lotor)

Short-tailed weasel (Mustela erminae)

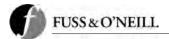
Fisher (Martes pennanti)

Striped skunk (Mephitis mephitis)

White-tailed deer (Odocoileus virginianus)



APPENDIX B POLLUTANT LOADING EVALUATION



Pollutant Loading Analysis Tankerhoosen River Watershed Baseline Assessment

1.0 INTRODUCTION

A pollutant loading analysis was performed for the Tankerhoosen River watershed in support of the Baseline Watershed Assessment to assess the potential for increases in nonpoint source (NPS) pollutant loads. The model was used to compare existing nonpoint source (NPS) pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario. The predicted change in pollutant loadings in each of the subwatersheds was then examined to assess their relative vulnerability to future development.

2.0 MODEL DESCRIPTION

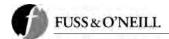
A pollutant loading model was developed using the land use/land cover data described in Section 7.0 of the Baseline Watershed Assessment report (Fuss & O'Neill 2008). The model was used to compare pollutant loadings from the watershed under existing land use conditions to future pollutant loadings under a watershed buildout scenario. It is important to note that the results of this screening-level analysis are intended for the purposes of comparing existing to future conditions and not to predict future water quality.

The Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), Version 4.0, was used for this analysis. This model was developed for US EPA by Tetra Tech in EPA Region 5 and has since been modified for use in other areas of the country. The model calculates watershed pollutant loads based on land use-related pollutant sources, including urban runoff, septic system failures, stream bank erosion, and agricultural activities. The model also allows simulation of best management practices (BMPs) and Low Impact Development (LID) practices to reduce pollutant loads.

The focus of the Tankerhoosen watershed pollutant loading model was future development of presently undeveloped land and re-development of developed land with higher-intensity land uses (See Section 7.2 of Fuss & O'Neill 2008), since these are likely sources of increased pollutant loads. Agricultural NPS pollutant loadings were not considered in the analysis since agricultural land comprises a very small percentage of the land uses within the watershed.

The pollutants modeled in this analysis are the default pollutants contained in the STEPL model: total phosphorus, total nitrogen, biological oxygen demand, and total suspended solids. These pollutants are the major parameters of concern in environmental systems.

Nitrogen and phosphorus are nutrients that promote the growth of algae and plants in water. When this biomass dies and settles to the bottom of water bodies, its decomposition consumes oxygen which is needed by other organisms for survival. Nitrogen is generally present in relatively small quantities compared to other nutrients in salt water systems, such as Long Island Sound, so limiting its concentration limits the growth of algae. In fresh water systems, such as the stream and impoundments in the Tankerhoosen River watershed, phosphorus is the nutrient that is relatively scarce and thus limits algal growth.



Biological oxygen demand (BOD) is a measure of the amount of oxygen that a pollutant consumes as it decomposes (e.g., one pound of BOD consumes one pound of oxygen). A given BOD loading to a water body effectively consumes an equivalent amount of oxygen from that water body, making it unavailable to aquatic organisms.

Total suspended solids (TSS) is a measure of both biodegradable and mineral sediment. Its discharge to a water body results in turbidity and sedimentation. TSS may also have secondary effect; biodegradable TSS exerts a BOD load, and mineral TSS can be associated with particulate phosphorus.

3.0 MODEL PARAMETER SELECTION

STEPL uses algorithms that calculate nutrient and sediment loads from different land uses to determine watershed pollutant loadings. The user specifies several model parameters for each land use in the watershed that are used to estimate runoff quantity and pollutant levels. These parameters include:

- Event Mean Concentrations (EMCs), which are literature values for the mean concentration of a pollutant in stormwater runoff for each land use, and
- Curve Number (CN), which is a measure of the runoff potential of the land surface and is a function of soil type, cover condition, and slope.

The model uses these parameters to estimate the runoff quantity and pollutant loading using data specific to each subwatershed, supplied by the user, as well as default climate data for the subject county. In addition to these parameters, the model includes percent impervious surface values for each land use. As part of this project, the model was modified to accept user-specified impervious surface values for each land use.

A literature review was conducted to determine EMCs values for use in the study. STEPL includes default EMC values for each land use within the watershed. Since comparison between existing and proposed watershed conditions is the focus of this project, EMC values were selected to reflect the relative difference in NPS pollutant characteristics between the existing and future land use. <u>Table 1</u> shows EMC values from several sources for the pollutants of interest.

Table 1. Runoff Event Mean Concentrations (EN	/ICs)
---	-------

			Land Use												
Source	Pollutant	Cropland	Open Space	Commercial	High Density Residential	Institutional	Industrial	Low Density Residential	Forest	Transport	Vacant	Units			
	N	1.9	1.5	2	2.2	1.8	2.5	2.2	0.2	3	1.5	mg/L			
STEPL	Р	0.3	0.15	0.2	0.4	0.3	0.4	0.4	0.1	0.5	0.15	mg/L			
SILFL	BOD	4	4	9.3	10	7.8	9	10	0.5	9.3	4	mg/L			
	TSS	-	70	75	100	67	120	100	-	150	70	mg/L			
NSQD	N*	-	1.2	2.2	2	=	2.1	-	-	2.3	-	mg/L			
	Р	-	0.25	0.22	0.3	-	0.26	-	-	0.25	-	mg/L			
	BOD	-	4.2	11.9	9	-	9	-	-	8	-	mg/L			



						Lar	nd Use					
Source	Pollutant	Cropland	Open Space	Commercial	High Density Residential	Institutional	Industrial	Low Density Residential	Forest	Transport	Vacant	Units
	TSS	-	51	43	48	-	77	-	-	99	-	mg/L
	N*	-	1.5	1.75	2.6	-	-	-	-	-	-	mg/L
NURP	Р	-	0.1	0.201	0.38	-	-	-	-	-	-	mg/L
	BOD	-	-	9.3	10	-	-	-	-	-	-	mg/L
	TSS	-	70	57	101	-	-	-	-	-	-	mg/L
	N*	-	-	2	2	-	-	2	-	2	-	mg/L
VA/TA A	Р	-	-	0.26	0.26	-	-	0.26	-	0.26	-	mg/L
WTM	BOD	-	-			-	-		-		-	mg/L
	TSS	-	-	55	55	-	-	55	-	55	-	mg/L
	N*	-	-	13.7	13.7	-	10.6	10.0	-	-	-	kg/ha/yr
BEC	Р	-	-	2.7	2.7	-	2.6	1.9	-	-	-	kg/ha/yr
DEC	BOD	-	-			-			-	-	-	kg/ha/yr
	TSS	-	-	748.0	748.0	-	802.5	456.0	-	-	-	kg/ha/yr
	N*	1.9	1.5	2.2	2	1.8	2.5	1.8	0.2	3	1.5	mg/L
Selected	Р	0.3	0.15	0.4	0.2	0.3	0.4	0.3	0.1	0.5	0.15	mg/L
Selected	BOD	4	4	10	9.3	7.8	9	7.8	0.5	9.3	4	mg/L
	TSS	-	70	100	75	67	120	67	-	150	70	mg/L

See References for Source Information

The majority of selected values were obtained from STEPL, with adjustments to ensure consistency with other sources. These adjustments include exchanging the multi-family and commercial values, since development included in the multi-family category is assumed to be less intensive in the Tankerhoosen watershed (See Section 4.0) than typical, and since the default commercial sediment EMC value was lower than sediment levels of other less sediment-intensive land uses. Similarly, since the single-family land use category selected for the watershed includes only large lot residential areas, the selected EMCs for these areas were reduced to Institutional land use levels.

As part of this project, the impervious surface coefficients in STEPL were adjusted for use in generating existing and proposed impervious surface estimates. The default factors, literature values for factors, and selected factors are presented in <u>Table 2</u>.

Table 2. Impervious Surface Coefficients

	Imperv	ious Cover Coeff	ficients
Land Use	STEPL	NEMO ¹	Selected
Commercial	0.85	0.205 - 0.557	0.50
Industrial	0.70	0.264 - 0.557	0.40
Institutional	0.50	-	0.30
Transportation	0.95	0.433	0.43
Multi-family	0.75	0.09 - 0.39	0.24
Single-family	0.30	0.065 - 0.12	0.10
Vacant (developed)	0.70	-	0.41
Open Space	0.01	0.001 - 0.094	0.01

¹Sleavin et al. (2000) and Prisloe et al. (2003)



The STEPL model also includes input parameters related to failing septic systems in the watershed. Parameters include the typical population per household and septic system failure rate. Default values were used for the typical population per household and septic system failure rate due to the limited availability of local data.

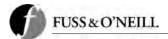
4.0 MODEL INPUT DATA

Land use/land cover data that is described in <u>Section 7.0</u> of the Baseline Watershed Assessment was adapted for integration into the STEPL model. Data was prepared in this manner for both the existing conditions and future conditions (watershed buildout) pollutant loading scenarios. STEPL allows fewer land use categories than contained in the land use/land cover data obtained from other sources, so several data categories were combined for use in the model. <u>Table 3</u> summarizes the assignment of STEPL land use categories for each of the land use/land cover data categories.

Table 3. Source Data - STEPL Category Correlation

Data Category	STEPL Category
Agriculture	Cropland
Cemetery	Open Space (urban)
Commercial	Commercial (urban)
Condominium	Multi-family (urban)
Government/Non-Profit	Institutional (urban)
Group Quarters	Institutional (urban)
Health/Medical	Institutional (urban)
Industrial	Industrial (urban)
Mixed Use	Commercial (urban)
Multi-Family	Multi-family (urban)
One Family	Multi- or Single-family (urban)
Resource/Recreation	Forest
Retail	Commercial (urban)
ROW	Transportation (urban)
School	Institutional (urban)
Three Family	Multi-family (urban)
Two Family	Multi-family (urban)
Undeveloped	Forest
Unknown	Vacant - Developed (urban)
Water	Not Considered

STEPL defines urban land uses differently from agriculture and forest. All urban land uses are lumped into a single land use category, and urban land cover characteristics are distinguished based on land use subcategories, which include commercial, industrial, institutional, transportation, multi-family residential, single-family residential, urban cultivated, vacant (developed), and open space land uses. Since the source land use data included many residential land use categories and STEPL only provides two residential categories, residential uses for all but the largest single-family residential parcels was included in the multi-family category. The Tankerhoosen River watershed has large areas of rural-residential land use with parcel sizes of greater than 2 acres. As such, parcels smaller than two acres were considered to



be high density residential and parcels larger than two acres were considered low density residential. <u>Table 4</u> summarizes the composition of single-family residential land use based on parcel size ranges.

Table 4. Composition of Single-Family Residential Land Use Based on Parcel Size

Watershed	0 - 22k sf	22k sf - 2 ac	2 - 5 acres	> 5 acres
Bolton Notch Pond	3.2%	49.7%	47.1%	0.0%
Clarks Brook	21.4%	36.0%	18.0%	24.6%
Gages Brook	11.4%	37.8%	25.4%	25.4%
Gages Brook South Tributary	0.9%	47.4%	33.6%	18.1%
Lower Tankerhoosen River	21.4%	43.9%	34.4%	0.3%
Middle Tankerhoosen River	13.6%	60.3%	15.7%	10.5%
Railroad Brook	0.2%	45.9%	53.7%	0.2%
Tucker Brook	22.0%	54.4%	11.1%	12.6%
Upper Tankerhoosen River	1.0%	79.9%	18.8%	0.3%
Walker Reservoir	17.0%	43.2%	24.0%	15.7%

Septic system data is also required for the STEPL model. Sewer service area GIS data from Connecticut DEP was used to screen out developed parcels in the Tankerhoosen watershed; parcels located completely outside of mapped sewer service areas were assumed to be served by septic systems. The resulting number of developed parcels without sewer service were divided into residential systems (single-family through multi-family systems) and other developed systems (including condominiums, industrial, commercial, and institutional systems). The residential systems were assumed to have similar characteristics and the other developed systems were assumed to be approximately 5 times the size of the residential systems, on average (this factor was estimated based on the total land area feeding these systems and an estimated intensity of use).

Hydrologic Soil Group (HSG) data are also required by the model. This data, which is available from the U.S. Natural Resource Conservation Service (NRCS), describes the infiltration characteristics of most soils in the county. Identifiers for the soil groups range from Type A soils, including sands and other soils that are very well drained and result in little runoff, to Type D soils, which are poorly drained, often being compacted, having high clay content and high groundwater levels. Soils data were compiled for each subwatershed and assimilated into an average HSG value. Each subwatershed was found to have Type B soil characteristics, on average, with the exception of the Gages Brook subwatershed, which was found to have Type C soil characteristics.

5.0 CURRENT POLLUTANT LOADINGS

5.1 Input

The following land use data were entered into the STEPL spreadsheet to create an existing conditions pollutant loading model. These inputs were reduced form the data presented in Section 7.1 of the Baseline Watershed Assessment. In general, agricultural land use (i.e. cropland) was the least common of the non-urban uses. In most subwatersheds, urban uses dominate, although forests compose more than half of the land area in the Railroad Brook and Upper Tankerhoosen River watersheds.



Table 5. Land Use Input Data

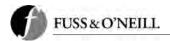
		Land Use A	Area (ac)	Land Use Area Composition			
Watershed	Urban	Cropland	Forest	Total	Urban	Croplan d	Forest
Bolton Notch Pond	183.9	0.0	134.7	318.6	58%	0%	42%
Clarks Brook	533.3	3.6	110.5	647.4	82%	1%	17%
Gages Brook	485.8	28.2	181.5	695.5	70%	4%	26%
Gages Brook South Tributary	491.3	5.7	183.3	680.3	72%	1%	27%
Lower Tankerhoosen River	179.4	0.0	127.1	306.5	59%	0%	41%
Middle Tankerhoosen River	1185.5	22.6	362.4	1570.5	75%	1%	23%
Railroad Brook	377.6	0.0	825.3	1202.8	31%	0%	69%
Tucker Brook	648.8	43.0	241.8	933.5	69%	5%	26%
Upper Tankerhoosen River	519.2	0.0	952.6	1471.9	35%	0%	65%
Walker Reservoir	192.2	0.0	129.8	322.0	60%	0%	40%

<u>Table 6</u> presents the composition of the urban land use areas listed in <u>Table 5</u>. In general, residential land use is the most prevalent in the urbanized areas, although transportation corridors are the predominant urban land use in the Bolton Notch Pond and Lower Tankerhoosen River watersheds, and comprise greater than 20% of urban land use in three of the ten watersheds.

Table 6. Urban Land Use Composition

		Urban Land Use Composition (%)									
Watershed	Com.	Ind.	Inst.	Trans.	Dense Res.	Rural Res.	Vacant	Open Space			
Bolton Notch Pond	25.5	2.1	5.7	29.4	17.6	15.7	4.0	0.0			
Clarks Brook	4.2	11.9	0.3	13.9	49.7	18.6	1.4	0.0			
Gages Brook	13.7	16.7	8.8	7.7	27.5	25.0	0.0	0.6			
Gages Brook South Tributary	2.4	0.0	4.0	19.7	35.4	37.9	0.6	0.0			
Lower Tankerhoosen River	4.3	4.1	9.8	32.6	30.6	14.1	2.0	2.5			
Middle Tankerhoosen River	2.7	1.9	1.8	17.9	55.8	18.5	1.0	0.4			
Railroad Brook	0.0	0.0	0.0	4.5	43.4	50.7	1.4	0.0			
Tucker Brook	0.3	0.0	4.5	11.9	63.9	19.3	0.1	0.0			
Upper Tankerhoosen River	0.0	0.0	0.7	13.6	66.9	15.1	3.3	0.4			
Walker Reservoir	6.3	2.7	0.0	37.8	39.4	11.5	2.3	0.0			

<u>Table 7</u> presents the total estimated number of septic systems in the Tankerhoosen River watershed, determined using the methods described in <u>Section 4.0</u>. Septic systems are assumed to be present at lots not included in or abutting the sewer service area shown in the Baseline Watershed Assessment report. As discussed in <u>Section 4.0</u>, "other" septic systems includes septic systems for land uses other than single-family and multi-family residential land uses, such as condominiums, group quarters, commercial, industrial parcels. These systems are assumed to serve an equivalent population of 5 times a residential system on average. Note that these



septic system estimates and are intended only for estimating increases in NPS pollutant loads and should not be used for other purposes.

Table 7. Estimated Number of Septic Systems

	Number of Septic Systems					
Watershed	Residential	Other	Equivalent Total			
Bolton Notch Pond	43	2	53			
Clarks Brook	108	8	148			
Gages Brook	81	1	86			
Gages Brook South Tributary	236	4	256			
Lower Tankerhoosen River	43	1	48			
Middle Tankerhoosen River	169	7	204			
Railroad Brook	76	0	76			
Tucker Brook	98	0	98			
Upper Tankerhoosen River	198	3	213			
Walker Reservoir	42	2	52			

5.2 Results

<u>Table 8</u> presents total estimated loadings of total nitrogen, total phosphorus, BOD, and TSS for each subwatershed, as well as the loading rate for each subwatershed. In terms of total existing loads, the largest loads of pollutants originate in the Middle Tankerhoosen River, Gages Brook, Gages Brook South Tributary, Clarks Brook, and Tucker Brook subwatersheds. As such, pollutants from these areas are likely to have the largest effect on water quality in the Tankerhoosen River.

Since some of these watersheds are large compared to others, it is useful to look at the data in terms of the loading rate, which is the load of pollutant per unit land area. A high loading rate indicates dense pollutant sources, which suggests that implementation of best management practices (BMPs) in these areas would be more effective in reducing pollutant loads. Pollutant loading rates are relatively uniform between many of the watersheds. Outstanding loading rates include those from Railroad Brook and the Upper Tankerhoosen River, which are significantly lower than rates from other subwatersheds, and those from the Walker Reservoir, which are significantly elevated compared to loads from other subwatersheds. The highlighting in Table 8 identifies subwatersheds with high (orange), moderate (yellow), and low (green) pollutant loadings.

Table 8. Estimated Existing Pollutant Loads

	N	Р	BOD	Sediment	N	Р	BOD	Sediment
Watershed	lb/yr	lb/yr	lb/yr	t/yr	lb/ac-yr	lb/ac-yr	lb/ac-yr	t/ac-yr
Bolton Notch Pond (318 ac)	2175	385	7895	51	6.8	1.2	24.8	0.2
Clarks Brook (647 ac)	4157	669	15686	92	6.4	1.0	24.2	0.1
Gages Brook (695 ac)	4640	787	18084	115	6.7	1.1	26.0	0.2
Gages Brook South Tributary (680 ac)	4062	720	14877	89	6.0	1.1	21.9	0.1
Lower Tankerhoosen River (306 ac)	2009	343	6987	47	6.6	1.1	22.8	0.2



	N	Р	BOD	Sediment	N	Р	BOD	Sediment
Watershed	lb/yr	lb/yr	lb/yr	t/yr	lb/ac-yr	lb/ac-yr	lb/ac-yr	t/ac-yr
Middle Tankerhoosen River (1570 ac)	9364	1473	34764	216	6.0	0.9	22.1	0.1
Railroad Brook (1203 ac)	1890	359	7451	40	1.6	0.3	6.2	0.0
Tucker Brook (934 ac)	4481	699	17014	118	4.8	0.7	18.2	0.1
Upper Tankerhoosen River (1472 ac)	3868	683	14562	82	2.6	0.5	9.9	0.1
Walker Reservoir (322 ac)	2312	390	7965	54	7.2	1.2	24.7	0.2
Total (8149 ac)	38960	6509	145286	903	4.8	0.8	17.8	0.1

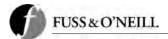
- Bolton Notch Pond. Although this subwatershed is the second smallest in the study area, it is characterized by the second highest nitrogen loading rate, is tied for the highest phosphorus and sediment loading rate, and has the third highest BOD loading rate. These high values reflect the large composition of commercial land use (approximately 26%) and transportation land use (approximately 29%) in the subwatershed.
- Gages Brook. This watershed is characterized by both relatively high total pollutant loads and pollutant loading rates. This watershed is 70% urban land, and has the highest industrial land use composition and second-highest commercial land use composition.
- Middle Tankerhoosen River. This watershed has moderate pollutant loading rates. Although it is the largest subwatershed in the study area, it also has total pollutant loads that are approximately twice as high as those of other large subwatersheds.
- Walker Reservoir. Although the Walker Reservoir subwatershed is similar in size to the Bolton Notch Pond subwatershed, its pollutant loading rates for nitrogen, phosphorus, and sediment are significantly higher. These loading rates reflect the highly urbanized nature of this subwatershed, which also has the highest percentage of transportation land use.

5.3 Discussion

The sources of pollutants in the watershed are generally associated with urban land use, as presented in <u>Table 9</u>. Note that urban areas are estimated to account for between 80% and 95% of the NPS pollutant load in the watershed, although urban uses comprise only 59% of the total watershed land use area (See <u>Table 5</u>)

Table 9. Pollutant Source by Land Use

	NILond	Dlass	BOD	Sediment
Source	N Load	P Load	Load	Load
Urban	91.9%	81.5%	93.1%	88.6%
Cropland	1.9%	2.6%	1.0%	7.8%
Forest	2.3%	6.7%	1.5%	3.6%
Septic	3.9%	9.2%	4.3%	0.0%
Total	100.0%	100.0%	100.0%	100.0%



By subdividing the urban pollutant loads into the distinct urban categories that were included in the model (See <u>Table 10</u>), it is apparent that transportation land use accounts for the largest NPS pollutant loads in the watershed, with higher-density residential use being the second largest source of pollutant loads. Higher-density residential land use is a significant source since it is the predominant land use in the watershed (See <u>Table 6</u>). Transportation use is a significant source since it has the highest pollutant EMCs, and commercial uses are a significant source for the same reason (See <u>Table 1</u>).

BOD BOD Sediment Sediment Urban Land N Load P Load N Load P Load Load Load Load Load Use lb/year lb/year lb/year tons/year % % % % Commercial 2242 408 10191 51 6% 8% 8% 6% Industrial 1898 304 6834 46 5% 6% 5% 6% Institutional 1061 177 4596 20 3% 3% 3% 2% Transportation 17400 2900 53938 435 49% 55% 40% 54% Dense Residential 9890 989 45990 185 28% 19% 34% 23% Rural Residential 2970 495 12871 55 8% 9% 10% 7% Vacant 297 792 1% 1% 1% 1% 30 7 39 Open Space 4 103 0% 0% 0% 0%

Table 10. Pollutant Loads and Sources for Urban Categories

6.0 FUTURE POLLUTANT LOADINGS

6.1 Input

Future land use estimates, presented in <u>Table 11</u>, were used in the STEPL model to simulate a watershed buildout scenario. Also summarized in <u>Table 11</u> is the predicted "increase" in urban land use for each subwatershed. These model inputs were derived form the data presented in <u>Section 7.2</u> of the Baseline Watershed Assessment report. Much of the future developed area in the watershed is currently forested, such that the increase in urban area for each subwatershed includes a corresponding reduction in forested land.

	Lar	nd Use Area	(ac)	Land	Urban		
Watershed	Urban	Cropland	Forest	Urban	Cropland	Forest	Increase
Bolton Notch Pond	233.3	0	85.3	73%	0%	27%	15%
Clarks Brook	590.4	2.4	54.6	91%	0%	8%	9%
Gages Brook	614.4	28.2	52.9	88%	4%	8%	19%
Gages Brook South Tributary	614.3	5.7	60.3	90%	1%	9%	18%
Lower Tankerhoosen River	270.7	0	35.8	88%	0%	12%	30%
Middle Tankerhoosen River	1312.5	10.1	247.9	84%	1%	16%	8%
Railroad Brook	589.9	0	612.9	49%	0%	51%	18%
Tucker Brook	771.2	43.0	119.3	83%	5%	13%	13%
Upper Tankerhoosen River	746.1	0	725.7	51%	0%	49%	15%
Walker Reservoir	296.4	0	25.7	92%	0%	8%	32%

Table 11. Land Use Input Data



<u>Table 12</u> summarizes a break-down of the urban land uses presented in <u>Table 5</u>. Much of the future development and redevelopment is anticipated in areas that are currently zoned for residential uses. As such, residential land use is likely to become a larger percentage of urban land use in many of the subwatersheds.

Table 12. Urban Land Use Composition

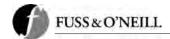
	Urban Land Use Composition (%)							
Watershed	Com.	Ind.	Inst.	Trans.	Dense Res.	Rural Res.	Vacant	Open Space
Bolton Notch Pond	20.2	6.5	4.5	23.2	16.0	26.6	3.1	0.0
Clarks Brook	6.0	15.2	0.3	12.6	57.1	7.6	1.3	0.0
Gages Brook	15.6	16.8	7.0	6.1	23.2	30.8	0.0	0.5
Gages Brook South Tributary	2.6	3.5	3.2	15.7	30.3	44.2	0.5	0.0
Lower Tankerhoosen River	3.5	2.7	6.5	21.6	59.8	2.8	1.3	1.6
Middle Tankerhoosen River	5.9	1.7	1.6	16.1	67.5	6.0	0.9	0.4
Railroad Brook	0.0	0.0	0.0	2.9	86.1	10.1	0.9	0.0
Tucker Brook	0.2	0.0	3.8	10.0	81.5	4.4	0.1	0.0
Upper Tankerhoosen River	0.0	0.0	0.5	9.5	33.9	55.0	0.9	0.3
Walker Reservoir	15.1	3.7	0.0	24.5	36.9	19.8	0.1	0.0

<u>Table 13</u> presents the total estimated number of existing and future septic systems in the Tankerhoosen River watershed, determined using the methods described in <u>Section 4.0</u>. Septic systems are assumed to be present at lots not included in or abutting the sewer service area shown in the Baseline Watershed Assessment report. As discussed in <u>Section 4.0</u>, "other" septic systems includes septic systems for land uses other than single-family and multi-family residential land uses, such as condominiums, group quarters, commercial, industrial parcels. These systems are assumed to serve an equivalent population of 5 times a residential system on average.

Table 13. Estimated Number of Septic Systems

	Existing	Future	Other	Future
	Equivalent	Residential	Future	Equivalent
Watershed	Total	Systems	Systems	Total
Bolton Notch Pond	53	8		61
Clarks Brook	148	3	9	196
Gages Brook	86	5		91
Gages Brook South Tributary	256	14	1	275
Lower Tankerhoosen River	48	4		52
Middle Tankerhoosen River	204	11	9	260
Railroad Brook	76	26		102
Tucker Brook	98	6		104
Upper Tankerhoosen River	213	19		232
Walker Reservoir	52	7	1	64

6.2 Results



<u>Table 14</u> presents projected future pollutant loads under a watershed buildout scenario. An increase in pollutant loads is predicted in all subwatersheds. The Railroad Brook subwatershed is predicted to have the highest increase in nitrogen, BOD, and sediment loads. Large increases are also predicted in nitrogen, phosphorus, and BOD in the Middle Tankerhoosen River subwatershed. The largest phosphorus increases are predicted in the Gages Brook subwatershed.

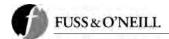
Table 14. Projected Future Pollutant Loads and Load Increases

		Total Future Load			Projected Load Increase			
	Ν	Р	BOD	Sediment	Ν	Р	BOD	Sediment
Watershed	lb/yr	lb/yr	lb/yr	t/yr	lb/yr	lb/yr	lb/yr	t/yr
Bolton Notch Pond (318 ac)	2384	416	8752	54	209	31	857	4
Clarks Brook (647 ac)	4745	756	18205	103	588	87	2519	11
Gages Brook (695 ac)	5538	921	21973	134	898	134	3888	19
Gages Brook South Tributary (680 ac)	4559	793	16976	98	497	73	2099	9
Lower Tankerhoosen River (306 ac)	2410	374	8916	53	401	31	1929	7
Middle Tankerhoosen River (1570 ac)	10357	1585	39700	229	993	112	4936	13
Railroad Brook (1203 ac)	2964	432	12652	59	1074	73	5201	19
Tucker Brook (934 ac)	5111	736	20084	129	630	37	3071	11
Upper Tankerhoosen River (1472 ac)	4228	759	16194	87	360	76	1632	5
Walker Reservoir (322 ac)	2909	481	10718	66	598	91	2754	12
Total (8149 ac)	45207	7252	174172	1011	6248	743	28886	109

<u>Table 15</u> presents the projected future pollutant loads in terms of the projected load increase based on existing loads (percent increase) and loading rate increase for each subwatershed. These criteria were selected to determine the most significant changes in watershed loadings since they control for the existing load quantities (percent increase) and watershed size (rate increase). The highlighting in <u>Table 15</u> identifies areas with the high (orange), moderate (yellow), and low (green) pollutant loadings or loading rates in the Tankerhoosen River watershed.

Table 15. Projected Pollutant Loading Rate Increases and Load Increases

	Projecte	Projected Future Loading Rate Increase			Projected Load Increase				
	N	Р	BOD	Sediment	N	Р	BOD	Sediment	
Watershed	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/yr	lb/yr	lb/yr	t/yr	
Bolton Notch Pond (318 ac)	0.66	0.10	2.7	0.012	9.6%	8.0%	10.9%	7.7%	
Clarks Brook (647 ac)	0.91	0.13	3.9	0.017	14.1%	12.9%	16.1%	11.7%	
Gages Brook (695 ac)	1.29	0.19	5.6	0.027	19.4%	17.0%	21.5%	16.7%	
Gages Brook South Tributary (680 ac)	0.73	0.11	3.1	0.014	12.2%	10.2%	14.1%	10.5%	
Lower Tankerhoosen River (306 ac)	1.31	0.10	6.3	0.022	20.0%	8.9%	27.6%	14.7%	
Middle Tankerhoosen River (1570 ac)	0.63	0.07	3.1	0.008	10.6%	7.6%	14.2%	5.8%	
Railroad Brook (1203 ac)	0.89	0.06	4.3	0.015	56.8%	20.3%	69.8%	46.4%	
Tucker Brook (934 ac)	0.67	0.04	3.3	0.012	14.1%	5.3%	18.0%	9.4%	



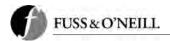
	Projected Future Loading Rate Increase			Projected Load Increase				
	Ν	N P BOD Sediment				Р	BOD	Sediment
Watershed	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/yr	lb/yr	lb/yr	t/yr
Upper Tankerhoosen River (1472 ac)	0.24	0.05	1.1	0.003	9.3%	11.1%	11.2%	6.0%
Walker Reservoir (322 ac)	1.86	0.28	8.6	0.036	25.8%	23.3%	34.6%	21.6%
Total (8149 ac)	0.77	0.09	3.5	0.013	16.0%	11.4%	19.9%	12.0%

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario. These include:

- Gages Brook. The existing conditions pollutant load model indicates that this subwatershed is characterized by both relatively high total pollutant loads and pollutant loading rates, with approximately 70% urban land use, the largest amount of industrial land use, and the second-highest commercial land use composition in the entire watershed. The buildout condition of this watershed is projected to result in a 19% increase in urban land use with a corresponding decrease in forest; and the new urban land is likely to consist of new residential and industrial development. As such, relatively large loads and loading rate increases may occur.
- Lower Tankerhoosen River. The existing conditions pollutant load model for this subwatershed predicts relatively small loads (since the watershed area is small) and moderate loading rates. Under a buildout scenario, this subwatershed is projected to result in more than a 20% increase in nitrogen and BOD loads. The resulting loading rates for these parameters are projected to be the second highest of the Tankerhoosen River subwatersheds.
- Railroad Brook. The projected buildout pollutant loadings in this subwatershed for nitrogen and BOD are anticipated to increase by approximately 57% and 70%, respectively. Significant increases are also anticipated in phosphorus and sediment loads. Currently, the Railroad Brook sub watershed is heavily forested, with comparatively little development. Several large tracts of land within this subwatershed are potentially available for future development, especially in Bolton and South Vernon, which makes this watershed vulnerable to potentially significant pollutant load increases.
- Walker Reservoir. The existing conditions pollutant loading model suggests that this
 subwatershed has some of the highest levels of pollutant loads within the overall
 Tankerhoosen River watershed. Potential land use changes in this subwatershed include
 significant areas of new residential and mixed-use development, much of which is
 located adjacent to Walker Reservoir. These changes are predicted to result in the
 greatest increases in pollutant loading rates for all of the parameters evaluated.

7.0 REFERENCES

Baystate Environmental Consultants, Inc. (2004). Watershed Management Plan for Tankerhoosen Lake.



Fuss & O'Neill, Inc. (2008) Baseline Watershed Assessment for the Tankerhoosen River Watershed. Prepared for the Friends of the Hockanum River Linear Park of Vernon, Inc.

NQQD (2004). Findings from the National Stormwater Quality Database, Research Progress Report. Prepared by the Center for Watershed Protection.

NURP (1983). Results of the Nationwide Urban Runoff Program. U.S. Environmental Protection Agency Water Planning Division, PB 84-185552, Washington, D.C.

Prisloe, Michael, Emily Hoffhine Wilson, Chester Arnold (2003). *Refinement of Population-Calibrated Land-Cover-Specific Impervious Surface Coefficients for Connecticut.* Final Report, DEP Project 01-08 Task #6. University of Connecticut Middlesex County Extension Center, Haddam, CT. Accessed at http://www.nemo.uconn.edu/tools/impervious_surfaces/literature.htm on March 12, 2008.

Tetra Tech., Inc. *Spreadsheet Tool for the Estimation of Pollutant Load (STEPL). Version 4.0.* Developed for the U.S. EPA

University of Connecticut Center for Land Use Education and Research (CLEAR). Connecticut's Changing Landscape —Statewide Land Cover. URL: www.clear.uconn.edu/projects/landscape/statewide_landcover.htm.

WTM (2001). Watershed Treatment Model User's Guide - Version 3.1. Prepared by the Center for Watershed Protection.

Watershed Field Inventories and Land Use Regulatory Review Tankerhoosen River Watershed

Friends of the Hockanum River Linear Park of Vernon, Inc.

In Association With:

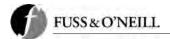
Town of Vernon North Central Conservation District Rivers Alliance of Connecticut Hockanum River Watershed Association Belding Wildlife Management Area

Vernon, CT

October 2008



Fuss & O'Neill, Inc. 78 Interstate Drive West Springfield, MA 01089

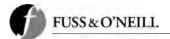


Report (MA)

WATERSHED FIELD INVENTORIES AND LAND USE REGULATORY REVIEW Tankerhoosen River Watershed

TABLE OF CONTENTS

SECTI	<u>ION</u>	<u>3E</u>
1.0	INTRODUCTION	1
2.0	WATERSHED FIELD INVENTORIES 2.1 Summary of Findings 2.2 Stream Corridor Assessment 2.2.1 Clarks Brook 2.2.2 Lower Tankerhoosen River 2.2.3 Middle Tankerhoosen River 2.2.4 Walker Reservoir 2.2.5 Gages Brook 2.2.6 Gages Brook South Tributary 2.2.7 Tucker Brook	4 9 .14 .16 .20
	2.3 Upland Assessment 2.3.1 Hotspot Site Investigation	.47 .47 .52
3.0	LAND USE REGULATORY REVIEW	.57 .58 .63
4.0	REFERENCES	.67
TABL 1 2 3 4 5 6	Field Inventory Nomenclature Number of Reach Level Assessments Performed and Impact Conditions Identified Stream Reach Classifications Stream Reach Assessment Scores and Classifications Hotspot Site Investigation Summary Neighborhood Source Assessments Conducted in the	3 7 7 8 48
7 8 9 10 11 12	Tankerhoosen River Watershed Streets and Storm Drain Assessment Photographs Tankerhoosen River Watershed Land Use Commissions Municipal Land Use Regulations Inland Wetlands and Watercourses Regulations Status of Municipal Open Space Plans in the Tankerhoosen River Watershed Open Space Regulations 0257\A20\Field Assessment Report\Watershed Field Assessments.doc	52 56 58 59 59 62 62



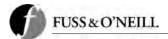
WATERSHED FIELD INVENTORIES AND LAND USE REGULATORY REVIEW Tankerhoosen River Watershed

TABLE OF CONTENTS

(continued)

<u>FIG</u>	<u>URES</u>	<u>PAGE</u>
1	Tankerhoosen River Watershed	2
2	Examples of Stream Reaches in Various Classification Categories	9
3	Clarks Brook Subwatershed Field Assessment Locations	10
4	Lower Tankerhoosen River Subwatershed Field Assessment Locations	15
5	Middle Tankerhoosen River Subwatershed Field Assessment Locations	17
6	Walker's Reservoir Subwatershed Field Assessment Locations	22
7	Gages Brook Subwatershed Field Assessment Locations	27
8	Gages Brook South Tributary Subwatershed Field Assessment Locations	37
9	Tucker Brook Subwatershed Field Assessment Locations	42
ΔΡΡ	PENDICES END OF	REPORT

- Stream Corridor Assessment Field Forms and Data Α
- В Upland Assessment Field Forms
- Photographs on CD С
- D Vernon Regulatory Review Memorandum



1.0 INTRODUCTION

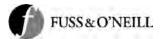
The Friends of the Hockanum River Linear Park of Vernon, Inc. (the "Friends") has retained Fuss & O'Neill to prepare a Watershed Management Plan for the Tankerhoosen River watershed. The Watershed Management Plan will be developed through a collaborative effort with a Technical Advisory Committee consisting of the Friends, the Town of Vernon (Planning Department and Conservation Commission), the North Central Conservation District, the Hockanum River Watershed Association, Rivers Alliance of Connecticut, and the Belding Wildlife Trust. The Plan will identify action items to be implemented by the municipalities and private groups which will protect and improve the health of the Tankerhoosen River watershed.

There are two key reports that provide the basis for recommendations in the Watershed Management Plan: 1) Baseline Watershed Assessment and 2) Watershed Field Inventories and Regulatory Review. The Baseline Watershed Assessment (Fuss & O'Neill, May 2008) evaluates the existing conditions of natural resources and pollutant sources in the watershed to prioritize watershed protection and restoration strategies. This report, the Watershed Field Inventories and Land Use Regulatory Review, describes the stream corridor and upland assessments conducted by Fuss & O'Neill to identify and evaluate pollutant sources in the watershed, as well as, review of local zoning and land use regulations for selected towns within the Tankerhoosen River watershed. Findings of the Baseline Watershed Assessment and the Watershed Field Assessment and Land Use Regulatory Review will serve as the basis for development of a watershed management plan for the Tankerhoosen River.

2.0 WATERSHED FIELD INVENTORIES

Field inventories were performed during summer 2008 to further assess existing watershed conditions and potential sources of pollution. The field inventories are screening level tools for locating potential pollutant sources and environmental problems in a watershed along with possible locations where restoration opportunities and mitigation measures can be implemented. The field inventories included selected stream corridors and upland areas within priority subwatersheds, which were identified in the Baseline Watershed Assessment report based on a comparative subwatershed evaluation that considered vulnerability to future development impacts and restoration potential to improve upon existing conditions. Field inventories were performed within the following priority subwatersheds (Figure 1):

- Clarks Brook.
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook,
- Walker Reservoir.



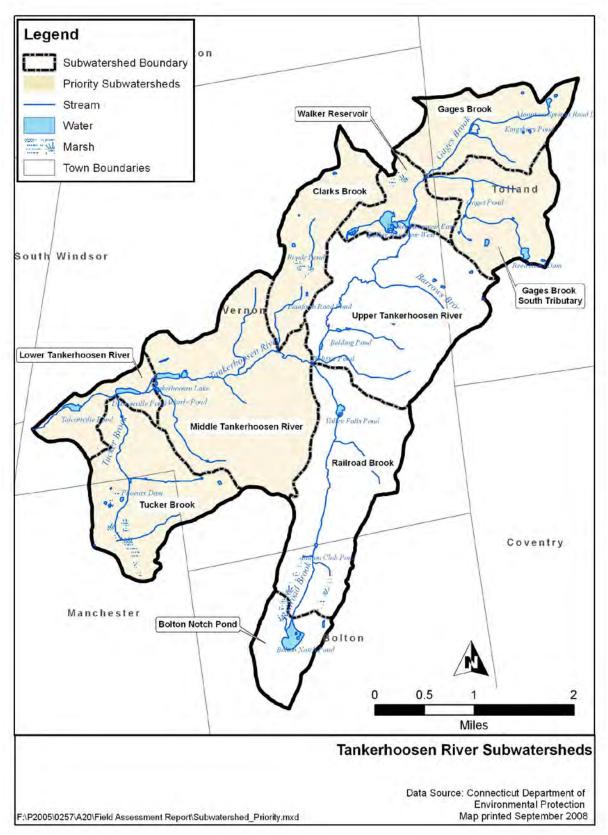


Figure 1. Tankerhoosen River Watershed

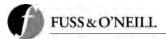


The stream corridor assessment procedure used in this study is adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) method (CWP, 2005). Upland areas and activities that may impact stream quality were also assessed using methods adapted from the Center for Watershed Protection's Unified Subwatershed and Site Reconnaissance (USSR) techniques (CWP, 2005). The upland assessments included inventories of selected representative residential neighborhoods, streets and storm drainage systems, and land uses with higher potential pollutant loads (i.e., "hotspot" land uses). Field assessment efforts were targeted on stream segments and upland areas with the greatest potential for direct impacts to the streams. These areas were identified through aerial and land use mapping. To the extent possible, efforts were also focused on publicly-owned land, which typically offers greater opportunities for retrofits and mitigation projects as opposed to privately-owned land.

During the field inventories, crews assessed approximately 8.7 miles of stream corridors, six potential hotspot locations, five representative residential neighborhoods, and a number of streets and storm drainage systems associated with the residential neighborhoods and hotspot land uses. Field inventory nomenclature used throughout this report is summarized in <u>Table 1</u>. Copies of completed field assessment forms are provided in <u>Appendix A</u> (stream corridor assessments) and <u>Appendix B</u> (upland assessments). Photographs of specific or representative pollutant sources and problem areas are included throughout this document for illustrative purposes. All of the photographs taken during the field inventories are included on a CD in Appendix C.

Table 1: Field Inventory Nomenclature

Subwatershed	Abbreviation
Clarks Brook	СВ
Lower Tankerhoosen River	LTR
Middle Tankerhoosen River	MTR
Walker Reservoir	WR
Gages Brook	GB
Gages Brook South Tributary	GBST
Tucker Brook	TB
Stream Corridor Assessment	Abbreviation
Reach Level Assessment	RCH
Channel Modification	CM
Severe Bank Erosion	ER
Impacted Buffer	IB
Stormwater Outfall	OT
Stream Crossing	SC
Trash & Debris	TB
Utilities	UT
Upland Assessment	Abbreviation
Hotspot Investigation	HSI
Neighborhood Site Assessment	NSA
Streets and Storm Drains	SSD



2.1 <u>Summary of Findings</u>

A variety of common issues and problems were identified during the field inventories. Some prevalent issues throughout the watershed are described below. These findings will be used to develop recommendations for the Watershed Management Plan.

- Overall in-stream habitat in the assessed reaches was mixed. Some of the assessed reaches have high quality habitat, with riparian cover, good floodplain connection, varied substrate, and significant stream shading. In other segments, in-stream habitat is marginal to poor due to bank erosion, buffer encroachment, trash and debris, lack of shading, and in-stream sedimentation. However, the majority of the stream reaches assessed appear to be either supporting biological communities (fish, frogs, birds, etc.) or sufficient to support such communities. Many potential barriers to fish passage were observed throughout the watershed, including perched culverts, culverts with very shallow flow, and natural and manmade dams. Therefore, the impact of potential fish barriers and the feasibility of fish barrier removal efforts should be investigated further.
- Stream buffer encroachments are prevalent along stream corridors in or near areas of residential and commercial development. Residential lawns and some commercial lawns extend down to the banks of the stream in many areas, particularly in residential back yards. Yard waste such as grass clippings, leaves, and brush and waste materials were also common occurrences in and near these areas where easy access exists to the streams. Education, signage, stream buffer regulations, and stream cleanups are potential approaches for improving buffer management.
- Residential areas appear to contribute significant quantities of rooftop runoff to the storm drainage system, particularly in medium and high-density residential neighborhoods with smaller yards. Many small outfall pipes were observed from the backyards of residential areas, which are presumably associated with foundation drains, yard drains, or roof downspouts. Opportunities exist to disconnect residential rooftop runoff from the storm drainage system and reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.
- Numerous outfalls were observed from virtually all of the land uses encountered during
 the stream assessments. Many appear to be associated with sources having low
 potential for water quality impacts (i.e., residential foundation drains), while others were
 of unknown origin and should be the focus of future investigation. A watershed-wide
 illicit discharge investigation is recommended in targeted areas and land uses.
- Invasive species (phragmites, cattails, reed canary grass, etc.) were observed in stream corridors in many areas of the watershed. Invasive species management should be incorporated into stream corridor restoration activities.
- Parking lots associated with apartment complexes, institutional land uses (schools), and commuter lots are potential candidates for stormwater retrofits to reduce site runoff and improve water quality through the use of bioretention, water quality swales, buffer strips/level spreaders, and other small-scale LID approaches.



- The field assessments identified very little evidence of storm drain stenciling or watershed stewardship signage, with the exception of a residential subdivision in the Tucker Brook subwatershed.
- Most of the developed areas surveyed have inadequate stormwater quality controls.
 Many of the residential developments were constructed prior to the advent of modern stormwater quality regulations and design requirements. Therefore, most of the development observed in the watershed employs traditional curb and gutter storm drainage collection systems with little, if any, stormwater management beyond detention basins for peak flow control. In most cases, the stormwater management controls that were observed at newer developments were not being maintained.
- No Low Impact Development (LID) design practices were observed in the watershed.
 With the recent shift toward LID site design and stormwater management
 requirements, as demonstrated by the Town of Tolland's new LID regulations and
 design manual, the watershed is an ideal candidate to showcase LID practices for both
 new development and retrofit applications. Local LID demonstration sites are a
 valuable tool for public education and promoting the widespread use of such practices.
 Incorporating LID into town projects, including roadway projects, can also serve as a
 proactive model for private development.
- Stormwater runoff from Interstate 84, other state roads such as Route 30 and 31, and local roads typically receives little or no treatment prior to discharge. Such discharges are a source of sediment and other pollutants to the receiving water bodies.
 Opportunities exist for stormwater retrofits at roadway stormwater outfalls
- Relatively isolated areas of moderate to severe streambank erosion were observed throughout the assessed portions of the watershed. Most of these areas are located at or downstream of stormwater outfalls in developed areas of the watershed. Access to many of these areas is limited; therefore, potential candidate sites for bank stabilization projects should be evaluated further for overall feasibility.
- Very few active construction sites were observed in the watershed. However, a large amount of developable land exists in the watershed, and future construction activity is a major potential source of polluted runoff. Approaches for stronger soil erosion and sedimentation controls include regulating building envelopes, encouraging property owners to minimize clearing for other purposes, and requiring drainage review for activities that disturb less than ½ acre.
- Due to limited project funding, not all stream segments in the priority subwatersheds were assessed, and other subwatersheds (Railroad Brook, Bolton Notch Pond, and Upper Tankerhoosen River) were not assessed as they were determined to be less vulnerable to future development impacts. A schedule should be established for assessing the remaining stream segments and subwatersheds.

The following sections present a more detailed discussion of the stream corridor and upland assessment methods and findings.



2.2 Stream Corridor Assessment

Stream corridors within the Tankerhoosen River watershed were assessed during June 3 through 6, 2008, and on July 2 and 10, 2008. The weather on these days was sunny, overcast or partly cloudy and not raining, with the exception of June 4, which had intermittent and heavy rain at times. Field crews consisted of staff from Fuss & O'Neill, the North Central Conservation District, and volunteers with Friends of the Hockanum River Linear Park of Vernon. Stream corridors were assessed along selected reaches within priority subwatersheds using methods adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) (CWP, 2005).

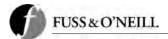
The stream assessment method used in this study is a continuous stream walk method that identifies and evaluates the following impact conditions for each reach:

- Outfalls (OT), including stormwater and other manmade point discharges;
- Severe Bank Erosion (ER), such as bank sloughing, active widening, and incision;
- Impacted Buffer (IB), which is a narrowing or lack of natural vegetation;
- Utilities in the stream corridor (UT), such as leaking or exposed pipes;
- Trash and Debris (TR), such as drums, yard waste, and other illegal dumping;
- Stream Crossings (SC), which are hard objects, whether natural or artificial, that restrict or constrain the flow of water. These may include bridges, culverts, dams, and falls;
- Channel Modification (CM), where the stream bottom, banks, or direction have been modified;
- Miscellaneous (MI), other impacts or features not otherwise covered; and
- Reach Level Assessment (RCH), the average characteristics of each reach.

The stream assessment method also includes a semi-quantitative scoring system as part of the reach level assessment to evaluate the overall condition of the stream, riparian buffer, and floodplain, based on a consideration of in-stream habitat, vegetative protection, bank erosion, floodplain connection, vegetated buffer width, floodplain vegetation and habitat, and floodplain encroachment.

Field data forms were completed for each stream reach assessed (<u>Appendix A</u>). The information was entered into a database and used to quantify the overall condition of stream corridors in the watershed, compare subwatersheds within the watershed to each other, and prioritize areas for restoration, stormwater retrofit, land preservation, and other stewardship opportunities.

Stream reaches were assigned a subwatershed abbreviation followed by a two-digit numerical identifier. Reaches were generally numbered sequentially from downstream to upstream when in series and west to east upstream from confluences. A reach was considered to be a stream segment with relatively consistent geomorphology and surrounding land use, and generally less than one-half mile in length. Features noted at reach junctions (e.g., culvert crossings) were associated with the downstream reach. Impact conditions within each reach were numbered sequentially with an abbreviation followed by a two-digit number. For example, the second stream crossing in a reach would have the identifier SC-02.



Forty-one stream reaches were evaluated in the Tankerhoosen River watershed using this stream assessment protocol. <u>Table 2</u> summarizes the number of impact conditions identified and reach level assessments that were performed within each subwatershed.

Table 2: Number of Reach Level Assessments Performed and Impact Conditions Identified

Subwatershed	RCH	CM	ER	ΙB	OT	SC	TD	UT
Clarks Brook	5		2		10	8	2	
Lower Tankerhoosen River	1				1	1		
Middle Tankerhoosen River	5		1		14	5	7	
Walker Reservoir	5				6	6		
Gages Brook	12	1	8	5	21	12	3	1
Gages Brook South Trib.	7	1	1	1	3	8	-	
Tucker Brook	6		2	4	9	9	3	

Reach level assessment scores were assigned by field crews based upon the overall stream, buffer, and floodplain conditions. A subjective determination of eight criteria is assessed on a scale of 0 to 20; 0 relating to poor conditions and 20 being optimal conditions. The total of these scores provides a quantitative index of overall stream health and condition. The maximum possible number of points that would be assigned for a fully optimal stream reach is 160 points.

Streams were assessed relative to a base condition, which for this study, is the highest scoring stream reach in the Tankerhoosen River watershed (153 points). All other assessed stream reaches were assigned a numerical score and categorized relative to the base score of 153 points (Table 3). Reaches scoring greater than 90% of the base condition (138 points) are considered "excellent", between 75% and 90% of the base condition are categorized as "good", between 55% and 75% of the base condition are categorized as "fair", between 35% and 55% of the base condition are categorized as "poor", and less than 35% of the base condition are categorized as "very poor". Table 4 summarizes stream reach assessment scores and classifications for the assessed stream reaches.

Table 3: Stream Reach Classifications

		Point
Category	Percentile	Threshold
Excellent	90%	≥138
Good	75%	≥115
Fair	55%	≥84
Poor	35%	≥54
Very Poor	<35%	<54



Table 4: Stream Reach Assessment Scores and Classifications

Excellent		Good		Fair		Poor		Very Poor	
Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score
MTR-08	153	GBST-02	127	GB-09	114	TB-04B	83	GB-05B	53
GB-10	146	GB-02	120	GBST-03	111	MTR-01	82	WR-01	35
GBST-04A	146	GBST-09B	120	LTR-03	111	GB-04	80		
GBST-01	145	TB-02	119	GB-07	105	WR-02	80		
MTR-07	139	GBST-04B	117	CB-03	104	WR-04	76		
CB-04	138	TB-01	116	GB-01	102	GB-03B	72		
		GB-08	115	GB-03A	97	GBST-09A	59		
				MTR-09	94				
				GB-05A	93				
				CB-02	93				
				TB-03	92				
				TB-04A	92				
				WR-03	91				
				GB-06	88				
				MTR-02	87				
				CB-01	85				
				WR-05	84				
Note: TB04C and CB-05 were not scored during the reach level assessment									

As depicted in <u>Figure 2</u>, MTR-08 is the highest rated stream reach due to good riparian cover and bed material. WR-03 is considered fair due to the presence of invasive species within the riparian corridor. TB-04B and GB-05B are poor and very poor, respectively, because of poor channel characteristics, outfalls, stream crossings, trash and debris and lack of stream buffer and stream bank erosion in the case of GB-05B.

The following sections summarize the major issues identified during the stream corridor assessments for each priority subwatershed. Specific locations are identified according to the stream reach and impact condition IDs described previously. Identification of "right" and "left" stream banks is from the observer's perspective facing downstream.





Figure 2: Examples of Stream Reaches in Various Classification Categories

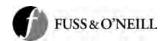
2.2.1 Clarks Brook

Clarks Brook is a tributary of the Tankerhoosen River that flows into the Middle Tankerhoosen River subwatershed. Clarks Brook is divided into five stream segments, labeled CB-01 through CB-05 (Figure 3). All five stream segments were assessed. Segments CB-01 through CB-03 were inventoried on July 2, 2008, while segments CB-04 and CB-05 were assessed on July 10, 2008. Land use in this subwatershed includes residential, commercial/industrial, retail, and some undeveloped land. Interstate 84 crosses Clarks Brook in the southern portion of the watershed.

CB-01

Stream segment CB-01 begins at the mouth of Clarks Brook and continues upstream to Bolton Road. The surrounding land use is primarily forested and open fields, with one residence along the left bank.

 RCH —The overall stream conditions are optimal to suboptimal with the exception of bank vegetative protection which is rated as poor due to lack of stream buffer along portions of the left bank. The dominant bed substrate is cobble; there are no attached or floating plants in the stream; wildlife such as fish, frogs, and birds are present; and the stream is approximately 50 percent shaded. The reach has good accessibility.



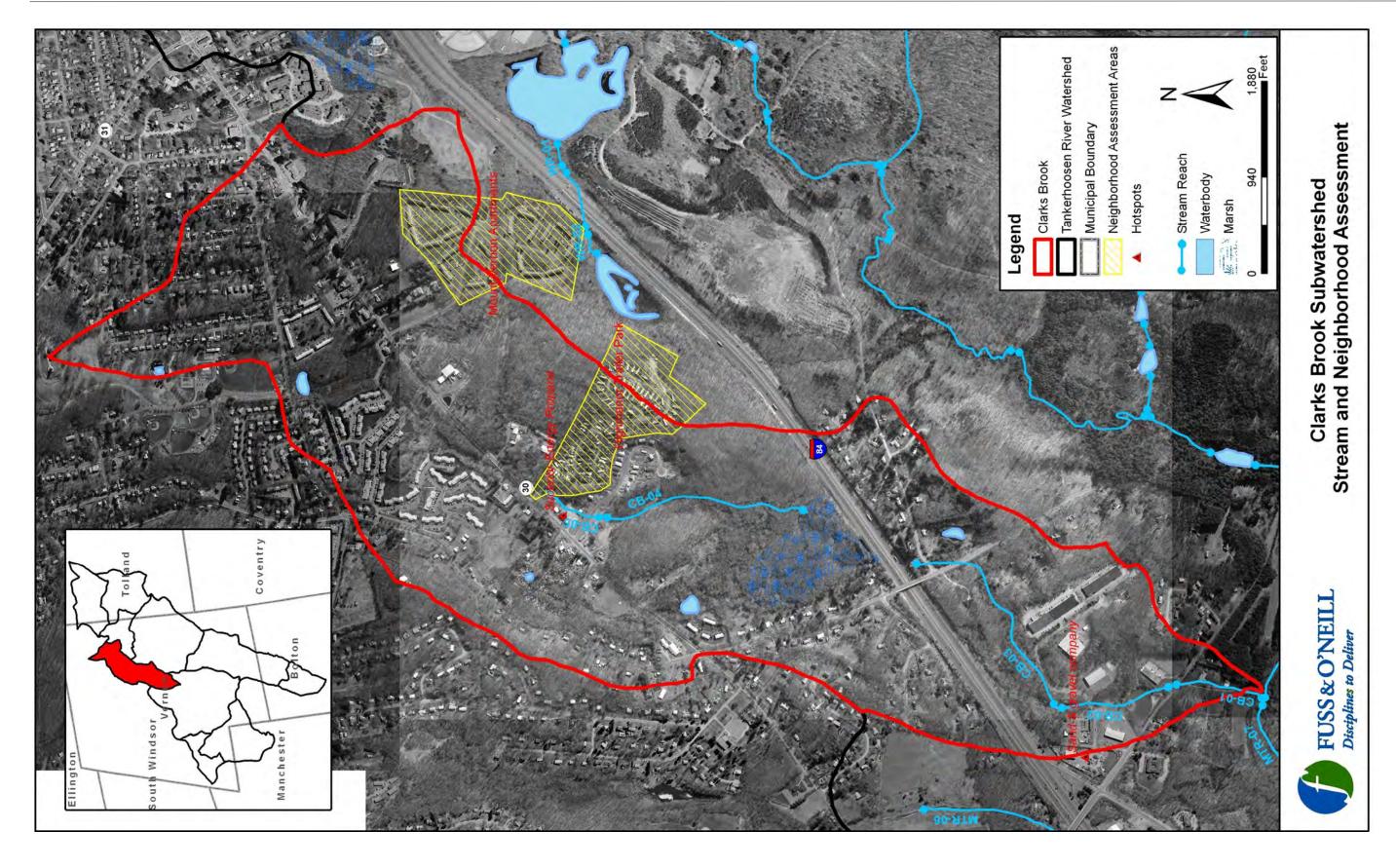


Figure 3. Clarks Brook Subwatershed Field Assessment Locations



- OT —The reach contains several outfall pipes, including several 4-inch plastic pipes
 which are believed to be connected to residential foundation drains or roof
 downspouts (no dry weather flows observed) and two 18-inch outfalls conveying
 roadway drainage (no dry weather flows observed). None of the observed outfall pipes
 appears to be contributing dry weather discharges or causing stream bank erosion.
- SC—Clarks Brook crosses under Bolton Road within a 5.5-foot circular concrete culvert. The upstream side of the culvert was partially blocked by brush and debris, and the concrete on the inside of the culvert is deteriorating. The sharp drop in elevation immediately downstream of the culvert creates a "perched" condition and a physical barrier to fish passage. This culvert is a potential candidate for fish barrier removal to address the perched outlet and cleaning/repair.

CB-02

Stream segment CB-02 flows along a baseball field and industrial properties, from Bolton Road to Industrial Park Road. The stream enters a culvert prior to Industrial Park Road and remerges on the other side of the road.

- RCH —The stream conditions are generally suboptimal to marginal. The instream
 habitat is considered optimal while the floodplain connection, vegetated buffer width,
 floodplain habitat and floodplain encroachment received a marginal rating. Clarks
 Brook flows at 100 percent of the channel width in this section, with clear water and
 some attached plants in the stream. The dominant substrate is sand and cobble and
 there is evidence of sediment deposition.
- OT —There are three outfalls along this reach. The first, OT-01, is a plastic pipe on the right bank originating from the parking lot of an adjacent industrial facility, was observed to have a trickle of discharge and brown benthic growth on the pipe. Outfall OT-02 is an earthen open channel approximately 4 feet deep and 5 feet wide. A trickle of discharge was also observed in the channel. The final outfall, OT-03, is a 4-inch diameter plastic pipe on the right back. No flow or microbial growth/discoloration was observed from the pipe.
- ER —Some moderate, isolated bank erosion was observed on the left bank. This area is a potential candidate for bank stabilization.
- SC —An approximately 400-foot long circular culvert conveys Clarks Brook under a parking lot. The triple barrel metal culverts are 2 feet in diameter. The outlets of the culverts are perched slightly above elevation of the stream bottom. This culvert is a potential candidate for fish barrier removal to address the perched outlet.
- TR Significant quantities of trash and debris (an estimated 1 pickup truck load) were
 observed including tires, automotive waste, appliances and a closed 55-gallon drum of
 unknown contents. The debris and waste materials should be removed and
 disposed in accordance with applicable local, state, and federal regulations.





Trash and debris along reach CB-02

CB-03

Reach CB-03 begins on the north side of Industrial Park Road, continues through the underpass of Bamforth and Baker Roads, and ends at Interstate 84. The stream passes through mostly forested areas, although the stream also flows along an industrial park for a short distance and then under the two roads.

- RCH The stream conditions are generally rated suboptimal. The in-stream habitat
 and floodplain vegetation are rated optimal. The vegetative protection, bank erosion,
 floodplain connection, habitat and encroachment are considered suboptimal. The bank
 erosion on the left bank and buffer width on the right bank are considered marginal.
 The stream flows at 75-100% of the channel width, which is dominated by boulder
 substrate. The water is clear with no aquatic plants in the stream, and the stream
 surface is mostly shaded. Access to the reach is rated fair or difficult.
- OT —There are two outfalls along this reach. OT-01 is a drainage channel, originating from a wooded area adjacent to Interstate 84, approximately 1 foot deep and 2 feet wide. OT-02 is an 18-inch concrete drainage outfall pipe with moderate flow.
- ER An approximately 30-foot long area of severe bank erosion was observed on the left bank downstream of a wooden foot bridge. The area has good access for construction equipment for potential restoration of the bank. This area is a potential candidate for bank stabilization.
- SC —Stream crossing SC-01 is a wooden foot bridge over Clarks Brook. Debris under the bridge is causing partial blockage of the stream. Removal of the debris is recommended. Crossing SC-02 is a circular culvert below Bamforth Road. The double metal barrels are approximately 4.5 feet in diameter and 60 feet long. The culvert outlet is elevated above the elevation of the stream bed, restricting fish passage. This culvert is a potential candidate for fish barrier removal to address the perched outlet. The third stream crossing in this segment is SC-03, which conveys flow underneath



Baker Road inside a circular double barrel metal culvert. The culverts are 4 feet in diameter and approximately 100 feet in length.



Bamforth Road crossing (perched culvert) along reach CB-03

• TR — Automotive debris was observed along the stream near a residential area, and should be removed as part of a stream cleanup in this reach.

CB-04

Stream segment CB-04 extends from the wetlands on the northern side of Interstate 84 through a forested area and ending at the edge of a residential neighborhood at Rockledge Drive.

- RCH This segment is rated as optimal using the stream assessment criteria in every category except floodplain habitat, which is rated suboptimal. The dominant substrate is cobble, the water is clear and there are no aquatic plants in the stream. There is evidence of fish, frogs and songbirds and the stream is mostly shaded. There is some evidence of sediment deposition in the stream channel.
- OT —A 12-inch concrete outfall pipe is located on the right bank near Rockledge Drive. The pipe is surrounded by dense knotweed and appears to originate from the adjacent residential area. A trickle of flow was observed, and the flow appeared to be cloudy and orange in color.
- SC —There are several stream crossings along Clarks Brook in this segment. The first two crossings consist of a low-head concrete dam located immediately upstream of an approximately 4-foot diameter concrete culvert, which is located below a forested dirt road. The concrete dam and forest road culvert (perched approximately 3 to 4 inches above the elevation of the streambed at the culvert outlet, and having very shallow flow) are potential barriers to fish passage. Both are potential candidates for fish barrier removal. The third crossing is a concrete culvert below Rockledge Drive. Both culverts identified in this reach showed evidence of cracking and deterioration, and should be evaluated for potential repair or replacement.



CB-05

The most upland reach in Clarks Brook, CB-05, could not be visually assessed because the segment flows entirely belowground in a culvert system. The flow is directed below a commercial building occupied by Superior Energy Propane and continues to flow through the culvert for approximately 650 feet, parallel to Route 30 until re-emerging on the north side of Middle Terrace. Historical filling of the Superior Propane site appears to have occurred, as evidenced by water seepage from the ground surface at the southeast corner of the site and the presence of a significant stand of phragmites adjacent to the site. A storm drain exists on the site. Representatives from Superior Propane indicated a desire to pave additional areas of the site and/or divert the water on the site to alleviate the wet soil conditions. This site should be further investigated to better define potential impacts of the historical filling, current drainage issues, and plans for additional site development.

2.2.2 Lower Tankerhoosen River

The Lower Tankerhoosen River subwatershed is the outlet for the main stem of the Tankerhoosen River prior to its confluence with the Hockanum River and is fed directly by Tucker Brook and the Middle Tankerhoosen River (Figure 4). Only stream segment LTR-03 was assessed in this subwatershed (on June 5, 2008) due to limited time and staff availability.

LTR-03

Stream segment LTR-03 is approximately 0.5 mile long and extends east to west, parallel to Interstate 84, from the inlet to Talcottville Pond through a forested area to the Dobsonville Pond dam and Dobson Road. The width of the stream varies from 20 feet to 50 feet and the upstream end of the segment near the dam has very steep banks.



The upstream side of Dobsonville Pond dam at the upstream limit of reach LTR-03.

The photograph is taken near the confluence with reach TB-01.

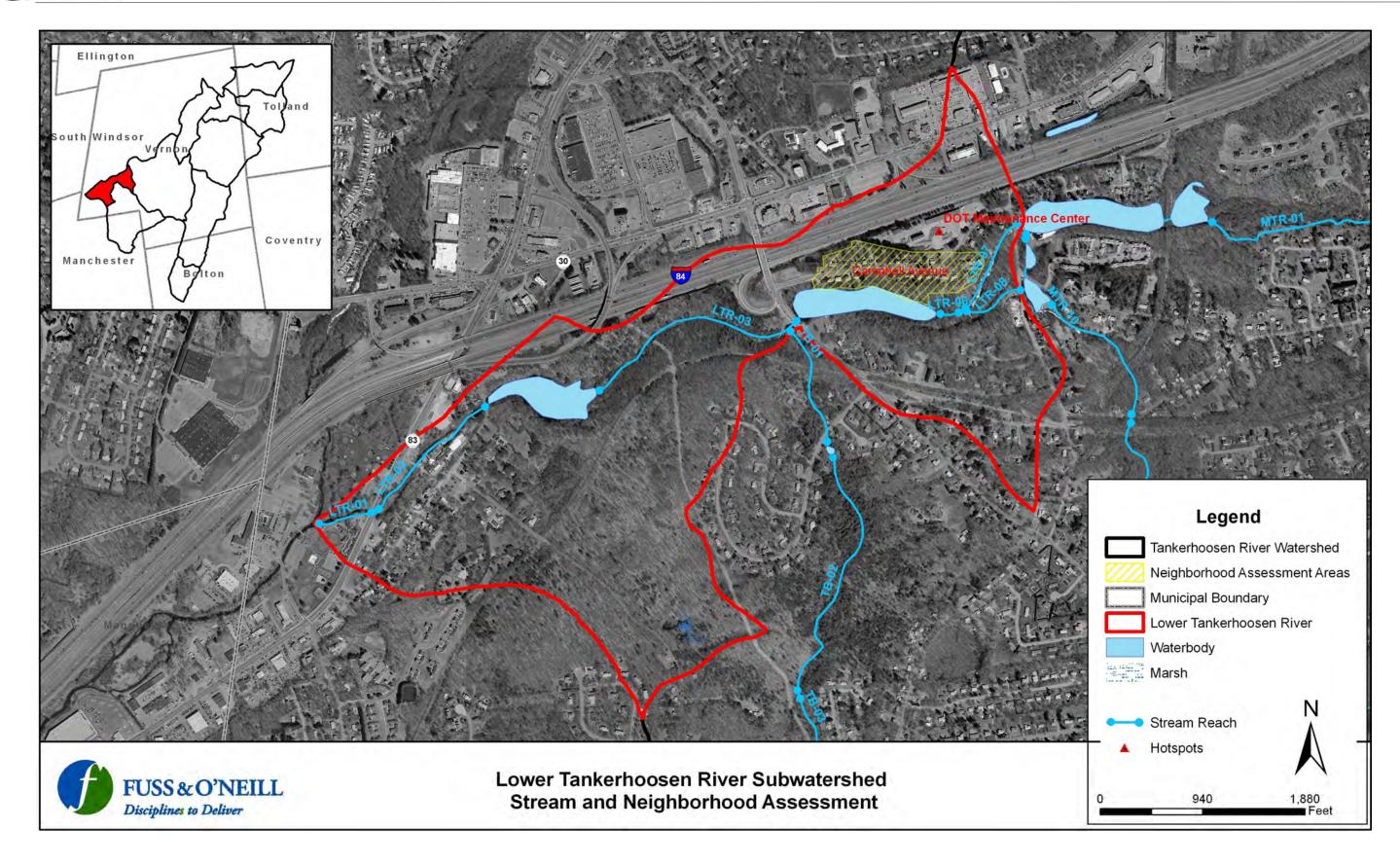


Figure 4. Lower Tankerhoosen River Subwatershed Field Assessment Locations



- RCH —The reach level assessment characterized this segment as generally suboptimal. The vegetated buffer width and floodplain vegetation is rated as optimal. The surrounding forested land provides good stream habitat. The beginning and end of the stream segment are altered by the manmade impoundments at both ends. The stream flows at 75 to 100% of the channel width and the substrate is dominated by cobble. The water is somewhat cloudy and has a naturally stained color. There are no plants in the stream and the surface is mostly shaded. The most significant issue observed along this reach is a stormwater detention basin associated with runoff from Interstate 84.
- OT —A stormwater outfall pipe conveys stormwater runoff from Interstate 84 to a
 detention basin located adjacent to the stream. The inside of the outfall pipe was
 observed to have an orange, rusty color, and an oily stain. A rusty, oily sludge was
 observed in the bottom of the detention basin. No standing water or discharge from
 the basin was observed at the time of the inspection. A discharge investigation is
 recommended to observe the basin function during wet weather and assess possible
 pollutant contribution to the stream. The basin and stormwater discharge is a
 potential stormwater retrofit candidate.
- SC —The dams that impound Dobsonville Pond and Talcotville Pond are potential barriers to fish passage. According to the CTDEP Inland Fisheries Division, there are currently no diadromous fish (herring, shad) passage plans for these dams (Murphy, personal communication, September 24, 2008). There has been an effort in recent years to provide American eel passage at inland dams when there is a need and opportunity. An assessment of the lower reaches of the Tankerhoosen River is recommended to evaluate the presence of American eel and other resident fish populations, as well as the potential benefit of providing fish passage for these dams. Based on the assessment findings, fish passage for the resident fish population in the lower Tankerhoosen River could be incorporated into future dam repair projects.

2.2.3 Middle Tankerhoosen River

Reaches in this subwatershed are labeled MTR-01 through MTR-12. Stream assessments were conducted on representative reaches including MTR-01, MTR-02, MTR-07, MTR-08 and MTR-09 (<u>Figure 5</u>). Segments MTR-01, MTR-02 and portions of MTR-09 were inventoried on June 4, 2008, while the remaining segments were assessed on June 5, 2008. Residential use is the dominant land use in the subwatershed, and Interstate 84 traverses the northern portion of the subwatershed. The Upper Tankerhoosen River and Clarks Brook drain to the Middle Tankerhoosen River, which feeds the Lower Tankerhoosen River.

MTR-01

This stream segment begins at the inlet to Tankerhoosen Lake and ends at the confluence of segments MTR-02 and MTR-09. The stream flows parallel to the back yards of a residential neighborhood

RCH —The reach level assessment indicates suboptimal in-stream habitat, vegetative
protection, bank erosion and floodplain connection. The overall buffer and floodplain
conditions are generally marginal, with limited vegetative buffer width, floodplain

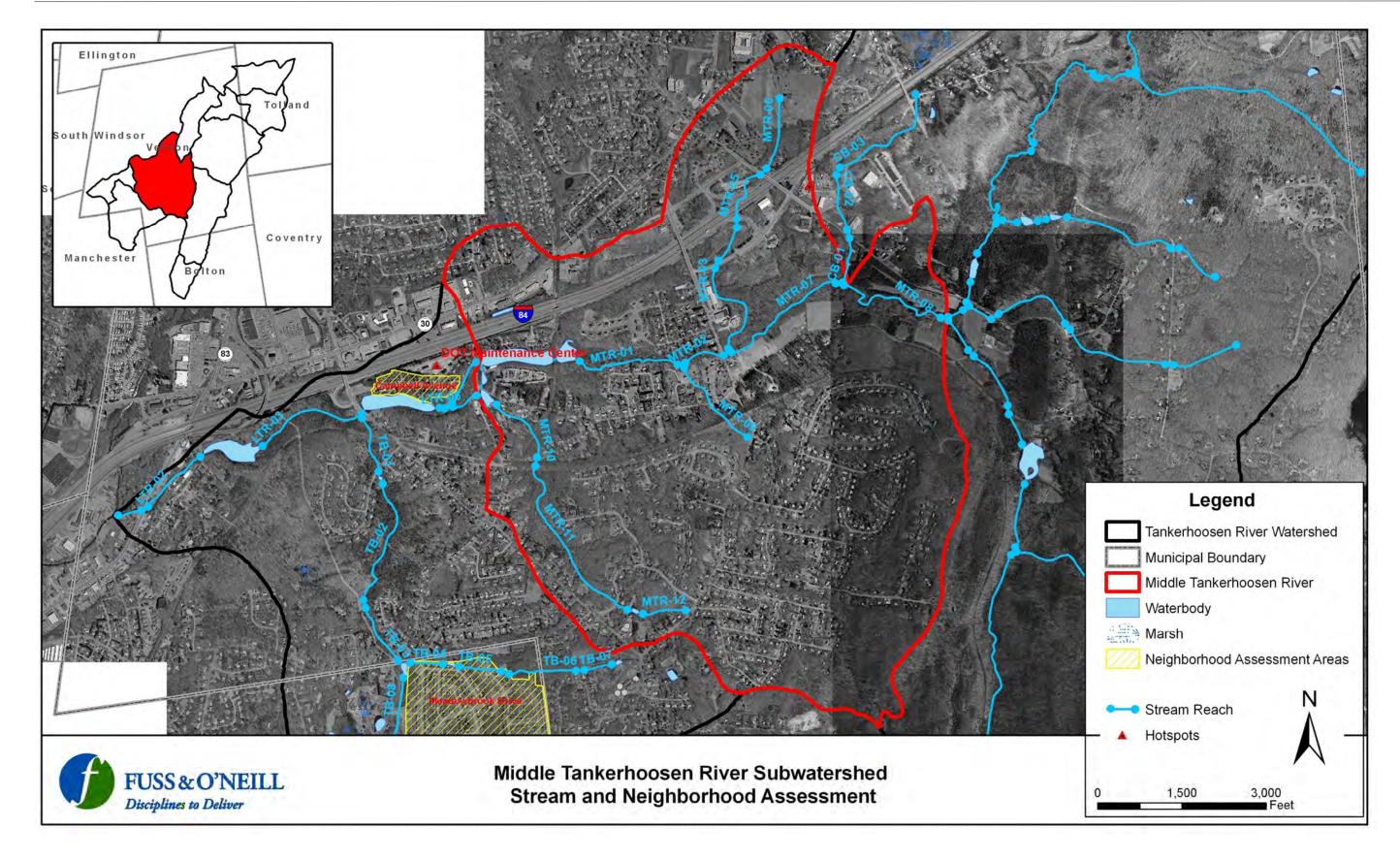


Figure 5. Middle Tankerhoosen River Subwatershed Ffield Aassessment Locations



vegetation and habitat and moderate floodplain encroachment. The dominant in-stream substrate is gravel and cobble, and 50 percent of the stream surface is shaded.



Stream segment MRT-01 has areas with little or no vegetative buffer.

- OT —Four outfalls were observed along the left bank of the stream. Three of the
 outfalls are storm drainage pipes that convey stormwater runoff from the adjacent
 residential development. Sediment accumulation was observed at the outlets of several
 of the outfalls. An ABS outfall pipe was observed behind a residence. The pipe was
 submerged below the stream water surface at the time of the inspection. The source of
 this pipe and the nature of the potential discharge from the pipe should be
 investigated further.
- TR Three instances of trash and/or debris were observed along this segment. TR-01 is a commercial-grade 55-gallon plastic drum located within the stream. The contents of the drum could not be determined. TR-02 consists of brush and debris stockpiled along the bank of the stream. The material was placed by the Town of Vernon following removal of a beaver dam, but never removed. TR-03 consists of approximately 16 plastic buckets that are submerged or partially submerged below the water surface of the stream. The contents of the buckets are unknown. Both areas should be the focus of stream cleanup efforts.
- IB —The left bank along much of the stream segment consists of residential lawns immediately adjacent to the stream, with little or no stream buffer. Stream bank erosion was observed in some areas along the left bank, including evidence of animal burrows in the stream bank below the exposed roots of the lawn.

MTR-02

Reach MTR-02 begins at the confluence with MTR-09 and ends at Tunnel Road. This braided stream segment also flows adjacent to residential properties.



- RCH —The right bank consists primarily of residential lawns with little or no buffer, while the left bank has a modest vegetated buffer consisting of shrubs and mature forest. The in-stream flow fills the channel, and the substrate is dominated by gravel. There are no aquatic plants in the stream, and the water surface is approximately 50 percent shaded. Sediment deposits were observed in areas of the stream channel. Generally, the stream ranges from suboptimal to marginal for overall stream conditions and buffer and floodplain conditions. The left bank is characterized as optimal for bank erosion and vegetated buffer width. The right bank has poor vegetative protection.
- OT —A 14-inch diameter concrete pipe conveys stormwater runoff from Tunnel Road.
 No dry-weather flow or other visible evidence of pollution was observed.
- SC Twin box culverts carry flow below Tunnel Road. The culverts are concrete, approximately 4 feet in diameter and 13 feet in length.

MTR-07

This segment begins at Tunnel Road and ends at the confluence of the Tankerhoosen River and Clarks Brook. The primary land use along stream segment MTR-07 is forested and agricultural land, with a small area of adjoining residential land near Tunnel Road.

 RCH —The reach level assessment identifies this segment as generally optimal, with high ratings for overall stream conditions and buffer and floodplain conditions. The reach is dominated by gravel and cobble substrate, clear water, no in-stream vegetation, observed fish and terrestrial wildlife, and a mostly shaded stream.

MTR-08

Segment MTR-08 begins at the confluence of Clarks Brook and the Tankerhoosen River and ends at the confluence of Railroad Brook and the Tankerhoosen River. The surrounding land use is forest or cleared fields.

 RCH —This segment is characterized by gravel and cobble substrate, no attached or floating aquatic plants, wildlife including fish, deer, raccoon, and songbirds, and the stream is mostly shaded. Some evidence of channel widening was observed. The overall stream, buffer and floodplain conditions are rated as optimal.

MTR-09

Stream segment MTR-09 is a tributary of the Tankerhoosen River that begins at the main stem of the Tankerhoosen River and extends upstream, crossing Warren Avenue and ultimately ending at Tunnel Road. The surrounding land uses are residential, forested, and wetlands, including a section of the Rails to Trails.

RCH —The reach level assessment rates this segment as suboptimal to marginal. Bank
erosion and floodplain connection for the reach is rated as marginal. The floodplain
habitat and encroachment are also at a marginal level. The dominant substrates are
sand, gravel and cobble. There are no aquatic plants in the stream, and the water
surface is mostly shaded. There is evidence of bank scour along the reach. Issues
identified along this reach include stormwater outfalls, severe bank erosion, stream
crossings, and trash and debris.



- OT —A total of 10 stormwater outfalls were identified along this reach. A majority of the outfall pipes are smaller than 8 inches in diameter, appear to be residential foundation drains, and do not warrant further investigation. Several of the outfall pipes are associated with the roadway drainage system. There are two 2-foot diameter pipes along the left bank which do not have dry-weather discharge and are clean and not submerged. A black ABS pipe observed in the stream appeared to originate from a residence along Warren Avenue. A trickle of flow was observed from the pipe, and brown sediment accumulation was observed in the stream near the outfall. The source of this pipe and the nature of the potential discharge from the pipe should be investigated further.
- ER An area of bank erosion was observed along the left bank, measuring approximately 20 feet in length and 6 feet high. The erosion severity is moderate and there is good access to the bank from the residential areas north of Warren Avenue. This area is a potential candidate for bank stabilization.
- SC —There are two road crossings and a rail crossing along this reach. The stone blocks on the outside of the Rails to Trails culvert crossing are partially dislodged and in need of repair. The Tunnel Road stream crossing has debris partially blocking the outlet of the culvert. The outlet of a concrete box culvert located north of Warren Avenue is perched approximately 14 inches above the elevation of the stream bed and is a potential barrier to fish passage. This culvert is a potential candidate for fish barrier removal to address the perched outlet.



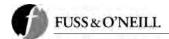


The Tunnel Road stream crossing (A) and the Rails to Trails crossing (B).

• TR — Four instances of trash and debris were noted along this stream segment. Three consist of minor quantities of yard waste, while the fourth consists of approximately 2 to 3 pickup truckloads of leaves, logs, tree stumps and tires. This stream segment is a potential candidate for a stream cleanup.

2.2.4 Walker Reservoir

Reaches assessed in this watershed include WR-01 through WR-05 (Figure 6). Land use in this watershed includes a former outdoor sports complex, a Connecticut Department of



Transportation (ConnDOT) commuter parking lot, the Interstate 84 and Route 31 interchange, and several residential areas. The water bodies along the stream reaches in this subwatershed, including Walker Reservoir East and West, receive upstream flow Gages Brook and the Gages Brook South Tributary, as well as runoff from Interstate 84, Route 31, and residential developments. Segments WR-03 and WR-05 were assessed on June 3, 2008, while the remaining segments were inventoried on June 4, 2008.

WR-01

This reach is located between Walker Reservoir West and Interstate 84, and receives flow from an upstream pond and the highway. The stream is braided and is surrounded primarily by forested land.

- RCH The reach is generally braided with a sandy bottom and a mostly-shaded stream surface. Channel widths were variable due to the braided nature of the stream, with the flow containing less than 25 percent of the channel width. Stream condition metrics in this reach are extremely poor with little habitat potential. Buffer metrics were somewhat better, with suboptimal (25-50 feet) width and mature forest vegetation. No notable floodplain was present.
- OT A drainage ditch outfall originating from Interstate 84 is present near the upstream end of the reach. The channel contained excessive debris that should be removed. There was no flow when it was observed.
- SC A stream crossing is present below Route 84. The 24-inch, steeply-sloped, corrugated metal pipe conveys flow from an upstream pond and reach WR-02 located north of the highway. The culvert is acting as grade control and has significant accumulated debris near its outlet. This reach also includes a chain link fence associated with the highway that has significant accumulated debris on the upstream side of the stream. The debris should be removed.

WR-02

This reach is located immediately upstream of the Interstate 84 culvert crossing and downstream of a pond, and situated at the southern end of the Mount Vernon Apartments.

- RCH This reach is mostly shaded with a variable bottom of gravel, sand, and cobble.
 In stream habitat and vegetative protection was generally marginal, with suboptimal bank stability and floodplain connection. Buffer and floodplain condition was generally suboptimal to marginal, with significant impacts from human activities and little habitat diversity.
- SC The Interstate 84 stream crossing described above is located at the downstream end of this reach. Generally, stream crossings separating reaches were considered to be associated with the downstream reach. However, the characteristics of the culvert inlet differ from the outlet; the upstream inlet is a 4-foot diameter pipe while the outlet is a 2-foot diameter pipe. A transition is suspected to occur at some point within the crossing.

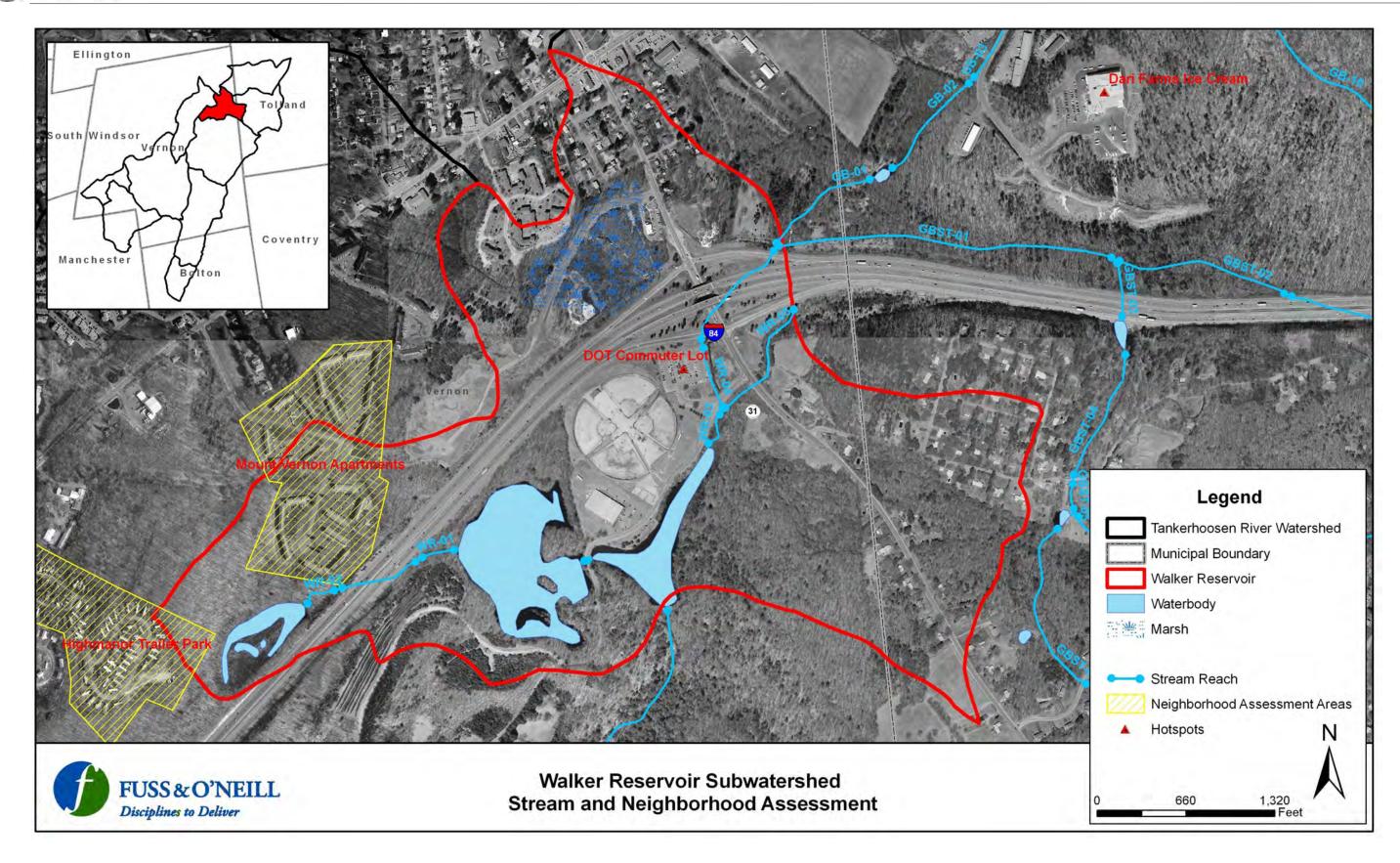


Figure 6. Walker Reservoir Subwatershed Field Aassessment Locations



WR-03

This stream reach connects Walker Reservoir East with reaches WR-04 and WR-05 and runs parallel to the east side of Reservoir Road, opposite the former outdoor sports complex.

- RCH This reach is mostly shaded and includes a bottom of fine material including silts, clays, and sand. The reach is variable in width and depth, but is generally well shaded. A variety of wildlife was observed, including fish, beaver, deer, snails, and birds. Evidence of channel widening and sediment deposition was observed. The overall stream condition is generally suboptimal, with the in-stream habitat, vegetated buffer width on the right bank and floodplain encroachment rated as marginal.
- SC —A 4.5-foot diameter circular metal pipe is located on the right bank near the upstream end of the reach. The culvert appears to originate from stream reach WR-04 and crosses under Reservoir Road.

WR-04

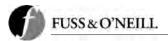
The stream reach WR-04 begins on the south side of Reservoir Road at the confluence of segments WR-03 and WR-05. WR-04 is a drainage ditch that flows parallel to the commuter parking lot between the Interstate 84 off-ramp at Exit 67 and Reservoir Road.

- RCH —Stormwater runoff from the commuter parking lot discharges directly into the stream through an outfall. The channel near the commuter lot contains significant invasive wetland vegetation (cattails and reed canary grass). The stream assessment rated this segment as generally suboptimal to marginal. The channel substrate is fine material including silt/clay and sands (sediment deposition). The water is observed to be turbid and there are some aquatic plants in the stream, which is partially shaded. The stream segment is readily accessible from the adjacent commuter parking lot.
- OT —The outfall that drains the commuter parking lot discharges to the stream through a 3-foot diameter concrete pipe. This outfall is a potential stormwater retrofit candidate to treat runoff from the parking lot.
- SC —Stream crossing SC-01 conveys flow below Reservoir Road and consists of a circular 4.5-foot diameter circular metal pipe. The pipe inlet is partially clogged with autumn olive and maintenance should be performed to remove the blockage. The second stream crossing in this segment, SC-02, is at the upstream end of the segment and crossed underneath the off-ramp for Exit 67 on Interstate 84. The culvert is circular with a diameter of 4 feet. There is evidence of sediment deposition, but otherwise the culvert is in good condition.

WR-05

Segment WR-05 is located between the confluence of WR-04 and WR-03 on the south side of Reservoir Road and the on-ramp for Exit 67 on Interstate 84. The stream flows in a southwesterly direction along this reach, crossing under Route 31 (Mile Hill Road).

• RCH —This segment is rated as suboptimal in the categories of in-stream habitat, vegetative protection and bank erosion, and rated as poor floodplain connection. The buffer conditions are generally marginal and there is extensive floodplain



encroachment. The surrounding land use includes public roads (Interstate 84 and Route 31) and a portion of the commuter parking lot. There is a small vegetated buffer along the stream corridor on the upstream portion of the stream segment, although beyond the buffer are cleared fields. The dominant substrates are sand and gravel, with limited cobble. There is evidence of fish, raccoon, great blue heron and Canada geese in the stream corridor. The stream has evidence of sediment deposition and portions have been channelized.

• OT —Stormwater outfall OT-01 is an earthen channel located on the left bank upstream of the Route 31 crossing. The channel originates from an adjacent residential property and was observed to have significant (3 to 4 feet deep) headcutting (erosion of the channel progressing upstream). A moderate flow of clear water was discharging from the channel at the time of the inspection. The property owner indicated that the source of the flow is groundwater seepage and surface runoff from upgradient areas. A discharge investigation is recommended, and this channel is a potential candidate for stream bank stabilization. The second outfall, OT-02, is a paved asphalt channel on the right bank, 8-inches deep and approximately 3 feet wide. The channel conveys road runoff.



Eroded channel and discharge from a residential property.

SC —Two stream crossings were identified along this reach. SC-01 is the stream
crossing underneath Route 31 (Mile Hill Road), and SC-02 is the culvert underneath the
on-ramp for I-84. Both crossings consist of twin concrete box culverts approximately 6
feet wide and 9 feet in height. Both have embedded bottoms. Sediment deposition was
observed in the stream channel at both locations, which is believed to originate from
Interstate 84 and channel erosion described above.





Twin box culvert along reach WR-05 underneath the onramp for I-84.

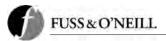
2.2.5 Gages Brook

A total of 2.2 stream miles were assessed in Gages Brook (Figure 7), including segments GB-01 through GB-10, during June 3 through 5, 2008. The primary land uses in this subwatershed include commercial development along Route 30, industrial uses associated with the Tolland Industrial Park, and residential and forested areas in the eastern portions of the watershed. The Gages Brook stream assessments performed for this study augment previous stream surveys performed by the North Central Conservation District in October 2007 between the Tolland Agricultural Center footbridge and Industrial Park Road West.

GB-01

This primarily forested reach of approximately 0.18 miles is the downstream-most reach of Gages Brook and extends from the Interstate 84 culvert crossing to the footbridge behind the Tolland Agricultural Center (TAC).

- RCH The reach was mostly shaded, with optimal habitat, and vegetation and floodplain characteristics ranging between suboptimal and marginal.
- OT Two outfalls were identified, both of which are believed to be drainage ditches
 associated with Interstate 84 located just upstream of the highway. Little discharge was
 present despite intermittent rain over the previous 1 to 2 days. The drainage ditches
 are potential candidates for stormwater quality retrofits.
- ER Two areas of severe bank erosion were identified. ER-01 included a 300-ft length of severe bank scour downstream of one of the outfalls described above. In a small section (30-40 feet), the stream was flowing mostly within an undercut section of the back, such that the channel bottom was mostly dry. ER-01 appeared to be located on private property and would be difficult to access. ER-02 included a 150-ft section of



undercut bank at a 90-degree bend where the stream enters CM-01. ER-01 may be located on State property but may also be difficult to access. While both areas of erosion are in need of restoration, limited site access may make bank stabilization impractical.

- CM —An approximately 200-foot long section of stream immediately upstream of the Interstate 84 crossing appeared to be straightened, disconnected from the floodplain, and modified to create a riprap-lined channel with trapezoidal cross section.
- TR A deposit of brush, logs, and disassembled fencing was observed immediately adjacent to the stream less than 100 feet downstream of the footbridge at the TAC grounds. The material should be removed during a stream cleanup.

GB-02

This reach of approximately 0.17 miles continues upstream from the TAC footbridge northeast to a transition from forest to old field. The reach is generally wooded with significant wetlands located in the floodplain.

- RCH The stream is mostly shaded with some evidence of sediment deposition. Instream habitat was marginal, with other in-stream metrics ranging from suboptimal to optimal. The reach includes a high-quality buffer and good floodplain connection, with associated metrics ranging from suboptimal to optimal.
- TR A small quantity of automotive debris was observed and should be removed. Access is difficult, although cleanup would be straightforward.



Trash and debris in stream segment GB-02

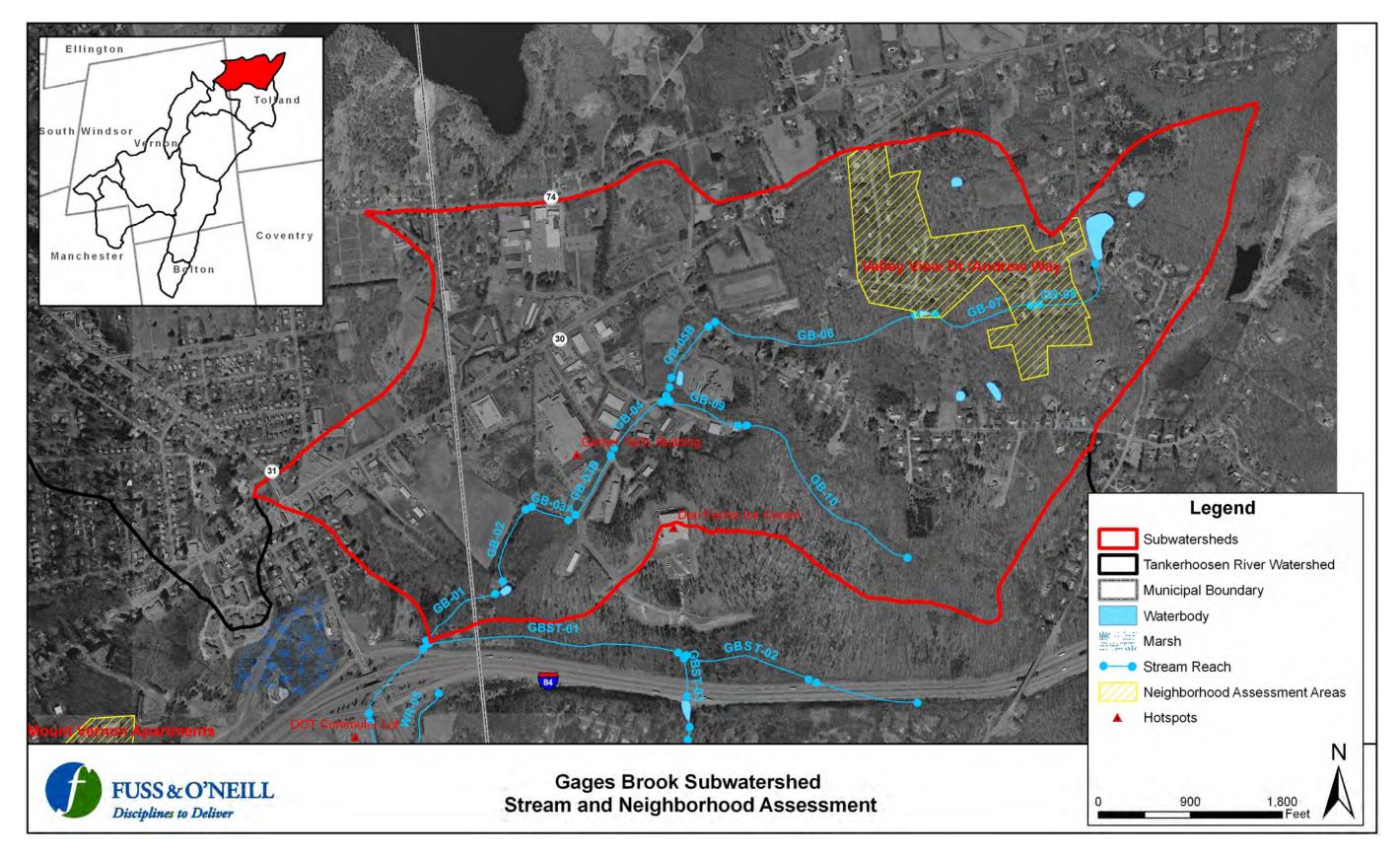


Figure 7. Gages Brook Ssubwatershed Field Assessment Locations



GB-03A

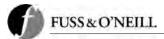
This reach begins where GB-02 emerges from the forest and extends east, with the forest to the south and the old field to the north, ending at Gerber Drive in the Tolland Industrial Park.

- RCH The reach is mostly shaded with old field to the right and forest to the left. Bed scour and bank scour were observed in some areas. Most stream, buffer, and watershed condition metrics were in the marginal to suboptimal range, with low-end marginal habitat and marginal floodplain connection. However, there was little floodplain encroachment, and the vegetated buffer was high-end suboptimal to optimal in condition.
- OT A wet stormwater basin associated with the industrial park discharges to the stream at the upstream end of the reach. Dense vegetation was growing in the riprap and erosion was present on the adjacent downstream bank in GB-03A
- ER An approximately 100-foot long area of bank scour was observed in a straight section of the right bank. The severity of the erosion was relatively minor and appeared to originate downstream of OT-01. Access to this area is fair, although it is likely in private ownership.
- SC A stream crossing is present below Gerber Drive and consists of two elliptical corrugated metal culverts. Fish passage may be difficult through these culverts due to shallow depth of flow during low-flow conditions.

GB-03B

This reach of approximately 0.14 miles runs parallel and adjacent to Gerber Drive between the crossings at Gerber Drive and Industrial Park Road West. The reach is located in a narrow, modified channel between the road/retaining wall and the parking lot of an adjacent industrial facility.

- RCH Stream condition metrics in this reach were generally suboptimal. Buffer and floodplain metrics were marginal to poor since significant encroachment is present on both sides of the stream. Artificial fish habitats (lunkers) were found along the stream banks, and fish were observed in the stream as well as evidence of raccoons and songbirds in the stream corridor.
- OT Four outfalls were present in this reach, including two paved asphalt swales ("leakoffs") directing surface runoff to the stream from adjacent parking lots, a 12-inch concrete pipe originating from the parking lot of an adjacent industrial facility, and a 24-inch concrete pipe suspected to be associated with the roadway drainage system. Significant trash was present at the outlet of one of the leakoffs.
- IB The majority of the stream reach has limited and highly impacted stream buffers. At the downstream end of the reach, a retaining wall is located along the top of the right bank, and industrial parking lots are located close to the left bank. Due to the limited area on both sides of the stream, there is low potential for stream restoration along this reach.





Concrete retaining wall adjacent to Gerber Drive along segment GB-03B

SC - The reach terminates at the Industrial Park Road West stream crossing, which consists of three 72-inch corrugated metal pipe culverts. The left barrel was slightly out of round. The majority of flow was through the left barrel; the bottom of the center barrel was dry, and the right barrel appeared to have some backflow. The flow depth in these culverts may be insufficient for effective fish passage during low-flow conditions. This crossing is a potential candidate for fish barrier removal. The inlet of the culverts was partially obstructed by brush and debris, which should be removed.

GB-04

Reach GB-04 is located between Industrial Park Road West and Industrial Park Road East. The reach includes numerous outfalls and significant sedimentation.

- RCH The reach is mostly shaded, although the buffer is significantly impacted on both sides. Stream condition metrics were generally within the suboptimal range, although poor floodplain connection was observed. The vegetated buffer width is suboptimal on the left and marginal on the right, and the vegetation quality is at the lower limit of the suboptimal range. Both the floodplain habitat and floodplain encroachment metrics were poor.
- OT Six outfalls were observed in this reach, originating from the industrial areas or associated roadways. These included an 8-inch corrugated metal pipe, a 6-inch plastic pipe, a 7-inch plastic pipe (OT-03) with some sediment deposition immediately downstream, a 12-inch concrete pipe draining a parking lot, a double 42-inch culvert that conveys roadway storm drainage, and a 24-inch concrete pipe conveying roadway drainage to the stream. The source of the sedimentation at OT-03 should be investigated.



• SC - This crossing includes triple 72-inch culverts below Industrial Park Road East. The depth in one pipe was approximately 6-12 inches, while the other two barrels were blocked with leaves, branches and sediment. The blockage should be cleared by removing the material.

GB-05A

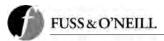
This reach continues upstream from GB-04 to GB-05B. The reach GB-05 was subdivided into two separate reaches because the confluence of GB-09 and GB-04 occurred a few hundred feet upstream of the location shown in the original mapping (the figure shows the updated reach segments).

- RCH This reach is mostly shaded with a gravel and cobble bottom, with some sedimentation and bank scour observed. In-stream habitat was optimal, with a mix of stable and naturally occurring substrate and habitat conditions. The majority of the remaining stream, floodplain, and buffer condition metrics were in the suboptimal range, although with marginal floodplain connection and encroachment.
- OT One outfall pipe was observed on the left bank just upstream of Industrial Park Road East and appeared to originate from an adjacent industrial area.

GB-05B

This reach extends from the confluence of GB-05A and GB-09 upstream to Old Post Road. The stream passes through the landscaped grounds of a technology company and much of the reach is unshaded. This reach may provide an opportunity for bank stabilization and stream buffer restoration, since it appears to be located on land owned by a single (although private) owner. Community garden plots were observed adjacent to the stream, and solar panels were being constructed on-site, indicating that the owner may be environmentally-motivated. A wet stormwater basin is located on the property between an on-site parking lot and the stream.

- RCH Stream condition metrics in this reach are generally suboptimal to poor, with
 little or no vegetative buffers, significant erosion problems, and little floodplain or
 floodplain connection. Water from the stream appears to be diverted through the onsite stormwater basin via a catch basin diversion structure. Buffer and floodplain
 condition metrics were marginal to poor, with narrow vegetated buffer width (10-25
 feet) floodplain vegetation consisting of turf, little or no wetland habitat, and significant
 floodplain encroachment.
- OT An 8-inch PVC outfall was observed originating from the on-site stormwater basin. Bank erosion and riprap was observed at the outfall. Some debris was present at the outfall, including pieces of plastic pipe.
- ER A significant area of bank erosion was observed in a bend in the stream. The erosive cut was approximately 5.5 feet in height and greater than 100 feet in length. This area is a potential candidate for stream bank stabilization.





Stream segment GB-05B showing limited vegetative buffer and a small footbridge crossing the stream.

• IB —Little or no vegetative buffer exists along the stream through the commercial/office building site. Mowed lawn borders much of the stream on both sides, and several footbridges have been constructed over the stream. This stream segment is a potential candidate for stream buffer restoration.



Stream segment GB-05B showing area of stream bank erosion.

SC - Two stream crossings were observed, including a 36-inch culvert below the facility access road and a 50-inch culvert below Old Post Road. Both culverts are perched on the downstream side approximately 2 to 4 inches above the bottom of the stream, and both have very shallow flow (less than 1 inch), which presents a barrier to fish passage.



The former appeared to be in good condition and the latter appeared to have been recently slip-lined. These culverts are potential candidates for fish barrier removal.

GB-06

This reach of approximately 0.4 miles in length continues from Old Post Road to a former pond located south of a residential subdivision on Valley View Drive.

- RCH The reach was mostly shaded with a bottom of gravel, cobbles, and boulders. Evidence of downcutting was present along much of the reach since many of the boulders were sharp-edged. In general, stream condition metrics were marginal or poor, with significant erosion, marginal vegetative protection, and marginal floodplain connection due to downcutting. Overall buffer and floodplain characteristics were generally suboptimal, with a relatively wide buffer of young forest and a mix of wetland and upland habitat.
- OT Three outfalls were present at the downstream terminus of the reach. These
 included 12-inch and 15-inch storm lines and a paved asphalt leakoff conveying
 stormwater runoff to the stream.
- ER Numerous areas of significant erosion were identified along this stream segment. Three areas of bank scour on the outside banks of bends were observed. One area included a low-head concrete dam where the stream eroded the abutment, creating a bypass channel around the structure. The last area included active downcutting ending at a nick point behind several residences at the terminus of the reach. These areas are potential candidates for stream bank stabilization.



Stream segment GB-06 showing area of stream bank erosion.



- IB—An impacted buffer was observed at the terminus of GB-06 near a footbridge on private property. Residential landscape vegetation (pachysandra) was observed growing up to the bank's edge.
- SC Three stream crossings were present in this reach, each of which likely prevents upstream fish passage. The first is located adjacent to Old Post Road at the downstream end of the reach. This crossing consists of an embankment such as a dam or railroad grade that does not include a culvert or opening. The stream appeared to be flowing through interstices in the embankment. The second crossing consisted of a dam with a total hydraulic drop of approximately 9 feet. The third crossing is a former road with a corrugated metal pipe culvert and a drop at the culvert outlet of approximately 5 inches. These crossings are potential candidates for dam removal and/or fish barrier removal.

GB-07

This reach of approximately 0.2 miles in length continues upstream to the east from GB-06 to Andrew Way. The stream corridor is generally forested, surrounded by residential development along Valley View Drive, Andrew Way, and Old Post Road.

- RCH The reach is mostly shaded with a bottom of cobbles and boulders. Typical
 channel dynamics include downcutting and bed scour. The reach is mostly shaded.
 Stream conditions were generally within the suboptimal to marginal range, while buffer
 and floodplain characteristics were generally optimal to the high end of suboptimal.
- IB —Similar to the residential encroachment observed in reach GB-06, an isolated area of pachysandra and lawn were present on both sides of the stream where the stream enters SC-01.
- SC This crossing includes an approximately 200-foot long, 24-inch concrete culvert below Andrew Way. A series of small drops (approximately 24 inches) were present downstream of the outlet. These drops were resulting from the boulders lining the channel. These drops and shallow flow in the culvert under low-flow conditions would likely limit upstream fish passage. This culvert is a potential candidate for fish barrier removal.

GB-08

This reach of 0.15 miles is the uppermost stream segment on Gages Brook, which is located between Andrew Way and a privately-owned pond situated north of Mountain Spring Road. The stream segment flows primarily through residential and forested areas.

- RCH This reach is mostly shaded with a sand and gravel bottom and a stable channel
 with little noticeable erosion. Stream condition metrics are within the suboptimal range
 in this reach, while buffer and floodplain connection generally are within the optimal
 and suboptimal ranges.
- OT An outfall was identified adjacent to a residence near the downstream limit of this reach. The outfall consisted of a 2.5-inch diameter PVC pipe with a screen projecting



over the water surface by approximately 6 inches. The pipe may be the outlet of a foundation or yard drain.

- IB Residences and lawn are located adjacent to the stream for approximately 300 feet on both sides of the stream near the downstream end of the reach.
- SC The upstream limit of this reach consists of a low-head dam with an outlet weir discharging directly to an 18-inch concrete culvert below Mountain Spring Road.
- TR An area of trash and debris was observed in the stream and buffer (right side) near the outlet of SC-01. Observed debris consisted of a tire, two 55-gallon drums (partially crushed with holes) and a bathtub. This debris should be removed and disposed of properly.

GB-09

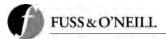
This 0.15 mile reach parallels an access road and industrial facility located at the end of Industrial Park Road East.

- RCH This reach has a gravel and cobble bottom, is mostly shaded, and has evidence
 of downcutting, bed scour, and bank failure. In-stream habitat is generally optimal to
 the high end of suboptimal. Buffer and floodplain characteristics are generally
 suboptimal to marginal due to the reach's incised nature and industrial land use along
 the left side.
- OT This reach includes two outfalls. The first is a paved asphalt leakoff from a
 parking lot paired with a 6-inch PVC outfall causing slight bank erosion. The other
 outfall, OT-02, is an 18-inch plastic pipe discharging from the direction of the industrial
 facility. There was significant iron staining around this outfall. The source of the
 discoloration should be investigated.
- SC A small dam is present in this reach, consisting of a weir with a drop of approximately 32 inches. Immediately downstream of the weir an area of soil has been undercut by the stream, forming a natural culvert, although one that is unlikely to significantly alter passage during low flow conditions.

GR-10

This reach of approximately 0.43 miles extends from the upstream limit of GB-09 into an extensive wetland complex where the stream originates in an area of groundwater seeps. This reach passes through a recently-constructed subdivision off of Old Post Road that does not appear on the aerial photos in the project mapping.

RCH - This reach is mostly shaded with a gravel and cobble bottom and included some
evidence of downcutting and sedimentation. The overall stream, buffer, and floodplain
conditions were in the optimal range for every metric. The majority of the stream is
surrounded by an extensive old-forest/wetland complex that is well connected to the
stream channel. There is little evidence of encroachment except at the subdivision
crossing.



- OT One stormwater outfall to the stream was identified. The outfall originates from a new subdivision road and discharges to a stormwater basin/constructed wetland. The basin contained a significant quantity of leaves and other sediment. Stormwater discharged to the buffer of the stream via overland flow and continued to the stream. There appeared to be potential for future erosion where overland flow is occurring. Two other stormwater basins associated with this subdivision were observed, but the outfall locations could not be identified.
- SC A new stream crossing was observed under the subdivision road, consisting of a 24-inch concrete pipe. A boulder was present below the flared-end outlet. The culvert outlet is perched several inches above the stream bed, and the depth of flow in the pipe was approximately 1-inch. Due to the headwater location of the culvert, upstream fish passage is unlikely to be an issue in this portion of the watershed.



New stream crossing on segment GB-10.

2.2.6 Gages Brook South Tributary

An unnamed tributary to Gages Brook (referred to as the Gages Brook South Tributary in this study) drains an area located south of the Gages Brook subwatershed. Reaches GBST-01 through GBST-04B and GBST-09A and GBST-09B were assessed on June 5, 2008, totaling approximately 1.3 stream miles (Figure 8). The subwatershed is bisected by Interstate 84 and contains forested and residential land uses.

GBST-01

This reach is approximately 0.5 mile in length and extends along Interstate 84 in an area that is otherwise relatively undeveloped.

RCH - The stream is well-shaded, has a cobble and gravel bottom, and was found to be
in optimal condition in terms of both overall stream, buffer, and floodplain
characteristics. Evidence of downcutting, sedimentation, and scour were observed in
some areas, but in general the reach is well-connected to the floodplain and appeared



to provide optimal wildlife habitat and vegetation conditions. Moss was observed on portions of the stream banks where erosion had occurred, indicating that the banks have since stabilized.

GBST-02

This reach of approximately 0.26 miles begins at its confluence of GBST-03 and continues upstream to the east generally running parallel to Interstate 84. The upstream end is a pair of culverts, one of which conveys the stream below Interstate 84 and the other which parallels the highway.

- RCH This reach includes a bottom of gravel, cobbles, and boulders and has portions
 that are downcut and channelized. This reach is mostly shaded and was evaluated to be
 in the suboptimal range for most stream condition metrics. However, vegetative
 protection of the banks was generally optimal, as was the vegetated buffer width,
 floodplain vegetation, and floodplain habitat in most areas. Encroachments on the
 stream's buffer and floodplain were limited to an area where the stream was
 channelized along Interstate 84.
- OT Several outfalls were identified along this reach. Each appeared to be associated with drainage from Interstate 84. Discharges were observed from both OT-02 and OT-03, and although rain fell the previous day. Significant sediment accumulation was observed at the outlet of OT-03 and SC-01. No discharge was present from OT-01, although significant erosion was present downstream of this outfall, which discharges approximately 300 feet from the wetland surrounding the reach. Minor bank erosion was observed downstream of OT-02.
- SC This stream crossing conveys the tributary below Interstate 84. The crossing is a concrete culvert several hundred feet long. The crossing is partially blocked by accumulated sediment.



Stream crossing (SC-01) below I-84 and outfall (OT-03) along reach GBST-02.

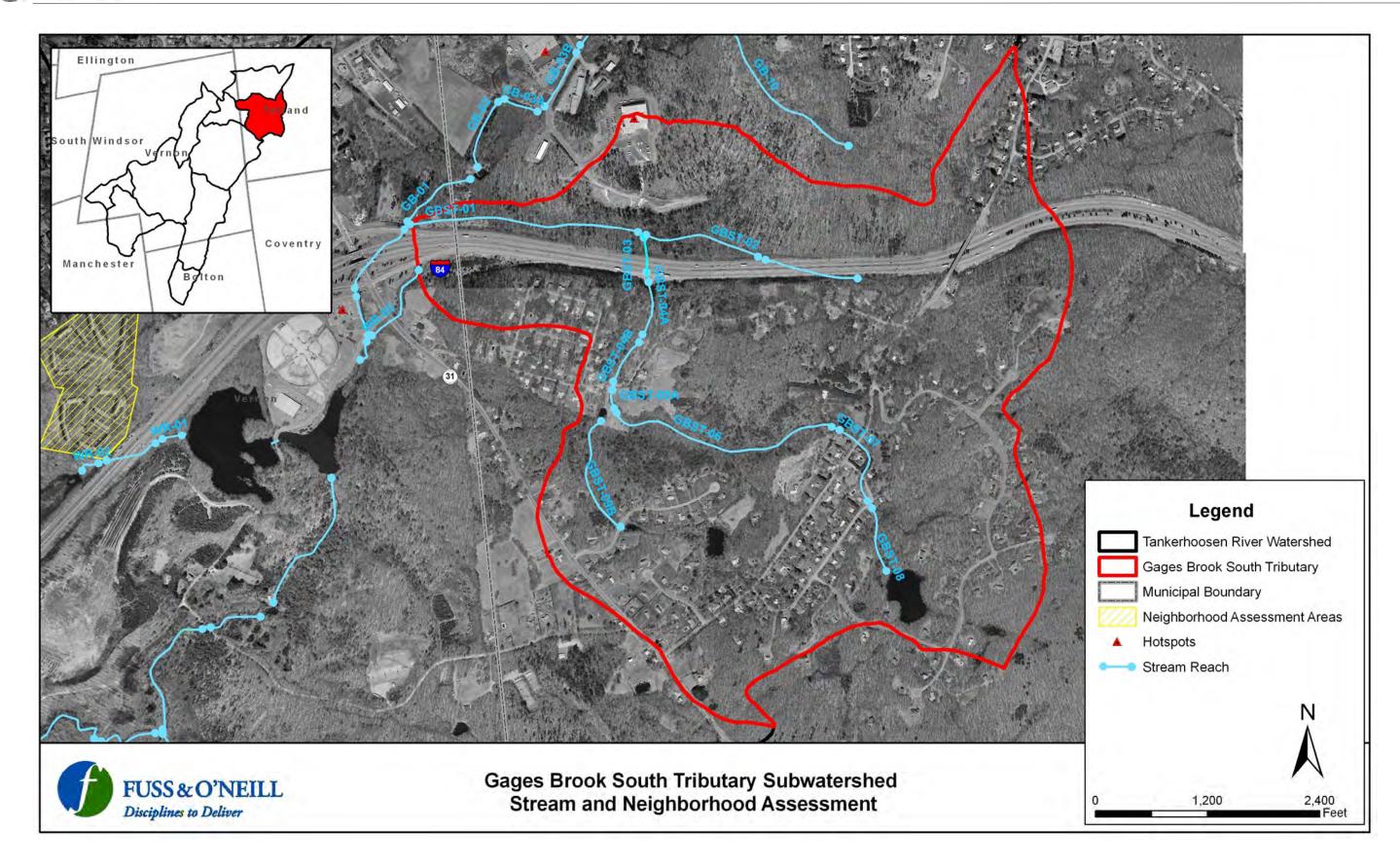
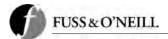


Figure 8. Gages Brook South Tributary Subwatershed Field Assessment Locations



 CM - The channel of GBST-02 has been modified significantly at the upstream end of the reach, which is channelized parallel to Interstate 84 for a length of approximately 700 feet. The channel is a uniform trapezoidal cross-section disconnected from a floodplain and lined with stone riprap.

GBST-03

This is a short reach located between GBST-01 and GBST-04A, which flows below Interstate 84.

- RCH The reach has a relatively steep bottom of boulders, cobble, and sand, and is
 well-shaded. Stream condition metrics are generally in the suboptimal range since some
 bank erosion was observed, and the area was generally well vegetated, although
 modification of the banks was evident. Buffer and floodplain condition metrics were
 generally suboptimal as well, although the floodplain appeared to be an even mix of
 wetland and non-wetland habitats with evidence of standing water (optimal) and to
 have significant encroachment (marginal).
- SC The stream crossing below Route 84 is a significant restriction to the upstream passage of fish. The 48-inch diameter concrete pipe has drop of approximately 4 feet at its outlet, and a series of boulders located downstream yield an additional stepped drop of approximately 10 feet. Additionally, the flow of water in the pipe was shallow. Despite these fish passage restrictions, this crossing is an unlikely restoration candidate since the pipe is below Interstate 84.

GBST-04A

This reach continues upstream from the Interstate 84 crossing to a small dam behind a residence. The field team observed a definitive break in stream and floodplain characteristics at this dam. The reach passes through an area of residential land use. Some evidence of downcutting was observed.

- RCH This reach is generally well-shaded and has a variable bottom with some silt and
 clay along the downstream portion and with cobbles and boulders upstream. The
 downstream portion appeared to be a pond that has filled with sediment. Stream
 condition metrics were all within the optimal range. Overall buffer and floodplain
 conditions were also optimal, although floodplain was only present in a limited area.
- OT A riprap drainage ditch along Route 84 discharges to the stream near its southern end.
- SC A low-head dam crossing the stream was defined as the upstream limit of this reach. The dam includes a drop of approximately 42 inches.

GBST-04B

This reach continues from GBST-04A to the downstream limit of GBST-06 and GBST-09. The reach passes behind several residences and includes a pond filled with sediment at its lower limit.



• RCH - This reach is mostly shaded with a variable bottom of generally fine material (silt/clay, sand, and gravel). In-stream habitat was marginal, and dense invasive vegetation was present on both banks. Floodplain connection was optimal, however, since the stream was not deeply incised and high flows could easily enter the floodplain.



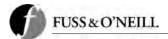
View of reach GBST-04B

- IB Impacted buffer was present near the downstream end of this reach. In this area, the left bank is forested, although the right bank is vegetated with turf, lawn, and shrubs. A single-family home was also located near the stream.
- SC The upstream limit of this reach is located at Loehr Road. The stream flows below the road through a 60-inch corrugated metal pipe. The pipe was deformed at the downstream end, but the invert was inundated by tailwater, indicating that fish passage may be possible.

GBST-09A

The downstream end of this reach is located at its confluence with GBST-06 prior to entering the culvert GBST-04B SC-01. The reach is short in length, receiving the discharge from a small privately-owned pond.

- RCH This reach includes a bottom of cobbles and boulders and appeared to be channelized. The reach is partially-shaded. Stream metrics were generally in the suboptimal to marginal range, although poor floodplain connection was observed. The channel has a buffer consisting of shrubs and brush. Little floodplain is present with poor habitat and connection to the stream.
- SC Two stream crossings are present in this reach. One (SC-01) includes double 16-inch HDPE culverts below an unpaved road. The culvert slope is relatively flat but has a shallow water depth that would be unlikely to allow fish passage. SC-02 includes the



dam for a small pond. The discharge of the pond could not be viewed, but is likely to be a significant barrier to fish passage.

GBST-09B

This reach begins from the inlet of the pond at the upstream end of GBST-09A and continues upstream to another pond located at the Tolland Farms Road residential subdivision.

- RCH The reach is mostly shaded with a bottom of gravel, cobbles, and boulders. The
 stream is downcut and has areas of bank failure and bank scour. As a result, stream
 condition metrics were generally within the suboptimal range, although floodplain
 connection was poor. The majority of the buffer and floodplain metrics were found in
 the optimal range, with ideal vegetated buffer of mature forest and very little floodplain
 encroachment, although floodplain habitat consisted of a mix of wetland and upland
 without ponded water (suboptimal).
- OT No outfalls were observed along this reach. However, stormwater runoff from the residential subdivisions on Tolland Farms Road, Deer Meadow and Reed Road is believed to ultimately drain to this reach of the Gages Brook South Tributary. The pond located upstream of Tolland Farms Road may provide some attenuation of peak flows and stormwater quality renovation for this upstream drainage area.
- ER Significant bank erosion was observed on the outside bank of two adjacent bends, each section of erosion being approximately 80 feet in length and 6 to 7 feet in height. This area is a potential candidate for bank stabilization, although site access is difficult in this area.
- SC Two stream crossings were observed along this reach. SC-01 included three 15-inch concrete pipes below an unpaved, likely privately-owned, road. The slope of the pipes is moderate, and a drop of approximately 5 inches is present on the downstream end, which is a barrier to fish passage. Limited access, private property ownership, and headwater location make this culvert a poor candidate for fish barrier removal. SC-02 is a 24-inch culvert below Tolland Farms Road. This culvert receives discharge from the control structure of the upstream pond.

2.2.7 Tucker Brook

Tucker Brook is a tributary of the lower Tankerhoosen River. The Tucker Brook subwatershed includes portions of Vernon and Manchester. The predominant land uses in the Tucker Brook subwatershed are residential and forested land. Reaches assessed in this subwatershed include TB-01, TB-02, TB-03, and TB-04 (Figure 9).

TB-01

This lower reach extends from the confluence with the Tankerhoosen River upstream to Brookview Drive. Partially demolished cement building foundations and stream crossings from demolished industrial-era infrastructure remain along the downstream portion of the stream. The upper portion of the reach has significant stream buffers, native vegetation, stream shading and flood plains.







Examples of impacted buffers along reach TB-01. A cement retaining wall (A) for the street and bridge on the right bank near the confluence with the Tankerhoosen River and partially demolished cement infrastructure along the banks (B).

- RCH —The reach is mostly shaded with native vegetation, has no attached or floating
 plants in the stream, and has a sand and cobble substrate bed. There is evidence of bed
 scour, bank failure and sedimentation along the reach. The overall stream, buffer and
 floodplain conditions are rated in the suboptimal range.
- OT —A 12-inch circular outfall pipe was observed on the right bank, although was not submerged and did not have flow. A possible earthen-type stormwater outfall was identified on the left bank which could collect storm drainage from the highway, but was not flowing during the assessment.
- ER —Bank failure and scour is present on the right bank along an approximately 50-foot meandering portion of the stream. The bank is currently stabilized by tree roots and other hanging woody debris. The bank appears to be stable.
- IB There is a bridge abutment on the right bank of Tucker Brook at the confluence with the lower Tankhoosen River. The Dobson Road overpass abutment extends approximately 40 feet upstream and is approximately 10 feet from the stream bank. The stream banks and riparian area along the downstream end of the reach at the confluence with the Tankerhoosen River lack a tree canopy; the stream is unshaded in this area. This area is a potential candidate for reforestation.

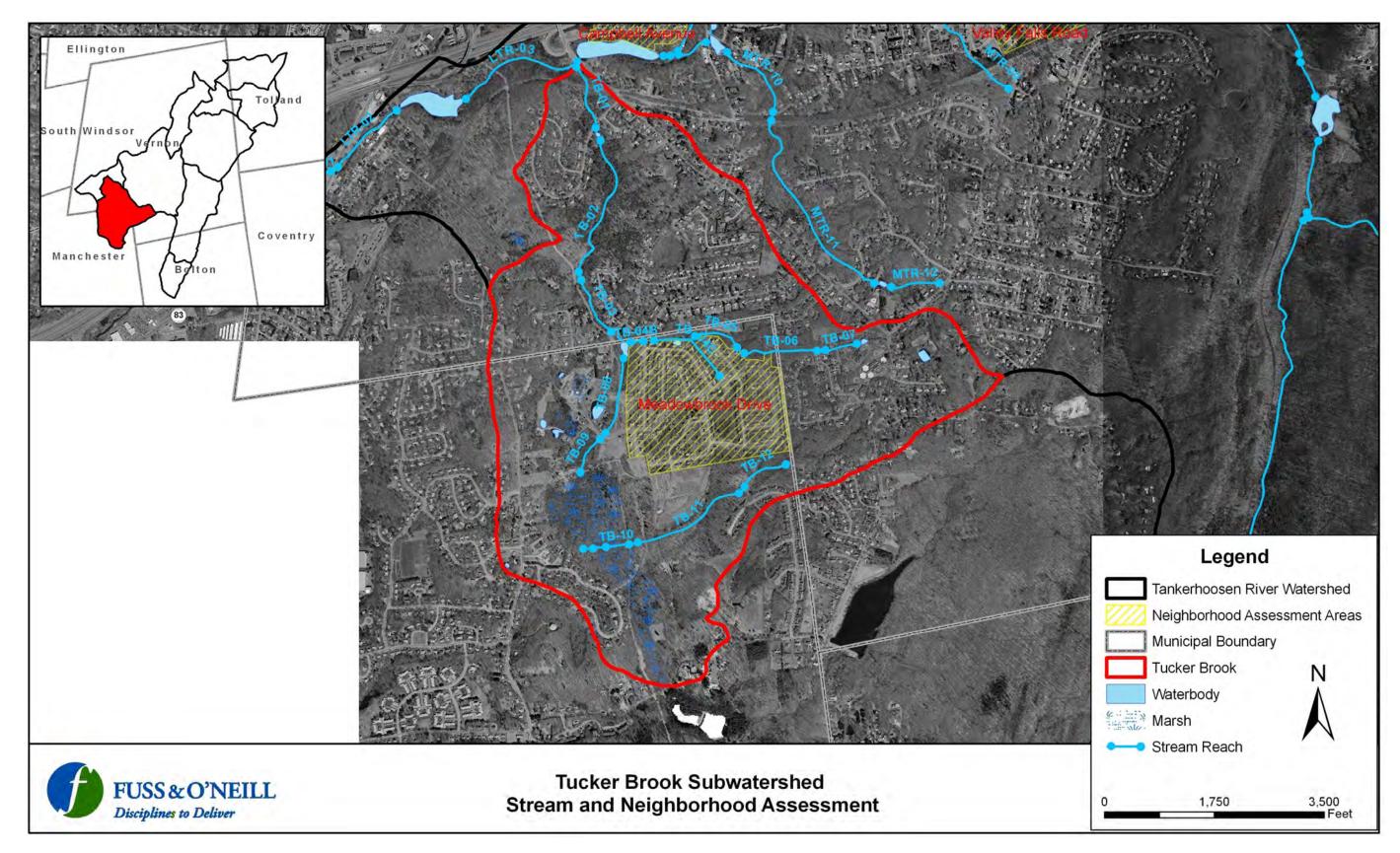
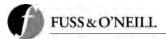


Figure 9. Tucker Brook Subwatershed Field Assessment Locations





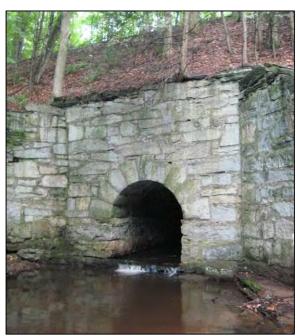
The left and right streambanks along the lower portion of Tucker Brook (foreground) at the confluence with the Tankerhoosen River (background) are potential candidates for reforestation.

• SC — Four stream crossings exist along this reach. SC-01 is an abandoned concrete abutment which was formally a road crossing. The stream crossing has a natural bed so is not an impediment to fish passage, although is a floodplain encroachment concern. SC-02 is a large arch-shaped railroad crossing constructed of stone which is approximately 125 feet long. The archway is in good condition but creates a barrier to fish passage and is suffering from downstream scour. SC-03 is an open-bottom box culvert with some evidence of downstream scour. The final stream crossing, SC-04, is at the upstream end of the reach and consists of a double barrel 6-foot concrete culvert below Brookview Drive. The circular culverts are in good condition although there is downstream pooling and scouring. The boulders placed in the stream for energy dissipation may serve as a barrier to fish passage. Crossings SC-03 and SC-04 are potential candidates for fish barrier removal.

TB-02

A reach level assessment was conducted for this section by examining characteristics of the downstream end, and not traversing the entire reach. The land use around this reach is forested, the stream is mostly shaded, the dominant bed substrate is sand and cobble, and the base flow is less than 25% of the channel width. The overall stream conditions are optimal for bank erosion and floodplain and suboptimal for instream habitat and vegetative protection. There is optimal buffer width along the stream and suboptimal floodplain characteristics.





Arch-type railroad crossing (SC-02) constructed of stone and extending approximately 125 feet. The crossing may prevent fish passage and is suffering from downstream scour evidenced by the large pool shown in the photograph.

TB-03

This stream segment is adjacent to a residential neighborhood (on Ironwood Drive) along the right bank and a gas pipeline corridor along the left bank.

- RCH Overall stream conditions in this section are rated marginal to suboptimal. The
 vegetative buffer limited due to the close proximity of private residential properties.
 The stream is flowing at almost 100% of the channel width, is mostly shaded, and has a
 variable bed substrate consisting of silt, sand, gravel and cobble. There is evidence of
 downcutting, aggrading, bank failure and scour.
- OT —A drainage outfall conveying roadway runoff is located at the upstream end of the reach near Phoenix Street. No dry weather flow was observed.
- ER Bank failure and scour were observed in several meanders along the right stream bank, totaling approximately 125 feet in length. A privately owned shed is located approximately 3 feet from the edge of the bank and is in danger of being damaged by further erosion. This site is a potential candidate for bank stabilization.
- IB —Three areas of buffer impacts were noted along this reach. IB-01 is on the right bank and approximately 50 feet long. Dense non-native vegetation associated with a residential backyard is growing on the stream bank. IB-02 and IB-03 are areas along the left stream bank with a reduced buffer resulting from vegetation clearing in the gas pipeline right-of-way.





This section of river is abutted by residential properties along the right bank and has an impacted buffer on this side of the stream from lawn vegetation and items such as this shed.

• SC —The first stream crossing, SC-01, consists of a small manmade dam constructed of boulders and cinder blocks. The dam is approximately 1 foot high and spans the width of the stream. SC-02 is a 48-inch concrete culvert below Phoenix Street. The crossing is in good condition and not a barrier to fish passage.

TB-04A

Stream segment TB-04 was further subdivided into three smaller segments based on field conditions at the time of the surveys. Segment TB-04A begins at the Phoenix Street crossing and ends approximately 500 feet upstream at a beaver dam.

 RCH —The reach level assessment revealed invasive species along the stream, a silt and sand-dominated bed substrate, and mostly shaded stream. There is marginal in-stream habitat, vegetative protection and floodplain characteristics. The bank erosion and floodplain characteristics are optimal due to low banks and wide floodplain. The buffer width is suboptimal because a pumping station and Phoenix Street are in close proximity to the stream.

TB-04B

Stream segment TB-04B is a short segment which begins at the boundary of the Meadowbrook Drive neighborhood and flows to the inlet of the pond created by the beaver dam. This stream segment is characterized by significant growth of invasive species. A stormwater basin associated with the adjacent residential subdivision discharges to this section of the stream.

• RCH — The reach level assessment characterized the stream conditions in this section as suboptimal to marginal due to a lack of vegetative protection along the banks, little in-stream habitat and some bank erosion. The overall buffer and floodplain condition ranges from poor floodplain habitat to suboptimal floodplain vegetation. There is some floodplain encroachment along the reach. The dominant substrate is silt/clay and gravel, and the water is naturally stained. The largest issue observed in the stream segment is the presence of invasive species which are growing over the stream.



- OT —Stormwater outfall OT-01 flows from the stormwater basin that serves the
 upland residential neighborhood. The outfall is a circular concrete pipe, 18 inches in
 diameter. Dry weather flow was observed, although the pipe is partially submerged in
 the stream. There is evidence of bank erosion at the outlet of the pipe and the
 basin appears to be in need of regular maintenance, including detailed
 inspection to further assess the condition of the basin.
- TR —A small amount of yard waste (TR-01) was observed along the right bank. The
 debris consists of grass and brush clippings.

TB-04C

Stream segment TB-04C continues through the Meadowbrook Drive subdivision, ending at a system of 6 culverts which cross under Meadowbrook Drive.

- RCH —The stream segment flows behind houses, often adjacent to the property line.
 The close proximity of the stream to these residences has resulted in numerous
 stormwater outfalls, impacted buffers, stream crossings, and occurrences of trash and
 debris in the stream.
- OT —There are five stormwater outfalls along this reach, ranging in size from 4 to 8inch diameter pipes. The outfalls appear to be associated with residential yard drains,
 foundation drains, or roof downspouts. All but one outfall pipe had dry weather flow at
 the time of inspection. The flowing outfall, OT-04, had a trickle of orange discharge,
 which may be naturally-occurring iron precipitate associated with groundwater
 discharge. A discharge investigation is recommended nevertheless to confirm the
 source of the discharge.



Outfall pipe originating from a residential property on the left bank of segment TB-04C.

• IB —There are two areas of stream buffer impacts along this stream segment. Both consist of residential lawn or scrub/shrub vegetation adjacent to the stream. Stream buffer restoration potential is limited due to private land ownership.



- SC —There are two manmade dams and one road crossing along this segment. The
 road crossing forms the upstream end of this segment, and consists of 6 metal arch
 culverts approximately 13 feet in diameter and 5 feet in height. The culverts extend
 approximately 70 feet in length under Meadowbrook Drive. The other two stream
 crossings are manmade dams; one is a stone dam that creates a pool and cascade
 downstream. The second dam creates a waterfall and redirects the stream sharply. Both
 dams are physical barriers to upstream fish passage and should be considered
 potential candidates for removal, although private land ownership may limit this
 potential.
- TR There are two instances of trash and debris along this segment. Both are piles of yard waste, including a tree that has been cut into logs and a pile of leaves and yard clippings.

2.3 <u>Upland Assessment</u>

Fuss and O'Neill conducted upland assessments in the Tankerhoosen watershed on July 16, 2008. The field observations assist in identifying pollution prevention and potential restoration opportunities at hotspot land uses and residential neighborhoods in the watershed. Factors that were considered when determining which hotspots and neighborhood areas to prioritize for assessment include:

- Stream condition (assessed during stream corridor inventory),
- Site proximity to the stream,
- Land use type and development density,
- Land ownership,
- Restoration potential.

The assessment framework was adapted from the Unified Subwatershed and Site Reconnaissance (USSR) method developed by the Center for Watershed Protection. USSR is a "windshield survey" evaluation method in which field crews drive and walk through areas of the watershed to quickly identify pollution prevention and restoration opportunities. The three major components to the upland assessments conducted in the Tankerhoosen watershed are: hotspots, residential neighborhoods, and streets and storm drains. Field data forms that were completed during the assessments are provided in Appendix B.

2.3.1 Hotspot Site Investigation

Hotspot site investigations were conducted for six representative sites with a high potential to contribute polluted stormwater runoff to the storm drain system and receiving streams. The purpose of the investigation was to qualitatively assess the potential for stormwater pollution from previously identified commercial, industrial, municipal or transport-related sites. The hotspot investigation was limited in scope to representative hotspot facilities in order to evaluate and illustrate common issues. The investigation was not intended to be an exhaustive review of all potential hotspot facilities in the entire watershed nor a detailed inspection or audit of each facility, which are beyond the scope of this study.



The hotspots examined in the field were located within the Lower Tankerhoosen River, Walker Reservoir, Clarks Brook, and Gages Brook subwatersheds. Representative priority hotspots were selected to cover a range of watersheds and land uses, including three industrial sites, one commercial site, one transportation-related site, and one state/municipal site. Sites are identified by the watershed abbreviation, followed by "HSI" and a numeric identifier. Table 5 summarizes the selected hotspots that were evaluated. Several of the sites that were investigated are privately owned, and field crews were unable to gain full access to the sites to closely evaluate the storm drainage and other site characteristics.

Table 5: Hotspot Site Investigation Summary

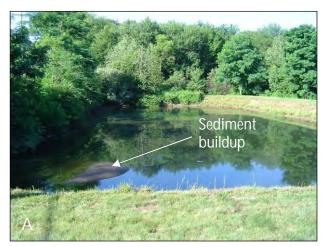
Site ID (Watershed)	Land Use Category	Description of Site Operations
GB-HSI-01 (Gages Brook)	Industrial	Industrial Park — Gerber Technologies Office Building
GB-HSI-02 (Gages Brook)	Industrial	Dari Farms Ice Cream Distribution Center
WR-HIS-01 (Walker Reservoir)	Transport-related	ConnDOT Commuter Lot
CB-HIS-01 (Clarks Brook)	Commercial	Superior Energy — Propane
CB-HIS-02 (Clarks Brook)	Industrial	Sand, gravel, construction storage/processing facility
LTR-HIS-01 (Lower Tankerhoosen River)	State/Municipal	ConnDOT Maintenance and Service Center

Gerber Technologies Office Building

The Gerber Technologies office building is located in the Tolland Industrial on Industrial Park Road West. The site is located adjacent to Gages Brook (see stream assessment discussion in Section 2.2.5). The office building has landscaped areas around the building with shrubs and turf lawn. The site is characterized by a large amount of impervious cover, consisting of building roof areas and parking lots. Approximately 100 vehicles were parked in the employee parking lots at the time of the inspection. Stormwater runoff from the site appears to discharge to the stormwater basin located near the southern limit of the site. The stormwater basin is a wet pond design containing a permanent pool of water and is approximately 70 feet wide by 140 feet long. The basin contained accumulated sediment captured from the site runoff. The basin outfall discharges to Gages Brook via a riprap spillway.

The stormwater basin that receives runoff from the Gerber Technologies facility incorporates many of the recommended elements to meet current stormwater quantity and quality design criteria. However, the basin is also in need of maintenance as demonstrated by the sediment accumulation near the center of the basin and the overgrown woody vegetation at the overflow spillway. Existing stormwater basins such as this one may also be good retrofit candidate to improve treatment effectiveness by incorporating a sediment forebay at the basin inlet, which may also facilitate routine sediment removal.







Stormwater basin at the Gerber Technologies facility on Industrial Park Road West. Sediment has built up near the center of the basin (A) and the basin overflow spillway is overgrown with vegetation (B).

Dari Farms Ice Cream Distribution Facility

The Dari Farms distribution facility is also located in the Tolland Industrial Park on Research Way/Gerber Drive near the divide between the Gages Brook and Gages Brook South Tributary subwatersheds. The facility is estimated to be less than 5 years old, as evidenced by the facility's modern pollution prevention site design elements including a covered fueling station, no visible outdoor storage of materials, and well maintained landscaping on the grounds. Possible pollution sources to the storm drainage system are the runoff from the large impervious areas on the site (the roof and parking areas) and potential vehicle fluids from truck fueling activities and employee vehicles. It could not be determined whether stormwater is managed on-site, by the downgradient stormwater basin near the Gerber Technologies facility, or both. The site did not appear to incorporate Low Impact Development (LID) design features such as vegetated swales or parking lot bioretention. New commercial/industrial facilities with significant impervious area, such as this one, are potential candidates for on-site LID and stormwater treatment practices to reduce runoff volume and pollutant loads.



The Dari Farms Ice Cream Distribution Facility has a covered fueling station and landscaped grounds (shown in the foreground).



ConnDOT Commuter Parking Lot

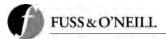
The hotspot investigation included the Connecticut Department of Transportation commuter parking lot at exit 67 of Interstate-84, which is located in the Walker Reservoir subwatershed (see stream assessment discussion in Section 2.2.4). Approximately 150 vehicles were parked at the lot during the site visit, which occurred on a weekday during mid-day. The site is contains significant impervious cover and high-intensity vehicle usage and is therefore a source of automobile-related stormwater pollutants including hydrocarbons, sediment, and metals. The entire parking lot drains to a double catch basin located on the southeastern side of the lot. The catch basin discharges through a short wetland corridor and subsequently to the stream segment located upstream of Reservoir Road and Walker Reservoir East. An easily accessible grass strip exists between the paved lot and the adjacent wetland and stream corridor. This site is a potential stormwater retrofit candidate (bioretention or water quality swale) to encourage infiltration and provide additional treatment for the parking lot runoff.



The southeastern side of the Interstate 86 Exit 67 commuter parking lot showing the edge of the lot on the left side of the photograph and the wetland corridor on the right side. The center of the photograph shows the easily accessible and open area for a potential stormwater retrofit.

Superior Energy

Superior Energy is a propane gas and related equipment distributor located on Hartford Turnpike (Route 30) in Vernon. The site is located within the Clarks Brook subwatershed (see stream assessment discussion in <u>Section 2.2.1</u>) near the headwaters of Clarks Brook. The property consists of a retail store, a paved parking lot for delivery trucks, and outdoor storage of propane tanks. It is unknown if vehicle maintenance or fueling occurs on-site. As described previously, the site appears to have been modified in the past through grading/filling based on an inspection of the existing site drainage and discussions with facility personnel. This site should be further investigated to better define potential impacts of the historical filling, current drainage issues, and plans for additional site development.

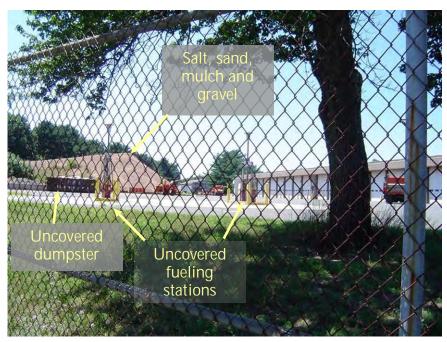


Sand & Gravel Facility

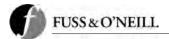
The facility is located on Clark Road at the western end of Industrial Park Road and near the western limit of the Clarks Brook subwatershed. Facility operations appear to include storage and processing of sand, gravel and other construction materials. The site contains one building, which is assumed to be an office and/or maintenance area. The majority of the site consists of an unpaved yard used for the storage of sand and gravel piles and equipment to process the materials and load transport vehicles. The site contains numerous potential sources of sediment and other pollutants associated with the sand and gravel stockpiles, heavy equipment and vehicles, waste construction materials stored outdoors, and pipes and debris in the yard. Sand and gravel operations such as this should employ stormwater pollution prevention practices and source controls as required by the DEP General Permit for Stormwater Discharges Associated with Industrial Activity, in addition to stormwater treatment practices to reduce sediment and hydrocarbon loadings in site stormwater runoff.

DOT Maintenance Service Center

The State of Connecticut operates a Department of Transportation Maintenance Service Center for District #1 located on Campbell Avenue in Vernon, which is located in the Lower Tankerhoosen River subwatershed. The facility has an office building, garages for vehicle storage and maintenance, a small parking lot, outdoor storage of sand, salt, gravel and mulch, and an uncovered outdoor fueling station. Vehicle maintenance activities and outdoor vehicle fueling are potential sources of stormwater pollution, in addition to the outdoor stockpile storage. A rolloff dumpster was observed to be overflowing and uncovered at the time of the windshield survey. Municipal and state-operated highway maintenance facilities such as this should employ source controls, pollution prevention, and stormwater treatment practices as necessary in accordance with the DEP General Permit for Stormwater Discharges Associated with Industrial Activity.



ConnDOT District #1 Maintenance Service Center, Campbell Avenue



2.3.2 Neighborhood Source Assessment

Stormwater runoff from existing residential neighborhoods and future residential development in the watershed is an important consideration for this study, since approximately 40 percent of the Tankerhoosen River watershed consists of residential land use and future buildout of the watershed could result in conversion of an additional 10 percent of the watershed to residential land use. Neighborhood source assessments were conducted on July 16, 2008 to evaluate pollution source areas, stewardship behaviors, and residential restoration opportunities within individual residential neighborhoods throughout the watershed. The residential behaviors that contribute to stormwater quality were assessed by considering the following source areas for "average" neighborhoods throughout the subwatershed:

- Yards and Lawns;
- Driveways, Sidewalks, and Curbs;
- Rooftops;
- Common Areas.

Neighborhoods were selected for assessment based on their proximity to stream corridors and their overall potential to contribute pollutants to the stream. The selected neighborhoods include a variety of residential types, including low- and high-density single-family residential and multi-family residential (apartments and condos). One field sheet was completed for each neighborhood assessed. The selected neighborhoods are located in the Tucker Brook, Lower Tankerhoosen River, Clarks Brook, Walker Reservoir, and Gages Brook subwatersheds, as summarized in Table 6.

Each neighborhood was assigned a score for pollution severity and restoration potential. Pollution severity is a measure of how much nonpoint source pollution a neighborhood is likely generating based on easily observable features such as lawn care practices, drainage patterns, oil stains, etc. Restoration potential is a measure of the feasibility of on-site retrofits or behavior changes based on available space, number of opportunities, presence of a strong homeowners association, and other factors.

Table 6: Neighborhood Source Assessments Conducted in the Tankerhoosen River Watershed

Neighborhood/Subdivision Name	Subwatershed	Residential Type	Pollution Severity	Restoration Potential
Mount Vernon Apartments	Walker Reservoir	Multi-family	Moderate	Moderate
Campbell Avenue	Lower Tankerhoosen River	High-density, single- family	Moderate	Low
Valley View Drive/Andrew Way	Gages Brook	Medium-density, single-family	None	Low
High Manor Mobile Home Park	Clarks Brook	High-density, single- family	Moderate	Moderate
Meadowbrook Drive	Tucker Brook	Medium-density, single-family with open space areas	None	Low



Mount. Vernon Apartments

The Mount Vernon apartments are a 33-acre multi-family housing complex situated between Hartford Turnpike (Route 30) and Interstate 84 in the Walker Reservoir subwatershed. The apartments are served by outdoor surface parking lots in front of each building. Site imperviousness is estimated at approximately 50 percent. Runoff downspouts are connected directly to the site stormwater drainage system, and parking areas are served by traditional curb and gutter drainage. The complex is generally well-maintained, with generally clean gutters, catch basins, and parking areas. Some oil staining was observed on the pavement within individual parking stalls. The overall pollution severity is rated as moderate due to the large amount of directly connected impervious area and potential pollutant sources from parking areas. This site is a potential retrofit candidate to reduce stormwater runoff from the site, including disconnecting downspouts from the storm drainage system and redirecting them to pervious grass areas, rain barrels/cisterns, and rain gardens. Multi-family parking lots, such as the parking lots at this complex, may also be good candidates for stormwater retrofits. The following photograph depicts an existing landscaped area adjacent to the parking lot that could potentially function as a bioretention/rain garden.





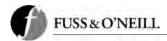
The Mount Vernon apartment complex buildings showing clean and well-maintained parking areas and landscaping (A) and a landscaped area that has the potential to be used as a rain garden (B).

Campbell Avenue

The Campbell Avenue residential development is a 13-acre neighborhood of single family homes on approximately ¼ acre lots. The neighborhood is located off of Dobson Avenue and is situated between Interstate 84 and the ConnDOT Maintenance Service Center to the north and Dobsonville Pond to the south. The age of the neighborhood is estimated as approximately 50 years. Almost none of the homes has a garage, and nearly all have impervious driveways connected to the street curb and gutter drainage system. No on-site or centralized stormwater management practices were observed, other than curb and gutter drainage. Most of the homes have downspouts that are directed to pervious lawn areas near the house. Landscaping practices were minimal. This type of older, high density single family residential neighborhood has limited potential for stormwater retrofits due to limited land area.

Valley View Drive/Andrew Way

The Valley View Drive/Andrew Way neighborhood is approximately 55 acres in size and located near the headwaters of Gages Brook. The neighborhood is approximately 25 years old



and consists of single family homes occupying approximately 1-acre lots. Most of the homes have garages and a high percentage of the lots are covered by lawn (60%) and landscaped areas (20%). The subdivision is served by traditional curb and gutter drainage. No centralized stormwater management measures were observed. Approximately three quarters of the roof downspouts are connected to adjacent pervious areas. Overall, the neighborhood was rated as having low pollution potential and limited potential for stormwater retrofits.



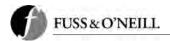
A typical lot in the Valley View Drive/Andrew Way neighborhood.

High Manor Mobile Home Park

High Manor Mobile Home Park is an approximately 28-acre neighborhood located in the Clarks Brook subwatershed, situated between Route 30 and Interstate 84. The park is believed to have been developed in the 1970s. The average lot in the neighborhood has approximately 40 percent impervious cover, including the home and driveway, 40 percent grass cover, and 20 percent landscaped area. Approximately 90 percent of the homes have roof downspouts that discharge to lawns. The streets have traditional curb and gutter drainage, and storm drain inlets were observed to be clean. No centralized stormwater management measures were observed.



A street view of the High Manor Mobile Home Park showing turf lawns with some mature trees on the properties.



Meadowbrook Drive

The Meadowbrook Drive neighborhood is an approximately 100-acre residential neighborhood in the northeast corner of Manchester. The neighborhood is situated in the central portion of the Tucker Brook subwatershed, and Tucker Brook flows partially through and along the north and west sides of the development (see stream assessment discussion in Section 2.2.7). The subdivision is estimated as approximately 10 years old, and the average lot size for the single family homes in the subdivision is approximately ½ acre. All of the homes have garages. The driveway, sidewalks and curb areas are clean and dry. A majority of the homes have roof downspouts that discharge to pervious lawn areas. The street storm drains are stenciled. An approximately 1-acre wet stormwater basin near the corner of Yale and Chatham Drives receives runoff from the subdivision storm drainage system. The basin outlet discharges to Tucker Brook. At the time of the inspection the stormwater basin outlet was observed to be overgrown with vegetation, and stream bank erosion was observed at the outfall to the stream. As noted in Section 2.2.7, the basin appears to be in need of regular maintenance. Buffer encroachment, stream crossings, residential drain outfalls, and yard waste dumping were common in residential areas along the stream corridors in this subdivision.





Typical conditions in the Meadowbrook Drive neighborhood showing landscaping, lot sizes, and general cleanliness.

2.3.3 Streets and Storm Drain Assessment

Urban streets and storm drains can be a source of stormwater pollutants if not maintained on a regular basis. The condition of the local road and storm drain infrastructure can be assessed to determine if existing maintenance practice could reduce pollutant accumulation. Selected streets and storm drains were assessed during the upland field inventories conducted on July 16, 2008. Most of the streets and storm drains that were assessed are located in or near hotspot or neighborhood source assessment locations. Findings of the street and storm drain assessment are summarized below. Photographs of the storm drains and the street conditions evaluated are provided as <u>Table 7</u>, and the completed field forms are included in <u>Appendix B</u>.



Table 7: Streets and Storm Drain Assessment Photographs

Location	Storm I	Drains	Streets
Campbell Avenue			
Mount Vernon Apartments			
Valley View Drive/Andrew Way			
High Manor Mobile Home Park			
Gerber Technologies			
Clark Road Industrial Park			[No photo]



Most of the streets were clean, free of sediment and debris, and in good condition. The one exception is Industrial Park Road in the Clark Road Industrial Park where roads were observed to be in poor condition (cracked, broken, and sediment accumulation). Storm drains along Industrial Park Road were also partially obstructed with sediment, leaves, trash, and one of the catch basins had standing water above the elevation of the stream water surface, indicating blockage of the outlet pipe. Many of the inspected catch basins had varying degrees of sediment accumulation and nearly all could benefit from increased clean-out and street sweeping. With the exception of the Meadowbrook Drive subdivision in the Tucker Brook subwatershed, none of the storm drains observed during the field assessments were stenciled.

3.0 LAND USE REGULATORY REVIEW

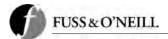
3.1 Introduction

Municipal land use regulations control patterns of new development and redevelopment and can play a significant role in protecting water quality and other natural resources in a watershed. These commonly include local plans of conservation and development, zoning regulations, subdivision regulations, inland wetland regulations, and stormwater regulations, all of which influence the type and density of development that can occur within a watershed. Local land use regulations often vary by town within a watershed, and regulations are periodically revised in response to development pressure, shifts in attitude toward natural resource protection, and political and socioeconomic factors.

A key element in the development of a Watershed Management Plan is to identify potential land use regulatory mechanisms (i.e., new or modified land use regulations) that can be implemented by the watershed towns to strengthen existing land use controls and better protect natural resources within the watershed. Many Connecticut communities are in the process of developing new or modified land use regulations that incorporate Low Impact Development (LID) and related stormwater management approaches to address stormwater quantity and quality objectives. Communities in urbanized areas are also faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl. An opportunity exists for the watershed towns to develop revised and/or new regulatory mechanism to satisfy Phase II stormwater requirements, while also protecting water quality and other natural resources in the Tankerhoosen River watershed.

This section summarizes the following information:

- 1. Existing municipal land use planning entities and regulations for each of the watershed communities based on information obtained from a land use questionnaire conducted by the North Central Conservation District in 2005 as part of the *Hockanum River State of the Watershed Report* (Fuss & O'Neill, 2005). The information was updated where necessary to reflect current conditions.
- 2. Existing land use regulations and related planning documents that pertain to stormwater management and natural resource protection issues, as well as potential approaches for developing regulatory mechanisms to incorporate improved stormwater



management, including LID concepts and opportunities to reduce impervious cover, into the local land use regulations. The regulatory review was performed for the towns of Tolland and Vernon because they comprise the majority of the land area in the Tankerhoosen River watershed and have the greatest potential for future development.

3.2 <u>Summary of Municipal Land Use Planning Entities and Regulations</u>

The 2005 land use questionnaire provided information from the watershed municipalities on the current land use regulations in each town, including information on wetlands and watercourses regulations, zoning regulations, plans of development, open space planning, and stormwater regulations. The following paragraphs summarize information obtained from the questionnaire.

Local land use regulations are administered by various Town commissions, boards, and agencies. Land use commissions in the Tankerhoosen River watershed communities are summarized below (Table 8).

Table 8: Tankerhoosen River Watershed Land Use Commissions

Town	Land Use Commissions
Manchester	 Planning and Zoning Commission (acts as Inland Wetlands and Watercourses Agency) Zoning Board of Appeals
Vernon	 Planning and Zoning Commission Inland Wetlands and Watercourses Agency Conservation Commission Design Review Board Open Space Task Force
Tolland	 Planning and Zoning Commission Inland Wetlands and Watercourses Commission Conservation Commission Design Advisory Board
Bolton	 Planning and Zoning Commission Inland Wetlands Commission Conservation Commission Open Space Preservation, Acquisition, and Conservation Committee

Source: Hockanum River — State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

<u>Table 9</u> summarizes the current plan of development, subdivision, inland wetlands, zoning, floodplain management, and stormwater regulations for the watershed towns. The table lists the last revision date for the applicable land use regulations.

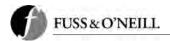


Table 9: Municipal Land Use Regulations

Regulation	Manchester	Vernon	Tolland	Bolton
Plan of Development	2004	2001	1999	1990
Subdivision Regulations	2005	2007	2008	2004
Wetlands Regulations	2007	2006	2007	2006
Zoning Regulations	2008	2006	2008	2005
Floodplain Management	1994	In Zoning Regs.	None	2005
Stormwater Regulations	2004 Connecticut Stormwater Quality Manual	In Zoning Regs.	2008 (LID)	2004

Source: Hockanum River — State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

Inland Wetlands & Watercourses

Regulating activity with the potential to affect wetlands and watercourses is an essential component in preserving or improving the water quality and overall health of the Tankerhoosen River. In Connecticut, the Inland Wetlands and Watercourses Act requires that each municipality establish an Inland Wetlands and Watercourses Agency or Commission and local regulations regulating private and municipal work located in or affecting wetlands or watercourses. Each of the surveyed watershed towns has an inland wetlands agency, and each town has defined an upland review area, or distance from wetlands and watercourses that is subject to review. Three of the four watershed towns indicated that they have identified wetlands or watercourses that are impaired or that require restoration or require special protection. Table 10 summarizes the regulating agencies, upland review areas, and identified wetlands and watercourses of special significance for the surveyed watershed towns.

Table 10: Inland Wetlands and Watercourses Regulations

Town	Regulating Agency	Upland Review Area	Wetlands and Watercourses of Special Significance
Manchester	Planning & Zoning Commission	50' wetlands and watercourses	None identified
Vernon	Inland Wetlands & Watercourses Agency	100' wetlands 200' designated watercourses	 Vernal pools on Box Mountain Road Tankerhoosen River Hockanum River Belding Preserve and Wildlife Management Areas
Tolland	Inland Wetlands & Watercourses Commission	50' wetlands 100' watercourses	Preliminary*



Town	Regulating Agency	Upland Review Area	Wetlands and Watercourses of Special Significance
Bolton	Inland Wetlands Commission, Conservation Commission	100' wetlands and watercourses	Yes*

Source: Hockanum River —State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

Stormwater Management and Soil Erosion and Sediment Control

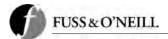
Development of the landscape with impervious surfaces can alter the hydrology of a watershed and has the potential to adversely affect water quality and aquatic habitat. As a result of development, vegetated and forested land that consists of pervious surfaces is largely replaced by land uses with impervious surfaces. This transformation increases the amount of stormwater runoff from a site, decreases infiltration and groundwater recharge, and alters natural drainage patterns. Natural pollutant removal mechanisms provided by on-site vegetation and soils have less opportunity to remove pollutants from stormwater runoff. During construction, soils are also exposed to rainfall, which increases the potential for erosion and sedimentation. Development can also introduce new sources of pollutants from everyday activities associated with residential, commercial, and industrial land uses.

Stormwater runoff both during construction and following completion of construction for new development and redevelopment projects is regulated at the local and state levels. All of the watershed towns have erosion and sediment control regulations as mandated by the Soil Erosion and Sediment Control Act. Most Connecticut municipalities have adopted regulations requiring that a soil erosion and sediment control plan be submitted with any application for development within the municipality when the disturbed area of such development is more than one-half acre. Projects that disturb greater than 5 acres of land are subject to regulation under the DEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities. This permit applies to discharges of stormwater and dewatering wastewaters from construction activities including, but not limited to, clearing, grading, and excavation that result in the disturbance of 5 or more acres of total land area on a site. Pursuant to Phase II of the NPDES Stormwater Program, construction activities disturbing between 1 and 5 acres have been delegated by DEP to the municipalities provided that the erosion and sediment control plan is reviewed and receives approval from the town, under the Soil Erosion and Sedimentation Control Act.

Post-construction stormwater quantity and quality are also regulated by the watershed municipalities through municipal planning and zoning and inland wetlands and watercourses regulations. All of the watershed towns are subject to the requirements of the NPDES Phase II stormwater program, which is regulated under the DEP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 General Permit). The MS4 General Permit regulates the quality of municipal stormwater discharges and requires the creation of a Stormwater Management Plan that addresses the following six minimum control measures:

1. Public education and outreach on storm water impacts required throughout the entire municipality;

^{*}Information available from the individual towns.



- 2. Public involvement/participation required throughout the entire municipality;
- 3. Illicit discharge detection and elimination required throughout the entire municipality including mapping all storm water discharges from a pipe or conduit with a diameter of 15 inches or greater (or equivalent cross-sectional area) owned or operated by the municipality;
- 4. Construction site storm water runoff control required throughout the entire municipality;
- 5. Post-construction storm water management in new development and redevelopment; and
- 6. Pollution prevention/good housekeeping for municipal operations.

The DEP *Connecticut Stormwater Quality Manual* provides guidance on the measures necessary to protect the waters of the State of Connecticut from the adverse impacts of post-construction stormwater runoff. It is intended for use as a planning tool and design guidance document by the regulated and regulatory communities involved in stormwater quality management in Connecticut. The manual provides uniform guidance for developers, engineers, and review agencies on the selection, design, and application of stormwater control measures. All of the watershed towns in the Tankerhoosen River watershed have indicated that they use the stormwater manual in reviewing development proposals for stormwater management issues.

The Town of Tolland recently (February 2008) amended its zoning and subdivision regulations to require that Low Impact Development (LID) techniques be implemented on all development to protect high quality wetlands, watercourses, open water bodies and other sensitive areas from the impacts of point and nonpoint sources of stormwater due to land development projects. Tolland also developed a companion LID design manual.

Open Space

Open space plays a critical role in protecting and preserving the health of a watershed by limiting development and impervious coverage, preserving natural pollutant attenuation characteristics, and supporting other planning objectives such as farmland preservation, community preservation, and passive recreation. Open space includes preserved natural areas as well as lightly developed parks and playgrounds. While approximately 40 percent of the Tankerhoosen River watershed consists of undeveloped land uses, much of this land is not considered open space because it may be privately owned and ultimately developed. Protected open space areas include deeded open space that is privately owned, parcels owned by land trusts, state and federally-owned land, land owned by water companies, and municipal park land. Such land is protected against future development. Each of the watershed towns has prepared an open space plan for their respective communities (Table 11).



Table 11. Status of Municipal Open Space Plans in the Tankerhoosen River Watershed

Town	Open Space Plan
Manchester	2004
Vernon	2002
Tolland	2006
Bolton	2004

Source: Hockanum River — State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

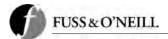
In addition to the designation of protected open space through donation, purchase of land by a town, conservation or land trusts, or other private and/or public agencies, towns also require that some land be dedicated as open space with the development of new subdivisions. The subdivision regulations of all of the towns in the Tankerhoosen River watershed require the set aside of a percentage of new subdivisions as open space, and all but Manchester have provisions for fee-in-lieu-of open space. <u>Table 12</u> summarizes responses from the surveyed watershed communities regarding their current open space regulations.

A majority of the surveyed watershed towns also allow "cluster development" and "open space subdivisions" in their subdivision regulations. These are compact forms of development that concentrate density in one portion of the site in exchange for reduced density elsewhere, thereby reducing overall site imperviousness and associated stormwater impacts and potentially avoiding development in sensitive areas of a site.

Table 12. Open Space Regulations

Town	Allow 'Cluster'	Allow 'Open Space'	Subdivision Open Space		
TOWIT	Development	Subdivisions	Required	Fee in lieu of	
Manchester	Yes	No	Yes, 6%	No	
Vernon	Yes	No	Yes	Yes	
Tolland	Yes	Yes	Yes, 10%	Yes	
Bolton	Yes	Yes	Yes	Yes	

Source: Hockanum River —State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005



3.3 <u>Summary of Existing Regulations and Preliminary Recommendations</u>

The following policy, regulatory and planning documents were reviewed for the towns of Vernon and Tolland relative to stormwater management and natural resource protection:

- Subdivision Regulations,
- Zoning Regulations,
- Inland Wetland and Watercourses Regulations,
- Plan of Conservation and Development/Open Space Plan.

3.3.1 Town of Vernon

The Town of Vernon has a number of land use regulations that regulate construction and post-construction stormwater runoff from new development and redevelopment activities, and provide for protection of natural resources. The local regulations are particularly strong in terms of erosion and sediment control (as well as consistent between the various regulations), open space protection, and regulating activities that can potentially affect wetlands and watercourses, including requirements for watercourse buffers. However, there are several areas where the regulations and design standards and guidance could be strengthened through amendments or new regulations to clarify and strengthen stormwater management requirements and better promote the use of LID principles.

This section contains preliminary recommendations for the town of Vernon based on the review of the existing land use regulations and planning documents. The recommendations in this section are a summary of the more detailed regulatory review, which is provided in a technical memorandum dated June 9, 2008 (Appendix D).

1. Town Design Manual

- Develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the Connecticut Stormwater Quality Manual to take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town (see Recommendation 2). The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.
- Include a section of the design manual that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects. Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management facilities.
- Incorporate/reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.



2. Stormwater Management Standards

Develop and incorporate into the Town stormwater design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance (see Recommendation 3). Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the *Connecticut Stormwater Quality Manual* and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included with the full memorandum in Appendix D.

3. New or Modified Stormwater Regulations

- Develop and implement new or revised stormwater regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects in Vernon, and 3) address other local drainage and natural resource protection issues identified by the Town. Two potential approaches have been identified —1) a new stand-alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.
- Form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:
 - If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
 - o Which projects and activities will the new ordinance apply to (i.e., applicability)?
 - o How will applications be received and reviewed?
 - o Who will be responsible for inspections and enforcement?
 - Will additional staff be required to handle the increased workload to review and process applications?

3.3.2 Town of Tolland

Zoning and Subdivision Regulations

The Town of Tolland recently amended its zoning and subdivision regulations to:

- 1. Incorporate Low Impact Development (LID) principles. The Town also developed a companion LID Design Manual that provides recommendations for site design, road design, and stormwater management.
- 2. Create a natural Resource and Wildlife Protection Overlay Zone around sensitive habitat areas and steep slopes throughout the town.
- 3. Adopt density-based zoning to replace the minimum lot size requirements.



Tolland is one of the first towns in Connecticut to adopt comprehensive LID regulations. The regulations are a good model for the other watershed communities to require the use of LID practices. The regulations are currently in the early stages of implementation. The Town should continue to monitor the effectiveness of the LID regulations as development projects subject to the new regulations are designed, reviewed, and constructed.

Consistent with the recommendations for the Town of Vernon, Tolland should also consider adopting a River Protection Overlay District for the Tankerhoosen River (Gages Brook). Such a district would establish a contiguous and parallel buffer strip on either side of the river and would supplement the underlying zoning regulations, with the added provision that the land within the buffer areas and the river itself would remain in a natural, undisturbed state.

Inland Wetlands and Watercourses Regulations

The Inland Wetlands and Watercourses regulations were amended in 2007, and are in accordance with the Connecticut General Statues. The regulations define an Upland Review Area extending a minimum 50 feet from the edge of a wetlands and/or watercourse and a extending a minimum of one hundred 100 feet from any watercourse, including intermittent watercourses. The width of the Upland Review Area may be doubled in cases where the slopes bordering the wetland and/or watercourse are in excess of 15%, the presence of highly erodible soils, or unique and/or easily damaged wetland ecosystems exist.

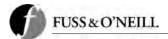
Permit application requirements include documentation that proposed stormwater quality management systems, at a minimum, conform to the "2004 Connecticut Stormwater Quality Manual", as amended. The Inland Wetlands and Watercourses Regulations should be revised to require that projects also meet the design requirements contained in the Tolland LID Design Manual, for consistency with the zoning and subdivision regulations and to promote the use of LID. The town should also consider incorporating more explicit watercourse buffer requirements, including minimum buffer widths, similar to the watercourse buffer provisions in the Town of Vernon Inland Wetlands and Watercourses Regulations.

Plan of Conservation and Development

The Tolland Planning & Zoning Commission is in the process of updating the 1999 Plan of Conservation & Development (POCD) in accordance with the Connecticut General Statutes which requires the plan to be updated every ten years. The plan will establish a common vision for the future of the community and determine policies that will help attain that vision. The plan will address a range of themes, including natural resources, open space, utility infrastructure, and community development.

The Town's planning consultant has prepared draft recommendations related to conservation issues as part of the POCD update process. The recommendations address surface and groundwater quality, important habitat areas, drainage issues, green infrastructure, and open space protection. Some of the key recommendations for natural resource protection that also apply within the Tankerhoosen River watershed include (Planimetrics, 2008):

 Future development should occur in a manner and in locations that are environmentally sustainable,

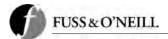


• Impacts from existing development should be minimized through education, incentives, and town leadership.

Open Space and Conservation Plan

The 2006 Tolland Open Space and Conservation Plan inventoried natural resources throughout the town, including wetlands, rivers and streams, lakes and ponds, vernal pools, water supply watersheds, forest resources, and wildlife resources. In addition to the Open Space and Conservation Plan, the town has also completed or is implementing the following open space preservation activities (Planimetrics, 2008):

- Establishing an Open Space Acquisition Fund,
- Setting up a structured process for open space procurement and management,
- Promoting the use of open space, with trail maps and programmed activities,
- Tapping into a volunteer group for maintenance (Tolland Conservation Corps).



4.0 REFERENCES

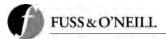
Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Fuss & O'Neill, Inc. 2005. Hockanum River State of the Watershed Report. North Central Conservation District, Inc.

Kitchell, A. and T. Schueler. 2005. Urban Subwatershed Restoration Manual No. 10: Unified Stream Assessment: A User's Manual (Version 2.0). Center for Watershed Protection.

Planimetrics. 2008. Draft Conservation Issues, Booklet #4, Town of Tolland Plan of Conservation and Development.

Wright, T., Swann, C., Cappiella, K. and T. Schueler. 2005. Urban Subwatershed Restoration Manual No. 11: Unified Subwatershed and Site Reconnaissance: A User's Manual (Version 2.0) Center for Watershed Protection.



APPENDIX A

Stream Corridor Assessment Field Forms and Data

Reach Level Assessment RCH

SURVEY REACH	1D: <u>(130)</u> Wi	rshd/Subshd: C\0	irks Brook	DATE: 7/2	108 Assi	ESSED BY:
	ie: <u>9:38</u> AM/PM		END TIME:_	:AM/PM	LMK:	GPS ID:
LAT4 0 49,0	$\frac{19,4}{}$ " Long $\frac{7}{6}$	1 · 27 · 23.5 "	LAT 4 0 49 12	57.5" Long/	7.093.14	711
DESCRIPTION:			DESCRIPTION: 3	Atom 21	01/08871	1
					- WW.AS	
RAIN IN LAST 24 HO		☐ Steady rain	PRESENT CONDITIONS	•		n □ Intermittent
□ None	☑Intermittent		Clear	☐ Trace	☐ Overcast	☐ Partly cloudy
SURROUNDING LAN		l □ Commercial rse □ Park	☐ Urban/Residential☐ Crop	☐ Suburban/Res☐ Pasture	Forested Other:	☐ Institutional
AVERAGE	E CONDITIONS (che	ck applicable)	•	SKETCH AND SI		RACKING
BASE FLOW AS %	□ 0-25%	☑ 50%-75%	Simple planar sketch	of survey reach. Tra	ck locations and	IDs for all site impacts
CHANNEL WIDTH	□25-50 %	□ 75-100%	within the survey re	each (OT, ER, IB,SC, deemed appropriate.	UT, TR, MI) as v	vell as any additional
l	slick) ☑ Co		- Jemin es	accinca appropriate.	mateur an equ	on of from
☐ Other (chemicals,	dyes)					
AQUATIC PLANTS	Attached: 🗹 non	e □ some □ lots		and the second		
IN STREAM	Floating: Inone	e □ some □ lots		And the second s		
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☐ Fish ☐ Beav ☐ Snails ☐ Other					
STREAM SHADING (water surface)	☐ Mostly shaded M Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25	o) I (≥25%)			Bolton	Road
CHANNEL	Downcutting	Bed scour]		othy	- 2
DYNAMICS	Widening	Bank failure		:		. 07 2
Unknown	Headcutting Aggrading Sed. deposition	Bank scour Slope failure Channelized			3 /	11-40
CHANNEL	Height: LT bank	(ft)		- definition of the control of the c	cit !	Emmend "
DIMENSIONS	RT bank	(ft)		<u> </u>		
(FACING DOWNSTREAM)	Width: Bottom	(ft)				
	Тор	(ft)				<u> </u>
F	REACH ACCESSIBILI))	3 4
Good: Open area in	Fair: Forested or developed area	Difficult. Must cross wetland, steep slope, or			(C	
public ownership, sufficient room to	adjacent to stream.	sensitive areas to get to		Į.	A. Share	
stockpile materials,	Access requires tree	stream. Few areas to				1/3
easy stream channel	removal or impact to landscaped areas.	stockpile available and/or located a great		- 		
access for heavy equipment using	Stockpile areas	distance from stream.	The second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a section in the second section in the section is a section in the section in the section is a section in the section in the section is a section in the section in the section is a section in the section in the section in the section is a section in the section in the section in the section is a section in the section in the section in the section in the section is a section in the section in	-		
existing roads or trails.	small or distant from stream.	Specialized heavy equipment required.		:		NKEY
5	4 3 2		•		/	(KK)) V
NOTES: (biggest prob	olem you see in survey	reach)				V
)						
				REPOR	TED TO AUTHO	rities 🗌 Yes 🔲 No

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambant surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
		ALL BUFFER AND FLOODPLAI	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 (1) 0	
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water			
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN Encroach-	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on	
MENT	20 19 18 17 16		effect on floodplain function	floodplain function	

\mathbf{O}	7	
U		L

WATERSHED/SUBSHED: Clarks Brook			DATE: 7/2/08 ASSESSED BY: Friends		
SURVEY REACH ID: CBO\ TIME: 10 :48 AM/PM		Рното ID: (Camera-P	ic#) /# 10	(2403)	
SITE ID (Condition-#):	OT- <u>03</u> LA	1741 · 49 ·57.2"I	ONG72.72 .2012	" LMK G	GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:		DIMENSIONS: Diameter: 1 (in)	SUBMERGED: No Partially Fully
☐ Moderate ☐ Substantial ☐ Other:	Open channel	Concrete Earthen Other:	Parabolic W	Depth: (in) Vidth (Top): (in) " (Bottom): (in)	NOT APPECABLE
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: M No Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: ☑ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GROV Brown Orange Other: POOL QUALITY: Good Odors Suds Algae	No pool
				Other:	
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization Storm water retrofit Other:					
If yes for daylighting:					
Length of vegetative cov	er from outfall:	ft Type of exi	sting vegetation:	Slope:	
If yes for stormwater:					
Is stormwater currently of	ontrolled?	Land Use de	escription:		
☐ Yes ☐ No ☐ Not	investigated	Area availal		10 At 10 At	
SEVERITY: str (circle #) str	avy discharge with a dist ong smell. The amount o mpared to the amount of eam; discharge appears nificant impact downstre	f discharge is significant normal flow in receiving to be having a	discharge; flow mostly clear and o arge has a color and/or odor, the an arge is very small compared to the s and any impact appears to be minor	nount of discharge; sta	ot have dry weather ining; or appearance verosion problems.
	5	4	3	2	
SKETCH/NOTES:					
<i>J</i>			- P	REPORTED TO AUTHORITH	es. YES NO

	1		^
•	J		
•		_	L

WATERSHED/SUBSHED: Clarks Brook			DATE:	DATE: 7/2/08 ASSESSED BY: Friends			
SURVEY REACH ID: CBO TIME: 10:50 AM/PM		РНОТО ID: (Camera-P.	РНОТО ID: (Camera-Pic #) /# // (२५०५)				
SITE ID (Condition-#):	DT- <u>0</u> 址 L	AT 1 0 49 15711 "	LONG 720 27 , 20.2				
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Me ☑ PVC/Plastic ☐ Brid ☐ Other:	ck	DIMENSIONS: SUBMERGED: No Diameter: (in) Partially Fully			
Moderate Substantial Other:	Open channel	Concrete Earth Other:	Parabolic V	Depth: (in) Width (Top): (in) " (Bottom): (in)			
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: ☑ NO ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GROWTH: None Brown Orange Green Other: POOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables Other:			
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization							
If yes for daylighting: Length of vegetative cov	rer from outfall:	Storm water retrofitft Type of e		Slope:°			
If yes for stormwater: Is stormwater currently o ☐ Yes ☐ No ☐ Not	investigated	Area avai	description:lable:				
SEVERITY: str (circle #) str	mpared to the amount of eam; discharge appears nificant impact downstre	of discharge is significant fromal flow in receiving to be having a	nall discharge; flow mostly clear and o charge has a color and/or odor, the an charge is very small compared to the s w and any impact appears to be minor	mount of discharge; staining; or appearance			
Grand Grand	5	4	3	2 1			
SKETCH/NOTES:			¥.	REPORTED TO AUTHORITIES: \(\square \text{YES} \square \square \text{NO} \end{array}			

\mathbf{O}	T
V	1

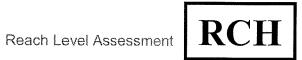
WATERSHED/SUBSHED	o: Clarks	Brook	DATE: 7 / 02 /08	ASSESSED BY: Friends	
SURVEY REACH ID: CBO\ TIME: 10:37 AM/PM		Рното ID: (Camera-Pi	PHOTO ID: (Camera-Pic #) /# 8 (2401)		
SITE ID (Condition-#): OT- LAT <u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>		LONG-12 ° 27 ' 20.4"			
BANK: THE RT Head	TYPE:	MATERIAL:	SHAPE: Single	DIMENSIONS: SUBMERGED:	
	Closed	☐ Concrete ☐ Meta		Diameter: 4 (in) Partially	
FLOW: None Trickle	pipe	Other:		Diameter: (in) Partially Fully	
Moderate					
Substantial	Open	Concrete Earther	·	epth: (in) idth (Top): (in) NOT APPESICABLE	
Other:	channel	Other:		(in) NOT APPASICABLE (Bottom): (in)	
CONDITION:	ODOR: No	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GROWTH: None	
None	Gas	None	None	☐ Brown ☐ Orange ☐ Green	
☐ Chip/Cracked☐ Peeling Paint	Sewage Rancid/Sour	☐ Oily☐ Flow Line	Normal Inhibited	Other:	
Corrosion	Sulfide	Paint	Excessive	POOL QUALITY: No pool	
Other:	Other:	Other:	Other:	Good Odors Colors Oils Suds Algae Floatables	
				Other:	
FOR COLOR:	☐ Clea	r 🔲 Brown 🔲 Grey	Yellow Green		
FLOWING TURBIDI	The second secon		☐ Cloudy ☐ Opaque	Orange Red Other;	
ONLY FLOATA		e Sewage (toilet paper		oil sheen)	
1	ss Trash (paper/pla	· · · · ·		Sedimentation	
CONCERNS: Need	ls Regular Mainter	ance Bank E	rosion Other:		
POTENTIAL RESTORAT	CION CANDIDATI	F Discharge investigation		Local stream repair/outfall stabilization	
no	TION CANDIDATI	Storm water retrofit	Other:	Local stream repair/outfall stabilization	
If yes for daylighting:					
Length of vegetative cove	r from outfall:	ft Type of exi	sting vegetation:	Slope:°	
If yes for stormwater:					
Is stormwater currently co			escription:		
Yes No Not i		Area availal	ole:		
SEVERITY. stron	vy discharge with a dist ng smell. The amount o	f discharge is significant	discharge; flow mostly clear and od	orless. If the Outfall does not have dry weather	
com	pared to the amount of am; discharge appears	to be baying a	arge has a color and/or odor, the amarge is very small compared to the st	ream's base discharge; staining; or appearance	
	ficant impact downstre		nd any impact appears to be minor /	localized.	
	5	4	3	2 (1)	
SKETCH/NOTES:					
<u> </u>			R	EPORTED TO AUTHORITIES: YES NO	

\	
	_

SURVEY REACH ID: \$5 \circ\ The: \(\(\) \(\) \(\) \(\) \(\) \(\) \(\) \(\) \(\) \(\) \(\) \(\) \(WATERSHED/SUBS	HED: Clarles	Brach	DATE: 7/2/08 ASSESSED BY: FIRMOS		
STEED (Condition=W): OT 2	SURVEY REACH ID	:CBO\ TI	МЕ: <u>10</u> : <u>40</u> АМ/РМ			
BANK:	SITE ID (Condition-#	: OT- <u>2-</u> LA	AT 410 49 155,5 "LO	ONG 72° 27 ' 20.5'		
Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed PVC/Plastic Brick Closed						
Substantial Open	FLOW: None Trick	d	☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick	☐ Circular ☐ Double ☐ Elliptical ☐ Triple	Diameter: (in) Partially	
None Gas None Chip/Cracked Sewage Chip/Cracked Sewage Chip/Cracked Sewage Chip/Cracked Sewage Chip/Cracked Sewage Columber Corrosion Sulfide Paint Excessive Conder: Chip/Cracked Sulfide Paint Excessive Conder: Chip/Cracked Sulfide Paint Excessive Columber Content	Substantial			Parabolic W	Vidth (Top): (in) NOT APPECABLE	
Turning None Slight Cloudiness Cloudy Opaque	☐ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion	☐Gas ☐ Sewage ☐Rancid/Sour ☐ Sulfide	☑ None ☐ Oily ☐ Flow Line ☐ Paint	☐ None ☐ Normal ☐ Inhibited ☐ Excessive	Brown Orange Green Other: POOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables	
Length of vegetative cover from outfall:	FLOWING TUR ONLY FLO OTHER CONCERNS:	BIDITY: Non ATABLES: Non Excess Trash (paper/pla Needs Regular Mainter	e Slight Cloudiness e Sewage (toilet paper, dastic bags) Dumping nance Bank Ero E Discharge investigatio	Cloudy Opaque etc.) Petroleum (g (bulk) Excessive esion Other: n Stream daylighting	(oil sheen) ① Other: Sedimentation	
Length of vegetative cover from outfall:			Storm water retrofit	Other:		
If yes for stormwater: Is stormwater currently controlled? Yes No Not investigated Area available: OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. SKETCH/NOTES: Stormwater currently controlled?		_				
Is stormwater currently controlled? Yes No Not investigated Area available:	Length of vegetative of	cover from outfall:	ft Type of exist	ring vegetation:	Slope:°	
Is stormwater currently controlled? Yes No Not investigated Area available:	If yes for stormwate	r:				
OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems. SKETCH/NOTES: Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems.			Land Use des	scription:		
SEVERITY: (circle #) strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. SKETCH/NOTES: strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. SKETCH/NOTES: STRIAI discharge; 10W mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.	☐ Yes ☐ No ☐ ì	Not investigated	Area availabl	e:		
SKETCH/NOTES:	SEVERITY: (circle #)	strong smell. The amount of compared to the amount of stream; discharge appears	f discharge is significant normal flow in receiving to be having a	ge has a color and/or odor, the am ge is very small compared to the s	ount of discharge; staining; or appearance	
		5	4	3	2 (1)	
REPROTEIT ATTEMPTED 1 1 VOC 1 1 VA 1	SKETCH/NOTES:			p	Reported to authorities: □ yes □ no	

Stream Crossing SC

WATERSHED		vool		DATE:	712108	ASSE	essed by: Frilnely
URVEY REA	URVEY REACH ID: CBO\ TIME: 11:00 AM/PM PHOTO ID: (Camera-Pic #) /# /2 (2405)						
SITE ID: (Con	dition-#) SC- <u>O</u>	41.049.51	$\underline{}$ " Long $\underline{}$	<u> 20 27</u>	<u> </u>	MK	GPS (Unit ID)
	<u> </u>						
TYPE: Roa		ng Manmade	1		Geological For		Other:
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		IGNMENT: Flow-aligned Not flow-aligned Do not know	Barrel dia	Height:(ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n Downstream			Flat Slight (2° – 5°) Obvious (>5°)	Culvert le	ength: <u>37</u> (ft) Width: (ft) elevation: <u>3</u> (ft)
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re			Treplacement U	Jpstream s	torage retrofit
Is SC ACTING	G AS GRADE CONTROL	□No ☑Y	es 🔲 Unkr	nown			
	EXTENT OF PHYSICAL BLO	CKAGE:		В	LOCKAGE SEVER	NTY: (circ	le #)
If yes for fish barrier	Total Partial Temporary Unknow CAUSE: Drop too high Water Dr Flow too shallow Water Dr Other:	rop:(in)	A structure such a road culvert on a greater stream blo upstream moveme anadromous fish; passage device pr	Brd order o cking the ent of no fish	r tributary that wou significant reach o or partial blockag- interfere with the anadromous fish.	ld isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
NOTES/SVET			5		4 3		2 (1)
Other: 5 4 3 2 (1)							
				1870 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971 - 1971	Repor	TED TO AU	THORITIES TYES NO



Time:	SURVEY REACH	m : <u>C\$08</u> w 1	TRSHD/SUBSHD: ()	arks Brook	DATE: 1/	. / 20 60	ESSED BY:
Clear Trace Clear Trace Clear Crop Cr	LAT211 049 1	ie:// :07/AM/PN	1 LMK:	END TIME:_ LAT_ 0 50 '		LMK:	GPS ID:
SURROUNDING LAND USE:	l .					-	/
BASE FLOW AS % 0-25% 50%-75% 75-100% CHANNEL WIDTH 25-50 % 75-100% DOMINANT SUBSTRATE Sillvelay (fine or slick) Cobble (2.5-10") Gravel (0.1-2.5") Bed rock WATER CLARITY Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes) AQUATIC PLANTS Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes) AROUND STREAM Shalbin Beaver Deer AROUND STREAM Shalbin Hardway (5.50%)	SURROUNDING LAN	D USE: 🗹 Industria	l Commercial	☐ Urban/Residential	☐ Suburban/Res	☐ Forested	
DOMINANT SUBSTRATE Sit/clay (fine or slick) Good: Open area in Dominant Substrate Stained (clear, naturally colored) Opaque (milky)	Averagi	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SI	TE IMPACT TI	RACKING
DOMINANT SUBSTRATE Silviclay (fine or slick) Globble (2.5 -10") Sand (gritty) Boulder (>10") Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes) Other (chemicals, dyes) AQUATIC PLANTS Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes) AQUATIC PLANTS Attached: none Some lots Floating: none some lots Floating: none some lots Floating: Other: STREAM SHADING Halfway (>50%) Ushaded (<25% coverage) Halfway (>50%) Ushaded (<25%) Ushaded (<25%) Ushaded (<25%) Ushaded (<25%) Ushaded (<25%) Ushamown Aggrading Bank failure Downcutting Bank scour Aggrading Stope failure One Aggrading Stope failure One Aggrading Stope failure One Aggrading Bank scour Aggrading Stope failure One Aggrading	i			within the survey re	each (OT, ER, IB,SC,	UT, TR, MI) as w	vell as any additional
Stained (clear, naturally colored)	☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick) ☐ C ☐ B 5") ☐ Be	oulder (>10") ed rock	- Journal	weemen appropriate	. mateur un een	on of from
NSTREAM	☐ Stained (clear, n	aturally colored) 🔲					
WILDLIFE IN OR AROUND STREAM AROUND STREAM Mostly shaded (≥75% coverage)							
STREAM SHADING (water surface) Halfway (>50%) Unshaded (<25%) CHANNEL Downcutting Bank failure Bank scour Bank scour Bank scour Channelized CHANNEL Height: LT bank (ft) Channelized CHANNEL Height: LT bank (ft) (ft) DIMENSIONS (FACING DOWNSTREAM) Width: Bottom (ft) (ft) Top 7 (ft) REACH ACCESSIBLITY Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails. 4	·	Fish 🗆 Beav					
□ Unknown □ Aggrading □ Slope failure □ Channelized CHANNEL DIMENSIONS (FACING DOWNSTREAM) Width: Bottom □ (ft) Top □ (ft) REACH ACCESSIBILITY Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails. Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream. Specialized heavy equipment required.	•	☐ Halfway (≥50% ☐ Partially shaded	%) 1 (≥25%)	<u> </u>			
CHANNEL DIMENSIONS (FACING DOWNSTREAM) Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails. Sed. deposition Channelized (ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft	DYNAMICS	☐ Widening ☐ Headcutting	Bank failure Bank scour		/R-01		
CHANNEL DIMENSIONS (FACING DOWNSTREAM) REACH ACCESSIBILITY Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails. Sequipment sing existing roads or trails. Top (ft) REACH ACCESSIBILITY Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas Stockpile areas small or distant from stream. Specialized heavy equipment required. South Policy (ft) Difficult. Must cross wetland, steep slope, or sensitive areas to get to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	Unknown			No.	No.		••
Top	DIMENSIONS (FACING	RT bank	$\frac{1}{2}$ (ft)	20 Hours		The the Contract of the Contra	
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails. Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream. Specialized heavy equipment required.	DOWNSTREAM)	Тор	(ft)	*	12 36-1		
sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails. adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream. 5 4 3 2 1	Good: Open area in	Fair: Forested or	Difficult. Must cross	087 - 513	7 · · · · · · · · · · · · · · · · · · ·		
2 1 had been been been been been been been bee	sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	Post Post		07-! 2 AA	
> 1						an di mandadi di dibunina ini ini ini ini mpananana na mananana na mananana na mananana na manana na manana na	

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags)	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.	
habitat regime)	that are <u>not</u> new fall and <u>not</u> transient).	rate at high end of scale). 15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamban surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0	
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
		ALL BUFFER AND FLOODPLA		3 4 3 2 1 0	
	Optimal	Suboptimal	Marginal	Poor	
Vegetated Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: littl or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0	

			Sto	rm Water Outfalls	OT
WATERSHED/SUBSHE	D: Clark	s Brook	DATE: 7/2/0	ASSESSED BY:	Friends.
SURVEY REACH ID:		FIME: <u>//</u> : <u>/5_</u> 4M/PM	Рното ID: (Camera-P	ic#) /# /	6,17(2409)
SITE ID (Condition-#): C)T- <u>/</u> /	LAT <u>41 ° 49 '583"</u> "	LONG 72 . 27 . 20.1		GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Meta ☐ PVC/Plastic ☐ Brich ☐ Other:		DIMENSIONS: Diameter: (in)	SUBMERGED: No Partially Fully
Moderate Substantial Other:	Open channel	☐ Concrete ☐ Earther☐ Other:	Parabolic V	Depth: (in) Vidth (Top): (in) " (Bottom): (in)	NOT APPELCABLE
CONDITION: None Chip/Cracked	ODOR: ☑ No ☐ Gas ☐ Sewage	✓ None □Oily	VEGGIE DENSITY: None Normal	PIPE BENTHIC GRO	
Peeling Paint Corrosion Other:	□Rancid/Sou □ Sulfide □ Other:	Paint Other:	☐ Inhibited ☐ Excessive ☐ Other:	POOL QUALITY: [Good Godors [Suds Algae [Other:	☐Colors ☐Oils
CONCERNS: Nee	ABLES: No ess Trash (paper/ eds Regular Main	one Sewage (toilet pape plastic bags) Dumpi	ng (bulk)	Sedimentation	
	er from outfall:	ft Type of ex	isting vegetation:	Slope:	0
If yes for stormwater: Is stormwater currently c ☐ Yes ☐ No ☐ Not		Land Use o Area availa	lescription: lble:		
SEVERITY: strc cor stre	SEVERITY: strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving discharge appears to be having a discharge appears to be having a			discharge; stream's base of causing a	not have dry weather staining; or appearance iny erosion problems.
SKETCH/NOTES:	5	5 4	3	2	. 1
ZALIGITIOTES.			1	Reported to authoriz	ries. □ ves □ vo

OT

WATERSHED/SUBSHED: Clarks Broch			DATE: 7/2/08 ASSESSED BY:					
SURVEY REACH II): (B07	TIME://:50 AM/PM	PHOTO ID: (Camera-Pic#) #20 (2413)				
SITE ID (Condition-#): O T	LAT41 ° 50 '01.8"	Long 72 ° 27 ' 21.5"	LMK GPS: (Unit ID)				
BANK: LT RT Heat FLOW: None Tricl	Closed	MATERIAL: ☐ Concrete ☐ Met ☐ PVC/Plastic ☐ Bric ☐ Other:	al Circular Double	DIMENSIONS: Diameter: (in) Fully				
Moderate Substantial Other:	Open channel	☐ Concrete ☑ Eartho	Parabolic Widt	h:				
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: N Gas Sewage Rancid/So Sulfide Other:	☑ None □Oily	□ None □ Normal □ Inhibited □ Excessive □ Other:	PIPE BENTHIC GROWTH: None Brown Orange Green Other: POOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables Other:				
FLOWING TURE ONLY FLOOM OTHER CONCERNS:	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation							
If yes for daylightin	g:	Storm water retrofit	Other:					
	~	ft Type of ex	xisting vegetation:	Slope:°				
If yes for stormwate Is stormwater current	y controlled?	Land Use	description:					
Yes No	Not investigated	Area avail	able:					
OUTFALL SEVERITY: (circle #)	SEVERITY: strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a discharge appears to be having a		all discharge; flow mostly clear and odorle harge has a color and/or odor, the amoun harge is very small compared to the strea and any impact appears to be minor / loc	t of discharge; staining; or appearance				
		5 4	(3)	2 1				
SKETCH/NOTES:			Rep	ORTED TO AUTHORITIES: YES NO				

OT	

WATERSHED/SUBSHED: Clarks			DATE: 7/2 /08 ASSESSED BY: Friends					
SURVEY REACH ID:	SURVEY REACH ID: CB OR TIME! OF AM/PM			Рното ID: (Camera-Pic #) /# 2				
SITE ID (Condition-#): (от- <u>03</u>	LAT41 ° 50 '03;	3 " Lo	ong 12 ° 27 ' 23,3 "	LMK	GPS: (Unit ID)		
BANK: Head	TYPE:	MATERIAL: ☐ Concrete ☐ ☐ PVC/Plastic ☐	Metal Brick	SHAPE: Single Circular Double Elliptical Triple	DIMENSIONS:	SUBMERGED: No in) Partially		
FLOW: None Trickle Moderate	pipe	Other:		Other:		Fully		
Substantial Other:	Open channel	Concrete E	arthen	Parabolic W	epth: (in idth (Top): (in in idth (Bottom): (in in idth (in idth (NOT APPECABLE		
CONDITION: None Chip/Cracked Peeling Paint	ODOR: N Gas Sewage Rancid/So	☑ None ☐ Oily	S:	VEGGIE DENSITY: ☐ None ☐ Normal ☐ Inhibited	PIPE BENTHIC G Brown Ora	ange Green		
Corrosion Other:	Sulfide Other:	ur Plow Line Paint Other:		Excessive Other:	POOL QUALITY: No pool Good Godors Colors Godors Godorn			
FLOWING TURBIN FLOAT. OTHER	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation							
POTENTIAL RESTORA	TION CANDID			n Stream daylighting [Local stream repa	ir/outfall stabilization		
If yes for daylighting:		Storm water retr	ofit	Other:	***************************************			
	er from outfall:	ft Type	of exist	ing vegetation:	Slope	:°		
If yes for stormwater:					,			
Is stormwater currently c		Land 1	Use des	cription:				
☐ Yes ☐ No ☐ Not	investigated	Area a	vailable	e:				
SEVERITY: strc cor stre	ong smell. The amou		discharg discharg	ischarge; flow mostly clear and od ge has a color and/or odor, the am ge is very small compared to the st d any impact appears to be minor /	ount of discharge	pes not have dry weather e; staining; or appearance g any erosion problems.		
		5 4	1	3	(2)	1		
SKETCH/NOTES:								
)				R	EPORTED TO AUTHOR	RITIES: YES NO		

Severe Bank Erosion

ER

WATERSHED/SUB	SHED: Clarks	Brook	Brook		DATE: 7 / 2 / 0 8 A			Assessed by: Friends	
SURVEY REACH:	CBO2	TIME: 11 :	<u>30 (a)</u> m/pm	РНОТО ID (СА	MERA-PIC#	^t):	1# 19	2412)	
SITE ID: (Condition-	#) START LAT _	11.50.01.2	" Long ७३ °३	7.20.4	LMK_		GPS: (Un.		
ER- <u>01</u>	END LAT_	0 1	" Long°_	1 11	LMK				
Dr. c. cross									
PROCESS:	Currently unknown	LOCATION:	NCERN: ☑ LT │ ☐ Meander bend	RTBoth ((looking dow	nstream)		Od	
Downcutting	Bed scour	DIMENSIONS		Suaight section	i ∐ Steep s	iope/vaiie	ey wall 📋	Other:	
Widening	Bank failure Bank scour		·• GPS) LTfi	and/or DT	a l	D 44		0	
Headcutting	1 =	Bank Ht		and/or RT			n width idth		
Aggrading Sed. deposition	Slope failure Channelized		LT		3	_	d Width		
	Private Public	/						1t	
LAND OWNERSHIP	Provide Public	c V Unknown	LAND COVER	Forest _	Field/Ag [Develo	oped:		
POTENTIAL RESTO	ORATION CANDIDATI	E: ☐ Grade	-	Bank stabilization	on				
	ERTY/INFRASTRUCT		Yes (Describ	ie).					
EXISTING RIPARIA			☐ 25 - 50 ft [_	5-100ft []>100ft			
EROSION	Active downcutting; tall ban		Pat downcutting evide	ent active stream					
SEVERITY(circle#)	of the stream eroding at a fa contributing significant amo	unt of sediment to	widening, banks active	ely eroding at a			e; isolated area aused by a pip		
Channelized= 1	stream; obvious threat to pr infrastructure.	operty or	moderate rate; no thre infrastructure		scour, impa	aired riparia	n vegetation or	adjacent use.	
Chamienzed- [] 1	5		4 3		(2)		1	-	
Access:	Good access: Open area in ownership, sufficient room t		Fair access: Forested		Difficult ac	cess. Must	cross wetland	, steep slope or	
	materials, easy stream char heavy equipment using exis	nnel access for	adjacent to stream. An removal or impact to I		stockpile a	eas availab	le and/or locat	ed a great	
	trails.	-	Stockpile areas small	or distant from stream.	equipment		ection. Specia	ilized heavy	
NOTES/CROSS SEC	5 CTION SWETCH:	4	3)	2		1		
1101E3/CROSS SEC	TION SKETCH:								
						•			
, management of the second					Descrip			1,,,	
<u></u>			•		KEPORTEI) TO AUTH	IORITIES L	Yes 🗌 No 📗	

						DATE: 7/2 /08 ASSESSED BY: Friend			
URVEY REACH ID: CB 03. TIME: 12:15 AM/PM					ото ID	:(Camera-Pic	: #)	1# 22 (2415)	
SITE ID: (Con	ndition-#) SC- <u>61</u> LAT	41 · 50 · Q.	9 " Long	<u>}</u> • :	27 '	را " <u>۲٫۶۶</u>	MK	GPS (Unit ID)	
TYPE: Roa	ad Crossing 🔲 Railroad Crossi	ng Manmade	Dam Beav	er Da	ım 🔲	Geological Form	nation 🗌	Other: Parking late	
	SHAPE:	#BARRELS:	MATERIAL:			MENT:		IONS: (if variable, sketch)	
	Arch Bottomless Elliptical	Single Double	Concrete			w-aligned	Barrel dia		
FOR ROAD/	Circular	Triple	Metal ☐ Other:			flow-aligned not know		Height:(ft)	
RAILROAD	Other:	Other:	U Ouler.		D0	not know		1100	
CROSSINGS ONLY	CONDITION: (Evidence of)					ERT SLOPE:	Culvert le		
ONLY	Cracking/chipping/corrosion	n Downstream	n scour hole		Flat			Width:(ft)	
	Sediment deposition	☐ Failing emb	ankment			ght (2° – 5°) vious (>5°)	~ .		
	Other (describe):					vious (~3)	Roadway	elevation: 13 (ft)	
POTENTIAL	RESTORATION CANDIDATE	☐ Fish harrier re	moval 🔲 Culv	ort ro	noir/ron	Jacoment Dr	Instraam -	torago rotrofit	
☑ no	ALSTORATION CANDIDATE	Local stream			раниср	nacement	psu cam s	torage retroffi	
	G AS GRADE CONTROL	□No ☑Y			· · · · · · · · · · · · · · · · · · ·	3" 8"	18"		
20001101111	EXTENT OF PHYSICAL BLO		CO LI OHK	110 0011		CKAGE SEVER	* -	·le#) 2	
	Total Partial	CRAGE.						, c n/	
	☐ Temporary ☐ Unknow	wn	A structure such a road culvert on a			A total fish blocka- tributary that woul		A temporary barrier such as a beaver dam or a blockage at	
If yes for fish barrier	CAUSE:	greater stream blockin		king the significant reach of		of stream,	the very head of a stream with		
Jish barrier		rop:(in)	anadromous fish;		n	or partial blockage interfere with the r		very little viable fish habitat above it; natural barriers such	
L	Flow too shallow Water D	epth: (in)	passage device p	resent		anadromous fish.	Ü	as waterfalls.	
	Other:		5		1 4	3		2 1	
NOTES/SKET	CH:								
	•								
								· .	
C ¹		-				Report	TED TO AU	THORITIES YES NO	

Trash and Debris



WATERSHED/SUBSHED: Clark			DATE: <u>712108</u>		ASSESSED BY: Friends	
URVEY REACH I	D : c B O A	TIME: 12:35 AM/PM	Рното ID: (Са	mera-Pic #)	# 24 (2417)	
SITE ID: (Condition	1#) TR- <u>01</u> LAT	1 ° 50 '07.5" LONG	72.27 .22.5	_" LMK	GPS: (Unit ID)	
TYPE: Industrial Commercial Residential	Appliances Y	per	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION: Stream Riparian Are Lt bank Rt bank	A NEONING (III DE 1	
POTENTIAL REST	CORATION CANDIDATE	☑ Stream cleanup ☐ Strear ☐ Other:	n adoption segment	Removal/pr	evention of dumping	
If yes for trash or	EQUIPMENT NEEDED:	☐ Heavy equipment ☐ Tra	ash bags 🗹 Unkno	bags Unknown DUMPSTER WITHIN 100 FT:		
debris removal	WHO CAN DO IT:	☐ Volunteers ☐ Local Go	Yes No Unknown			
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., than two pickup truck loads) loc inside a park with easy access		ay have been dumped or could be cleaned up in	ver area, where ac	of trash or debris scattered over a large ess is very difficult. Or presence of drums nazardous materials	
	(5)	4	3	2	1	
NOTES:						
			on an appropriate to	REPORTE	TO AUTHORITIES YES NO	

Reach Level Assessment



SURVEY REACH	ID: (303) WTRSHD/SUBSHD: (1)	arks Brook	DATE: 7/2	107 Ass	ESSED BY:
	ie: <u>/2 :45_</u> am/pm)	END TIME:_	:AM/PM	LMK:	GPS ID:
LAT41 0 50 '	10.7" Long 72 ° 27 '23.9"	Lat°'	" Long_	<u> </u>	
DESCRIPTION:		DESCRIPTION:			
RAIN IN LAST 24 HO	DURS ☐ Heavy rain ☐ Steady rain	PRESENT CONDITIONS	☐ Heavy rain	Ctoody mi	- [] I:
□ None	☐ Intermittent ☐ Trace	☐ Clear	☐ Trace	☐ Overcast	n ☐ Intermittent ☐ Partly cloudy
SURROUNDING LAN			□ Suburban/Res	☑ Forested	☐ Institutional
	☐ Golf course ☐ Park	1	☐ Pasture	☐ Other:	7773
	E CONDITIONS (check applicable)		KETCH AND SIT		
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □ 50%-75% □ 25-50 % □ √75-100%	within the survey rea	ch (OT, ER, IB,SC,	UT, TR, MI) as v	IDs for all site impacts well as any additional
DOMINANT SUBSTR		features d	leemed appropriate.	Indicate directi	ion of flow
☐ Silt/clay (fine or	slick) ☐ Çobble (2.5 –10")				
☐ Sand (gritty)☐ Gravel (0.1-2.5	⊠Boulder (>10") 5") □ Bed rock				
`					
	☐ Clear ☐ Turbid (suspended matter) naturally colored) ☐ Opaque (milky)				
☐ Other (chemicals,					
AQUATIC PLANTS	Attached: ☐ none ☐ some ☐ lots				
IN STREAM	Floating: ☑ none ☐ some ☐ lots				<i>e</i> 1
WILDLIFE IN OR	(Evidence of) ☑ Fish ☐ Beaver ☐ Deer				
AROUND STREAM	□ Snails □ Other: Striders	-		g. cheese	X.
STREAM SHADING	✓ Mostly shaded (≥75% coverage)☐ Halfway (≥50%)				3000 13003
(water surface)	☐ Partially shaded (≥25%)			<i></i>	030112-32
	☐ Unshaded (< 25%)	_		1 1	
CHANNEL	Downcutting Bed scour				
DYNAMICS	☐ Widening ☐ Bank failure ☐ Headcutting ☐ Bank scour				3,4
Unknown	Aggrading Slope failure				5x - SCO2
	Sed. deposition Channelized				3
CHANNEL	Height: LT bank(ft)			Fin s	co1 ,
DIMENSIONS (FACING	RT bank (ft)				1
DOWNSTREAM)	Width: Bottom $\frac{8}{15}$ (ft)				
n en	Top /5 (ft) REACH ACCESSIBILITY				N.
Good: Open area in	Fair: Forested or Difficult. Must cross		/ /f-0'	12	
public ownership, sufficient room to	developed area wetland, steep slope, or adjacent to stream. sensitive areas to get to			ž 8	
stockpile materials,	Access requires tree stream. Few areas to removal or impact to stockpile available	5 / /	y'.		
easy stream channel access for heavy	landscaped areas. and/or located a great				
equipment using existing roads or trails.	Stockpile areas distance from stream. small or distant from Specialized heavy				
	stream. equipment required.				
	blem you see in survey reach)	1		***************************************	1
)					
			REPOR	TED TO AUTHO	rities 🗌 Yes 🔲 No

	Optimal	Suboptimal	Marginal	Poor	
In-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	f stable habitat; well-colonization potential; itat for maintenance of resence of additional se form of newfall, but ed for colonization (may)		
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 13 12(11 <i>)</i> ALL BUFFER AND FLOODPLAI	10 9 8 7 6	5 4 3 2 1 0	
	T	I .			
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	3 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
To	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	

() ′	Γ

WATERSHED/SUBSHED:	Clarks	Brook	DATE: 7/2/08 ASSESSED BY: Fright			
SURVEY REACH ID: CE	503 TIM	1E: <u>/2 :55</u> AM/PM	Рното ID: (Camera-Pic #) /# 27 (2421)			
SITE ID (Condition-#): OT-	- <u>01</u> La	r <u>41 ° 50 '11.3 "</u> L	ONG 72 0 27 133.4	" LMK (GPS: (Unit ID)	
BANK: THead	Гүре:	MATERIAL: Concrete Metal	SHAPE: Single	DIMENSIONS:	SUBMERGED:	
	Closed	PVC/Plastic Brick		Diameter:(in)	☐ No☐ Partially	
FLOW: Trickle	pipe	Other:	Other:			
Moderate					Truny	
	Open	Concrete Earthen		Depth: 3-12 (in)	VOT. (D. C.	
Other:	channel	Other:		Vidth (Top): (in) " (Bottom): (in)	NOT APPASICABLE	
	ODOR: No	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GRO	WTH: ☐ None	
	Gas	None	None	☐ Brown ☐ Orange		
	Sewage Rancid/Sour	☐Oily ☐ Flow Line	Normal	Other:		
- -	Sulfide	Paint	☐ Inhibited☐ Excessive	POOL QUALITY:		
	Other:	Other:	Other:	Good Odors		
				Suds Algae C	Floatables	
FOR COLOR: FLOWING TURBIDITY	Clear			Orange Red Otl	ner:	
ONLY FLOATABL		August Market State Company of the C	Cloudy Opaque etc.) Petroleum	(oil sheen) Ot	her'	
	Trash (paper/plas			Sedimentation	ner:	
1	Regular Maintena					
POTENTIAL RESTORATION	ON CANDIDATE	☐ Discharge investigati	on Stream daylighting	Local stream repair/or	utfall stabilization	
no		Storm water retrofit	Other:			
If yes for daylighting:						
Length of vegetative cover f	from outfall:	ft Type of exis	sting vegetation:	Slope: _	· · · · · · · · · · · · · · · · · · ·	
If yes for stormwater:						
Is stormwater currently contr		Land Use de	escription:	1777-1		
Yes No Not inv		Area availab	ile:			
	discharge with a distir smell. The amount of	discharge is significant SINBII	discharge; flow mostly clear and o	dorless. If the	not have dry weather	
compare compare	red to the amount of n	ormal flow in receiving discharge	rge has a color and/or odor, the an rge is very small compared to the s	discharge; sta	aining; or appearance	
l , sucam,	; discharge appears to ant impact downstrea	DC Having a	nd any impact appears to be minor	/ localized. of causing an	y erosion problems.	
	5	4	3	2	1	
SKETCH/NOTES:				No. of the second secon		
· 			F	REPORTED TO AUTHORITI	ES: YES NO	

\mathbf{O}^{r}	Г
	1

WATERSHED/SUBSHE	D: Clarks	Brook	DATE: 7/2/08 ASSESSED BY: Frilings					
SURVEY REACH ID: (CB03 T	IME: <u>/</u> : <u>0</u> 6_AM/PM	PHOTO ID: (Camera-Pic#) /# 28					
SITE ID (Condition-#): C)Τ- <u>Ο</u>	AT <u>41 ° 50 '12.0 "</u> L	ong 72°27 '17.2"	LMK	GPS: (Unit ID)			
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: ☑ Single ☐ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:	DIMENSIONS: Diameter: 1 (in	SUBMERGED: No Partially Fully			
Moderate Substantial Other:	☐ Open channel	☐ Concrete ☐ Earthen ☐ Other:	Parabolic Wi	ppth: (in) idth (Top): (in) (Bottom): (in)	NOT APPESCABLE			
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: ☑ NO ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:	DEPOSITS/STAINS: ☑ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GR Brown Orar Other: POOL QUALITY: Good Odors Suds Algae Other:	ge ☐ Green Mo pool ☐Colors ☐Oils			
FLOWING TURBIT ONLY FLOAT. OTHER SECONCERNS: Nee	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation							
☑ no		Storm water retrofit	Other:					
If yes for daylighting:								
Length of vegetative cov	er from outfall:	ft Type of exis	ting vegetation:	Slope:	0			
If yes for stormwater:								
Is stormwater currently c	ontrolled?	Land Use des	scription:					
☐ Yes ☐ No ☐ Not	investigated	Area availabl	•					
SEVERITY: stro (circle #) stro	avy discharge with a dis ong smell. The amount on opared to the amount on am; discharge appears onlificant impact downstre	of discharge is significant f normal flow in receiving to be having a	ischarge; flow mostly clear and ode ge has a color and/or odor, the amo ge is very small compared to the str d any impact appears to be minor /	ount of discharge;	s not have dry weather staining; or appearance any erosion problems.			
	5	4	3	2	1			
SKETCH/NOTES:								
\(\frac{1}{2}\)			R	EPORTED TO AUTHORI	TIES: YES NO			

Severe Bank Erosion



WATERSHED/SUBS	SHED: Clarks	Brook		DATE: 7/2	108	ASSESSED BY: Friends		
SURVEY REACH:	CB03		23_AM/PM)	РНОТО ID (САМ	IERA-PIC#	#): /# 29 (2424)		
SITE ID: (Condition-	#) START LAT 4	1 050 1/3.1	" Long <u>7</u>	71/24"	LMK	GPS: (Unit ID)		
ER- <u>0</u>	END LAT_		" LONG°_		LMK			
PROCESS: Downcutting Widening Headcutting Aggrading Sed. deposition	Currently unknown Bed scour Bank failure Bank scour Slope failure Channelized	LOCATION: DIMENSIONS Length (if no (Meander bend GPS) LT 30 f	and/or RT	Steep s	slope/valley wall Other:		
LAND OWNERSHIP	Private Public					Developed: voar ind plk.		
POTENTIAL RESTO	ORATION CANDIDATE	C: Grade Other	e control [Bank stabilization	1	>100ft		
EROSION	Active downcutting; tall ban				T .			
SEVERITY(circle#)	of the stream eroding at a fa contributing significant amo stream; obvious threat to pr	ast rate; erosion unt of sediment to	Pat downcutting evide widening, banks activ moderate rate; no thre infrastructure	ely eroding at a	failure/eros	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.		
Channelized= 1	infrastructure. 5		4 3		2	1		
Access:	Good access: Open area in ownership, sufficient room to materials, easy stream char heavy equipment using exist trails.	o stockpile nnel access for ting roads or	Fair access: Foreste adjacent to stream. A removal or impact to	borested or developed area eam. Access requires tree eact to landscaped areas. s small or distant from stream. Difficult access. Must cross wetland, so ther sensitive areas to access stream. stockpile areas available and/or located distance from stream section. Specialis equipment required.				
NOTES/CROSS SEC	CTION SKETCH:							
	TONDALT CIT							
2					REPORTE	d to authorities 🗌 Yes 🔲 No		

Stream Crossing

C	
D	

WATERSHED	SUBSHED: Clarks 3	noch		DATE: 🖳	12/08	ASSE	ESSED BY: 🖓		
URVEY REA	.cн ID: 6803		_AM/PM]	Рното ID	: (Camera-Pic	#)	/# 3	1 (2426)	
SITE ID: (Con	dition-#) SC- <u>0</u> LAT	no osignal	" LONG	0 1	" LN	/IK	GPS (U	nit ID)	
TYPE: Ros	ad Crossing Railroad Cross	ng Manmade	Dam Beaver	· Dam 🔲	Geological Forn	nation \square	Other:	bridae	
FOR ROAD/ RAILROAD CROSSINGS ONLY	SHAPE: Arch Bottomless Box Elliptical Circular AILROAD CONDITION: (Evidence of)		MATERIAL: Concrete Metal Other:	ALIGI Flo No Do	NMENT: ow-aligned t flow-aligned not know TERT SLOPE:	DIMENS Barrel dia	IONS: (if variate ameter:	ble, sketch) (ft) (ft) (ft)	
ONLI	☐ Cracking/chipping/corrosio☐ Sediment deposition☐ Other (describe):	n Downstrean Failing emb		☐ Sli	☐ Flat ☐ Slight (2° − 5°) ☐ Obvious (>5°)		Width:	(ft)	
по	POTENTIAL RESTORATION CANDIDATE Fish barrier removal Culvert repair/replacement Upstream storage retrofit no								
IS SC ACTING			es Unkno		CVACE SEVED	YTV: (sine	-1- #\		
If yes for fish barrier	barrier CAUSE: Drop too high Water Drop: (in) Flow too shallow Water Depth: (in)		A structure such as road culvert on a 3r greater stream bloc upstream movemer anadromous fish; n passage device pre	a dam or d order or king the nt of o fish esent.	r or tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. beaver dam or a bit the very head of a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.			a blockage at f a stream with fish habitat	
NOTES/SKET	Other:		5		4 3		(2)	1	
7					Report	ΓED TO AU	THORITIES	YES 🗆 No	

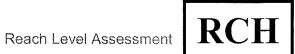
WATERSHED	***************************************	Brook]	DATE: <u> </u>	12 108	ASSE	SSED BY:	Friends	
URVEY REA	CARROLL CONTROL TIME: / :50): (Camera-Pic	: #)	/#	32 (2427)		
SITE ID: (Con	dition-#) SC- <u>0</u> 2 LA	T41°50'17	<u>, 2</u> " Long <u>7</u> 2	<u> </u>	<u> ወሃ.ዴ"</u> LI	мк	GPS	(Unit ID)	
The same of the	10 . []	. 🗀	~ FT -						
TYPE: Roa		sing Manmade			Geological For		Other:		
	SHAPE: Arch Bottomless	# BARRELS:	MATERIAL: Concrete	at a	NMENT: ow-aligned	DIMENS Barrel dia		riable, sketch) $\frac{4}{3} = 5 $ (ft)	
	Box Elliptical	Double	Metal	1	t flow-aligned	Darrer die	Height: _	(ft)	
FOR ROAD/ RAILROAD	☑ Circular ☐ Other:	☐ Triple☐ Other:	Other:	ı	not know			(10)	
CROSSINGS	CONDITION: (Evidence of)			CIII V	ERT SLOPE:	Culvert le	ength: _	<u>60 (ft)</u>	
ONLY	Cracking/chipping/corros		n scour hole	Flat			Width: _	(ft)	
	Sediment deposition	Failing emb		i ·	ght $(2^{\circ} - 5^{\circ})$			0 A	
	Other (describe):			□ОЬ	vious (>5°)	Roadway	elevation:_	<u>(ft)</u>	
POTENTIAL P	RESTORATION CANDIDATE	Fish barrier re	emoval 🏻 Culve	rt renair/ro	nlacement D I	Instraom	torage rotes	fit	
no									
	IS SC ACTING AS GRADE CONTROL No Yes Unknown 6								
	EXTENT OF PHYSICAL BI				CKAGE SEVER	UTY: (circ	le #)		
	☐ Total ☐ Partia		A structure such as	a dam or	A total fish blocka	ge on a	A temporary	barrier such as a	
If yes for		IOWII	road culvert on a 3r greater stream bloo	rd order or	tributary that would significant reach of	ld isolate a	beaver dam	or a blockage at	
fish barrier	CAUSE:	Duran (in)	upstream movemer	nt of	or partial blockage that may		very little via	ble fish habitat	
	☐ Drop too high Water☐ Flow too shallow Water	Drop: (in) Depth: (in)	anadromous fish; no passage device pre		interfere with the anadromous fish.	migration of	above it; nat as waterfalls	tural barriers such	
)	Other:	()	5		4 3		2	1	
NOTES/SKET	СН:				<u>-</u>		2		
			ī						
				•	÷				
1									
<i>,</i>					REPOR'	TED TO AU	THORITIES	□ YES □ NO	

WATERSHED		mode		DA	re: <u> </u>	12108	ASSE	ESSED BY: Friends
URVEY REA	E SOUL DE SOUR NEW AND ARREST OF THE SOURCE	TIME: <a> :00	1			: (Camera-Pic	: #)	<u>/# 33 (2428)</u>
SITE ID: (Con	dition-#) SC- <u>03</u> LAT	11 0 50 120	$\frac{2}{2}$ " Long $\frac{7}{2}$	<u> </u>	27 '	04.2" LI	ИК	GPS (Unit ID)
TYPE: Roa	nd Crossing 🔲 Railroad Crossi	ng 🔲 Manmade	Dam 🔲 Beav	er Da	ım 🔲	Geological For	nation 🗌	Other:
FOR ROAD/	SHAPE: Arch Bottomless Box Elliptical Circular	#BARRELS: ☐ Single ☐ Double ☐ Triple	MATERIAL: Concrete Metal		Flo	w-aligned t flow-aligned	Barrel dia	IONS: (if variable, sketch) ameter:(ft) Height:(ft)
RAILROAD	Other:	Other:	Other:		□ №	not know		3
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n Downstrean			Fla ☐ Slig	ERT SLOPE: t ght $(2^{\circ} - 5^{\circ})$ vious $(>5^{\circ})$	Culvert le	ength:
POTENTIAL I	^							
IS SC ACTING	G AS GRADE CONTROL	MNo □ Y	es 🔲 Unk	nown	1			
	EXTENT OF PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVER	RITY: (circ	:le #)
If yes for fish barrier	Total Partial Unknow CAUSE: Drop too high Water Drop too shallow Water Drop too Other:	rop:(in)	A structure such road culvert on a greater stream bl upstream movem anadromous fish; passage device p	3rd ore ocking ent of no fish oresent	am or def or tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of a nadromous fish. A temporary barrier beaver dam or a blo the very head of a si very little viable fish above it; natural bar as waterfalls.			
NOTES/SKET			5		4	3		2 1
	CH: Coloble Sul)) Nation						
T	The state of the s					REPOR	TED TO AU	THORITIES YES NO

Trash and Debris



WATERSHED/SUB	shed: Clarks (Brook	DATE: _7/ 2	108	ASSESSED BY: Friends		
JURVEY REACH I	D: CB03	TIME: 1:23 AM/PM	Рното ID: (Са	ımera-Pic #)	/# 30 (2425)		
SITE ID: (Condition	#) TR- <u>O</u> LAT	1 . 50 13.1 "LONG	372.027.12:	<u> </u> " LMK_	GPS: (Unit ID)		
TYPE: ☐ Industrial ☐ Commercial ☐ Residential		onstruction	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION: Stream Riparian Ar Lt bank			
POTENTIAL REST		☑ Stream cleanup ☐ Strea ☐ Other:	am adoption segment	t Removal/pr	revention of dumping		
If yes for trash or debris removal	EQUIPMENT NEEDED: WHO CAN DO IT:	☐ Heavy equipment ☐ T ✓ Volunteers ☐ Local C			DUMPSTER WITHIN 100 FT: Yes ☐ No ☐ Unknown		
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., than two pickup truck loads) loc inside a park with easy access		nay have been dumped o it could be cleaned up in	ver A large amoul	nt of trash or debris scattered over a large cocess is very difficult. Or presence of drums of hazardous materials		
NOTES:	5	4	3	2	1		
)	MANUAL CALL			REPORTE	D TO AUTHORITIES YES NO		



SURVEY REACH I	D: <u>C604</u> WT	rshd/Subshd: 🔾 🔾	rlus Brook	DATE: 7/0	108 Assi	ESSED BY:
	e: <u>10 : 34 AM</u> /PM	LMK:		2:02 AM/PM	LMK:	GPS ID:
LAT41050 13	2.]" Long 7	2017 10/12"	LAT 1050			
DESCRIPTION: OU	Het to soda	e well and	DESCRIPTION: (00	d arossiny, ku	otweed, m.	f rose
Tussock, winter						
RAIN IN LAST 24 HO	_	☐ Steady rain	PRESENT CONDITIONS	-	•	n 🗆 Intermittent
□ None	Intermittent		☑ Clear	☐ Trace	☐ Overcast	☐ Partly cloudy
SURROUNDING LAN		l □ Commercial rse □ Park	☐ Urban/Residential ☐ Crop	☑ Suburban/Res ☐ Pasture	☐ Forested ☐ Other:	□ Institutional -84
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SIT	TE IMPACT TI	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% □ 75-100%	within the survey re	of survey reach. Tra ach (OT, ER, IB,SC, deemed appropriate.	UT, TR, MI) as v	
DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick)	obble (2.5 –10") oulder (>10") ed rock			i day	
WATER CLARITY ☐ Stained (clear, n ☐ Other (chemicals,	aturally colored) dyes)	Opaque (milky)		çv ^x	W Co	1 1 . d o a
AQUATIC PLANTS	,	e □ some □ lots		M		Ekladge
IN STREAM		e 🗆 some 🗀 lots	_		roll & sc	0,5
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☐ Fish ☐ Beav ☐ Snails ☐ Other	er Deer r: Songbirds, Prog		01		
STREAM SHADING (water surface)	✓ Mostly shaded ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25	%) d (≥25%)		Porg	y Road Sc-01	
CHANNEL DYNAMICS Unknown	Downcutting Widening Headcutting Aggrading Sed. depositio	Bed scour Bank failure Bank scour Slope failure Channelized			,	
		1	_			-
CHANNEL	Height: LT bank	(ft)				
DIMENSIONS (FACING	RT bank	(ft)				
DOWNSTREAM)	Width: Bottom	(ft)				and the second second
	Тор	5(ft)		د		
Good: Open area in	KEACH ACCESSIBILI Fair: Forested or developed area	Difficult. Must cross wetland, steep slope, or		4	The state of the s	
public ownership, sufficient room to stockpile materials, easy stream channel	adjacent to stream. Access requires tree removal or impact to	sensitive areas to get to stream. Few areas to stockpile available	Short d	<u> </u>	J	
access for heavy equipment using existing roads or trails.	landscaped areas. Stockpile areas small or distant from stream.	and/or located a great distance from stream. Specialized heavy equipment required.	N N			
		2 1				
NOTES: (biggest prob	otem you see in survey	reach)				
1						
				Repor	TED TO AUTHO	RITIES YES NO

	Optimal	Suboptimal	Marginal	Poor		
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of base soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0		
	Right Bank 10 (9).	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0		
The state of the s	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		

Stream Crossing

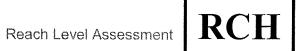
SC

WATERSHED	Isubshed: Clarks B	roole		DAT	re: 7	110 108	ASSE	SSED BY:	Friends
25 90 23 90 25 Report 5 124/25 5	CHID: CBOL		_AM/PM			: (Camera-Pic	c #)	/# :	5
SITE ID: (Con	dition-#) SC- <u>O</u>] LAT	41050 .47	<u>. 9</u> " Long <u>7</u>	2°2	26 ·	<u>56.3</u> " Li	мк	GPS	(Unit ID)
								et pass	
TYPE: V Roa		T	T			Geological Forr			
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	#BARRELS: Single Double Triple Other:	MATERIAL: ☐ Concrete ☐ Metal ☐ Other:		☐ Flo	NMENT: w-aligned t flow-aligned not know	Barrel dia	meter: _ Height: _	riable, sketch) 4 (ft) (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) ☑ Cracking/chipping/corrosio ☐ Sediment deposition ☐ Other (describe):	n Downstrear				t ght (2° – 5 ⁰)	Culvert length: 50 (ft) Width: (ft) Roadway elevation: $0-3.5$ (ft)		(ft)
☑no									
IS SC ACTING	G AS GRADE CONTROL	□ No □Y	es 🔲 Unk	nown					
	EXTENT OF PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVEF	RITY: (circ	le #)	
If yes for fish barrier	Total Partial Temporary Unknown CAUSE: Drop too high Water Drop: 3.5 (in) Flow too shallow Water Depth: (in) Other:		A structure such road culvert on a greater stream bl upstream moven anadromous fish passage device p	3rd ord ocking nent of no fish present	tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. beaver dam or a bloc the very head of a stream, very little viable fish interfere with the migration of anadromous fish.			or a blockage at ad of a stream with able fish habitat tural barriers such s.	
NOTES/SKET			5			3		2	<u> </u>
						Repor	TED TO AU	THORITIES	☐ YES ☐ NO

WATERSHED	WATERSHED/SUBSHED: Clarks Grade DATE: 7/10/08 ASSESSED BY: Friends								
URVEY REA		TIME: <u>/2</u> :02				: (Camera-Pic	: #)	/#	
SITE ID: (Con	dition-#) SC- <u>D</u> LAT	41050 :53	<u>.9</u> " Long <u>7</u>	<u> २० २</u>	6 1	58,6" LI	ИК	GPS	(Unit ID)
	1								
TYPE: Ros	ad Crossing 🔲 Railroad Crossi	ng Manmade	Dam Beave	er Dam		Geological For	nation 🗌	Other:	
	SHAPE:	#BARRELS:	MATERIAL:	ı		IMENT:		-	variable, sketch)
	☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical	Single Double	Concrete	i i		w-aligned	Barrel dia	meter:	(ft)
FOR ROAD/	Circular	Triple	☐ Metal ☐ Other:			flow-aligned		Height:	(ft)
RAILROAD	Other:	Other:	U Otner:		7 Do	not know			
CROSSINGS	CONDITION: (Evidence of)			C	ULVI	ERT SLOPE:	Culvert le	-	(ft)
ONLY	Cracking/chipping/corrosio	n Downstream	n scour hole	,	∦Flat	t t		Width:	(ft)
	Sediment deposition	☐ Failing emb							
	Other (describe):					710us (>5)	Roadway	elevation:	(ft)
POTENTIALI	RESTORATION CANDIDATE	☐ Figh harmia	movel D C-1-	aut +	:/	lecomert Dr	Tu atus :		- C-
	AESTORATION CANDIDATE	☐ Fish barrier re☐ Local stream		_	ш/гер	nacement [] (pstream st	orage retr	OH
	G AS GRADE CONTROL								
18 SC ACTING		☑No ☐Y	es 🔲 Unkı		Dro	OK LOE CENTER		7 (1)	
	EXTENT OF PHYSICAL BLO	CKAGE:		<u></u>	BLUG	CKAGE SEVER	IIIY: (circ	le #)	
	Temporary Unkno	wn	A structure such a			A total fish blocka			ry barrier such as a
If yes for	CAMER.		road culvert on a 3rd order or greater stream blocking the tributary that would significant reach of			of stream, the very head of a stream with			
fish barrier	CAUSE: Drop too high Water D	rop: (in)	upstream moveme anadromous fish;		İ	or partial blockage interfere with the	e that may		iable fish habitat atural barriers such
	Flow too shallow Water D		passage device p			anadromous fish.	ingration of	as waterfa	
	Other:		5		I	3		2	1
NOTES/SKET	CH:								
1									
<u></u>						Repor	ΓED TO AU	THORITIES	S ☐ YES ☐ NO

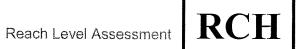
()	7	Γ
l	J		L

WATERSHED/SUBSHE	D: Clarks 3	Syooli	DATE: 7 / 10 / 0	ASSESSED BY:	Friends
SURVEY REACH ID:		ME:// 50 AM/PM	Рното ID: (Camera-Pi	ic #) /#	Personality
SITE ID (Condition-#):	DT-OLL LA	141.50 153.5"La	ONG 720 26 158161	' LMK	GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle Moderate	TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: Single Circular Double Elliptical Triple Other:	Diameter: <u>√2 (in</u>)	SUBMERGED: No Partially Fully
Substantial Other:	Open channel	Concrete Earthen Other:	Parabolic W	/epth: (in) /idth (Top): (in) " (Bottom): (in)	NOT APPELCABLE
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other: Rust	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GRO Brown Oran Other: POOL QUALITY: [Good Odors Suds Algae [Other:	ge
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other; FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:					
POTENTIAL RESTORA	ATION CANDIDATE	☐ Discharge investigatio☐ Storm water retrofit	n ☐ Stream daylighting	☐ Local stream repair/	outfall stabilization
If yes for daylighting: Length of vegetative cov	ver from outfall:		ing vegetation: Knot	NII d Slope:	45 .
If yes for stormwater: Is stormwater currently of Yes □ No ☑ No		Land Use des Area availabl	scription: Forested :	to residential	
SEVERITY: str (circle #) str	eavy discharge with a dist ong smell. The amount o mpared to the amount of eam; discharge appears unificant impact downstrea	f discharge is significant normal flow in receiving to be having a	ischarge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor.	nount of discharge; stream's base	s not have dry weather staining; or appearance any erosion problems.
SKETCH/NICTES	5	4	3)	2	1
SKETCH/NOTES:					
<u> </u>			R	REPORTED TO AUTHORI	ΓIES: ∐ YES ∏ NO



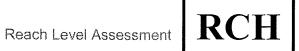
C	- CB OK	·	```	7.10	ASSI	ESSED BY:
SURVEY REACH	V	rrshd/Subshd: 🕦		DATE: 7 / 10	<u>/// 0 0</u>	Friends
START TIM			END TIME:_		LMK:	GPS ID:
LAT'	" Long_		LAT°'	" Long _	<u> </u>	
DESCRIPTION:) Ngergrou	101	DESCRIPTION:	Lawn ?		
D	(may)					
RAIN IN LAST 24 HO	OURS ☐ Heavy rain ☐ Intermitten	☐ Steady rain ☐ Trace	PRESENT CONDITIONS Clear	S ☐ Heavy rain ☐ Trace	-	☐ Intermittent
SURROUNDING LAN			☐ Urban/Residential		☐ Overcast ☐ Forested	☐ Partly cloudy
BURROUNDING LAN		irse Park	☐ Crop	☐ Pasture	☐ Other:	☐ Institutional
AVERAGE	E CONDITIONS (che	ck applicable)	REACH	SKETCH AND SI	TE IMPACT TI	RACKING
BASE FLOW AS %	□ 0-25%	□ 50%-75%	Simple planar sketch	of survey reach. Tra	ick locations and	IDs for all site impacts
CHANNEL WIDTH	□25-50 %	□ 75-100%		each (OT, ER, IB,SC, s deemed appropriate		
DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5) WATER CLARITY	slick)	obble (2.5 –10") oulder (>10") ed rock d (suspended matter)	,	accinal appropriate	The control of the co	51
☐ Stained (clear, n☐ Other (chemicals,	naturally colored) 🛚					
AQUATIC PLANTS IN STREAM		e □ some □ lots e □ some □ lots				
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beav □ Snails □ Othe		-		Company of the property of the	And the second s
STREAM SHADING (water surface)	☐ Mostly shaded ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 2:	%) d (≥25%)			gant fatt freshe America (St. St. St. St. St. St. St. St. St. St.	and the second section of the second section s
CHANNEL DYNAMICS	☐ Downcutting ☐ Widening ☐ Headcutting	Bed scour Bank failure Bank scour		Upperssion		
Unknown	Aggrading Sed. depositio	Slope failure Channelized	Champerson dephases	10	ragmites	
CHANNEL	Height: LT bank	(ft)	The state of the s	graphical and the state of the		
DIMENSIONS	RT bank	(ft)		<u> </u>	3208	
(FACING DOWNSTREAM)	Width: Bottom	(ft)			1	drain and
	Тор	(ft)	· ·		Storm	, sugar
I	REACH ACCESSIBILI			(XE		TRE Grann
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	10/	Rack Rack	edge	ites amound
NOTES: (biggest prob		2 1 reach)	1	104		
Str	eam is ev	\$ 24	durground	L. 04		
Swer	io propa	ne Kois la	oun trum to	REPOR	TED TO AUTHOR	RITIES YES NO
1: 10:4	0.01	ALLE STEVELL	to Mary which of	d'hard at	100st 4	1

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamban surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
		15 14 13 12 11 ALL BUFFER AND FLOODPLA		5 4 3 2 1 0
		5 - 17 C 10 C 10 C 10 C 10 C 10 C 10 C 10 C		5 4 3 2 1 0
VEGETATED BUFFER WIDTH	OVER	ALL BUFFER AND FLOODPLAI	IN CONDITION	
BUFFER	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: little or no riparian vegetation due to
Buffer Width	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. 5 4 3 5 4 3	Poor Width of buffer zone <10 feet: littl or no riparian vegetation due to human activities.
BUFFER WIDTH FLOODPLAIN	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: littl or no riparian vegetation due to human activities.
BUFFER WIDTH FLOODPLAIN	Over Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type	Suboptimal Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. 5 4 3 5 4 3 Predominant floodplain vegetation type is shrub or old	Poor Width of buffer zone <10 feet: littl or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation
BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation type is young forest	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. 5 4 3 5 4 3 Predominant floodplain vegetation type is shrub or old field	Poor Width of buffer zone <10 feet: littl or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation type is turf or crop land
BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN	Over Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest 20 19 18 17 16 Even mix of wetland and non-wetland habitats, evidence of standing/ponded	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation type is young forest 15 14 13 12 11 Even mix of wetland and non-wetland habitats, no evidence of	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. 5 4 3 5 4 3 Predominant floodplain vegetation type is shrub or old field 10 9 8 7 6 Either all wetland or all nonwetland habitat, evidence of	Poor Width of buffer zone <10 feet: little or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation type is turf or crop land 5 4 3 2 1 0 Either all wetland or all nonwetland habitat, no evidence of
Buffer	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest 20 19 18 17 16 Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Suboptimal Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation type is young forest 15 14 13 12 11 Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. 5 4 3 5 4 3 Predominant floodplain vegetation type is shrub or old field 10 9 8 7 6 Either all wetland or all nonwetland habitat, evidence of standing/ponded water	Poor Width of buffer zone <10 feet: little or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation type is turf or crop land 5 4 3 2 1 0 Either all wetland or all non-wetland habitat, no evidence of standing/ponded water



SURVEY REACH 1	ID: <u>GBST-</u> OI WTRSHD/SUBSHD: G-al	es South Tulb	DATE: 6/5	Asse Asse	SSED BY:	
/	E: <u>] </u>		: 40 AM/PM	LMK:		GPS ID:
LAT4 0 51 1	159" LONG 770° 25 '31.2"	LAT41 ° 51 ' 1	16.6" LONG 7.2	0 25 104	1.3 "	
DESCRIPTION:	2010	DESCRIPTION:	20110	<u> </u>		
DESCRITION.		DESCRIPTION.				
RAIN IN LAST 24 HO	DURS Heavy rain Steady rain	PRESENT CONDITIONS	☐ Heavy rain	☐ Steady rain	☐ Interm	ittent
□ None	☐/Intermittent ☐ Trace	☐ Clear	☐ Trace	☐ Overcast	₽́Partly	cloudy
SURROUNDING LAN	D USE: ☐ Industrial ☐ Commercial ☐ Golf course ☐ Park	☐ Urban/Residential ☐ Crop	□ Suburban/Res □ Pasture	☑ Forested ☐ Other:	□ Institu	tional
AVERAGE	E CONDITIONS (check applicable)	REACH S	SKETCH AND SI	TE IMPACT TR	ACKING	
BASE FLOW AS %	□ 0-25% ⊠ 50%-75%	Simple planar sketch o	of survey reach. Tra	ck locations and 1	Ds for all si	te impacts
CHANNEL WIDTH	□25-50 % □ 75-100%	within the survey rea	ach (OT, ER, IB,SC, deemed appropriate.			lditional
DOMINANT SUBSTR	ATE /	Jeann'es e	лестви ирргоргине. Д	maicute atrectio	on of flow	
☐ Silt/clay (fine or	slick)	E _C upa diceres	# ±		J=1	
☐ Sand (gritty)	☐ Boulder (>10")	New York Control of the Control of t	1 4		•	
☑ Gravel (0.1-2.5	5") \square Bed rock	1	6BST-03		X	
WATER CLADITY	Clear Turbid (suspended matter)	GR \			WENDER!	v = -
1 man	aturally colored)	1000			1	***
☐ Other (chemicals,			0 11 /	1000ccate	No.	
			PINO & GES	7	and the second second	
AQUATIC PLANTS	Attached: ✓ none ☐ some ☐ lots		A	1-01	Inst.	1 . 1
IN STREAM	Floating: ☑ none ☐ some ☐ lots	100	1.11.5101		16ddeil	1882 t
WILDLIFE IN OR	(Eyidence of) ☑ Fish ☐ Beaver ☑ Deer	61/2 - 1	5eef	e constant	7	(albeg
AROUND STREAM	☐ Fish ☐ Beaver ☐ Deer ☐ Snails ☐ Other:			Para de la companya d	and the second	
1		1 Wilker / / /		Standowed?		
STREAM SHADING	☑ Mostly shaded (≥75% coverage) ☐ Halfway (≥50%)				Age of the second	
(water surface)	☐ Partially shaded (≥25%)			163	Q	
	☐ Unshaded (< 25%)			Schol Française	b	
Crando	Downcutting Bed scour			and the state of t	112	
CHANNEL	Widening Bank failure				/ Eros	ion
DYNAMICS	Headcutting Bank scour			1	Ρ	
	Aggrading Slope failure			/	/	
∐ Unknown	Sed. deposition Channelized			/		
	3	1 / /	Ž.	1		
CHANNEL	Tieight. Li bank (ii)		X /	and the same of th		
DIMENSIONS	RT bank (ft)	Series Se	/ /			
(FACING DOWNSTREAM)	Width: Bottom(ft)	A P				
DOWNSHILLAM	Top 2 (ft)					
F	REACH ACCESSIBILITY		1			
Good: Open area in	Fair: Forested or Difficult. Must cross	/	/ /			
public ownership,	developed area wetland, steep slope, or adjacent to stream. wetland, steep slope, or sensitive areas to get to		<i></i>			
sufficient room to	Access requires tree stream. Few areas to	/^				
stockpile materials, easy stream channel	removal or impact to stockpile available	GBOI GR	351-0/			
access for heavy	landscaped areas. and/or located a great	1				
equipment using	Stockpile areas distance from stream. small or distant from Specialized heavy		<			
existing roads or trails.	stream. equipment required.					İ
	3 (2) 1	- The state of the				
NOTES: (biggest prob	olem you see in survey reach)					
7						
			REPOR	TED TO AUTHOR	ITIES [] Y	ES NO

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 /18 /17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambanl surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		failure absent or minimal; tential for future problems. bank affected.		Active downcutting; tall banks or both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to proper or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 (19)	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull not able to enter floodplain. Stream deeply entrenched.	
	to the second of	ALL BUFFER AND FLOODPLA	10 9 8 7 6 IN CONDITION	5 4 3 2 1 0	
~	Optimal	Suboptimal		Poor	
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: lit or no riparian vegetation due to human activities.	
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 /17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on	
Encroach- ment	20 19 (18)17 16	15 14 13 12 11	effect on floodplain function 10 9 8 7 6	floodplain function 5 4 3 2 1 0	



SURVEY REACH ID: GBSFOR WTRSHD/SUBSHD: GASEN	BLS Trib DATE: 6 15 158 ASSESSED BY:
START TIME: 1/ : 50 AM/PM LMK:	END TIME: 12:45 AM/PM LMK: GPS ID:
LAT 41°51 ' 186" LONG 72 ° 25 '043"	LAT <u>4/ ° 6 / ' 17.0 " LONG 7 2 ° 24 ' 34 3</u> "
DESCRIPTION:	DESCRIPTION:
1 — · · · · · · · · · · · · · · · · ·	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent
	☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy ☐ Urban/Residential ☐ Suburban/Res ☐ Forested ☐ Institutional
Golf course Park	□ Crop □ Pasture □ Other: Highway
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % □ 0-25% □ 50%-75% CHANNEL WIDTH □ 25-50 % □ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE ☐ Silt/clay (fine or slick) ☐ Sand (gritty) ☐ Gravel (0.1-2.5") ☐ Cobble (2.5 -10") ☐ Boulder (>10") ☐ Bed rock	013/ (sc-1)
WATER CLARITY ☐ Clear ☐ Turbid (suspended matter) ☐ Stained (clear, naturally colored) ☐ Opaque (milky) ☐ Other (chemicals, dyes)	frice of dot-2
AQUATIC PLANTS Attached: In none I some I lots	Sperenall
IN STREAM Floating: ☑ none ☐ some ☐ lots (Eyidence of)	C C Cary 5 to m
WILDLIFE IN OR AROUND STREAM Spails Other: 500 Ce	
STREAM SHADING (water surface) ☐ Halfway (≥50%) ☐ Partially shaded (≥25%) ☐ Unshaded (<25%)	
CHANNEL DYNAMICS Downcutting Widening Headcutting Bed scour Bank failure Bank scour	BEOSIA
Unknown Aggrading Slope failure Sed. deposition Channelized	En Berson
CHANNEL Height: LT bank 2.5 (ft) DIMENSIONS RT bank 2.5 (ft)	dam custary
$\begin{array}{ccc} (FACING & Width: Bottom & & & & (ft) \\ DOWNSTREAM) & Top & 12.5 & (ft) \\ \end{array}$	duned of the
REACH ACCESSIBILITY	1 /1 / OT-1
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails. Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream. Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream. Specialized heavy stream equipment required.	Ground water seep + thirastory
5 4 3 (2) 1	
NOTES: (biggest problem you see in survey reach)	
	REPORTED TO ALITHORITIES VES NO

-	Optimal	Suboptimal	Marginal	Poor	
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	d for full colonization potential; quate habitat for maintenance of plations; presence of additional strate in the form of newfall, but yet prepared for colonization (may)		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
		15 (14) 13 12 11 ALL BUFFER AND FLOODPLA	10 9 8 7 6	5 4 3 2 1 0	
	Optimal			T	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10	6 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 1/3 12 11			

WATERSHED/SUBSH	ED: LAZER X	South strib	DATE: 6/5/08 ASSESSED BY: DOS		
SURVEY REACH ID: 0357-02 TIME: 12:30 AM/PM			Рното ID: (Camera-Pi	ic#) DBC~~~ /#	1834
SITE ID (Condition-#):	OT- <u>02</u> LA	TY1051 17,1"LO	ong 72° 24 ' 47.3'	' LMK	GPS: (Unit ID)
D					
BANK: RT RT Head	TYPE:	MATERIAL: ☐ Concrete ☐ Metal	SHAPE: Single Circular Double	DIMENSIONS:	SUBMERGED: No
FLOW:	Closed	☐ PVC/Plastic ☐ Brick	Elliptical Triple	Diameter:] % (ir	No Partially
None Trickle	pipe e	Other:	Other:		Fully
Moderate			☐ Trapezoid ☐	Pepth:(in)	
Substantial Other:	Open channel	☐ Concrete ☐ Earthen☐ Other:	□ n 1 1:	/idth (Top):(in)	NOT APPEICABLE
	Site in the same of the same o			" (Bottom): (in)	
CONDITION:	ODOR: No	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GR	OWTH: None
None Chip/Cracked	☐Gas ☐ Sewage	│	☑ None ☐ Normal	Brown Oran	nge 🗌 Green
Peeling Paint	Rancid/Sour	Flow Line	Inhibited		
Corrosion	Sulfide	Paint	Excessive	POOL QUALITY:	
Other:	Other:	Other:	Other:	Suds Algae	
				Other:	
For Colo	R: XClean	r 🔲 Brown 🔲 Grey	Yellow Green	Orange Red (Other:
	IDITY: None	Slight Cloudiness	Cloudy Dpaque	1 Oxninge	Juici.
	TABLES: None				Other:
·1.	cess Trash (paper/pla eds Regular Mainten	· · · · · · · · · · · · · · · · · · ·		Sedimentation, 5. elos M.	1. A.
CONCERNS:		ance 🔀 Bank Ero	osion A Other: V.	J. 40-001 10. 1	ANAKA
POTENTIAL RESTOR	ATION CANDIDATE	Discharge investigatio	n Stream daylighting	I ocal stream renair	/outfall stabilization
no		Storm water retrofit	Other:	Local stream repair	outian staomzanon
If yes for daylighting.	•				
Length of vegetative co	ver from outfall:	ft Type of exist	ting vegetation:	Slope:	0
If yes for stormwater.	•			*	
Is stormwater currently		Land Use des	scription: Highway	84	
☐ Yes ☐ No 📮 No		Area available			
0 1 .	eavy discharge with a disti		ischarge; flow mostly clear and or	dorloss If the	
BEVERUIT.	trong smell. The amount of cmpared to the amount of	normal flow in receiving discharge	ge has a color and/or odor, the am	nount of	s not have dry weather staining; or appearance
	ream; discharge appears t gnificant impact downstrea	O De Having a	ge is very small compared to the s d any impact appears to be minor.	illeams base 1 ,	any erosion problems.
	5	4	3		1
SKETCH/NOTES:	84 unbone	was the	easter flow		
	-	- 1 2 A W	west of the		
	4 6	1.00 M/ W	₽ 		
	1		ilian(Transport parco, , ,		
and the second of the second of the second s	And the second s	D 1 707-07			
and the second s	general and state of the state	2 GBST-02	TO AND MORE SECURITY AND A .		
The Market and the State of the					
<u>)</u>			R	REPORTED TO AUTHORI	TIES: YES NO

			Sto	rm Water Outfalls	ОТ	
WATERSHED/SUBSI	HED: Gages Ble	S. Trib	DATE: 6/5/07	ASSESSED BY:		
SURVEY REACH ID	GBST-02 TI	S. 7/16 ME:12:35 AM/PM	Рното ID: (Camera-Pi	ic#) 10000 /# 15	35	
SITE ID (Condition-#)	The State of the S	AT 41/0 6 15 17.0 "L	ong 72°24 '39.9'	' LMK_ G	PS: (Unit ID)	
BANK: LT RT Head FLOW: None Trick	Closed	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS: Diameter: 24 (in)	SUBMERGED: No Partially Fully	
Moderate Substantial Other:	Open channel	Concrete Earthen Other:	Parabolic W	Pepth: (in) Vidth (Top): (in) " (Bottom): (in)	NOT APPEICABLE	
CONDITION: None Chip/Cracked Peeling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: None Oily Flow Line	VEGGIE DENSITY: ☐ None ☑ Normal ☐ Inhibited	PIPE BENTHIC GROW Brown Orange Other:	Green	
Corrosion Other:	Sulfide Other:	Paint Other:	Excessive Other:	POOL QUALITY: Good Godors God	Colors Doils	
FLOWING TURN ONLY FLOW OTHER	ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation					
no If yes for daylighting	,·	E ☐ Discharge investigation ☐ Storm water retrofit ☐ If Type of exis	Other:	Local stream repair/out Slope:	fall stabilization	
If yes for stormwater: Is stormwater currently controlled? Land Use description: Yes No Not investigated Area available: OUTFALL Heavy discharge with a distinct color and/or a						
(circle #)	strong smell. The amount of compared to the amount of stream; discharge appears significant impact downstre	normal flow in receiving to be having a am.	discharge; flow mostly clear and or rge has a color and/or odor, the and rge is very small compared to the sid any impact appears to be minor	nount of causing any of causing any	t have dry weather ning; or appearance erosion problems.	
SKETCH/NOTES:	3	4	(3)	2	1	
REPORTED TO AUTHORITIES: YES NO						

Channel Modification



WATERSHED		Gazes Bks.	Trib	DATE: <u>6</u> /_	5-108	ASSESSED BY: JHW
SURVEY REA	CH ID: 스(TIME: 12: 40 AM/P		D: (Camera-Pic #)	J# 1835
SITE ID: (Con-	dition-#)	START LAT 1 0	51 '17.1" LONG	72024 149311	LMK 8" 20	GPS: (Unit ID)
CM !		END LAT 41 °	<u>\$1'130"</u> LONG	12 024 139,8 11	LMK I 8 4	3
TYPE: Cha	nnelization	Bank armoring	concrete channel	Floodplain encroach	nment Other:	
MATERIAL:	_	Does channel have	e perennial flow?	⊮ Yes □ No	DIMENSIONS:	
Concrete [_ Gabion ☐ Earthen	Is there evidence of	of sediment deposition?	Yes No	Height Bottom Width	(ft)
☐ Metal	_ Lartiteii	Is vegetation grow	ring in channel?	ĭ Yes □ No	Top Width:	(ft)
Other:		Is channel connect	ed to floodplain?	☐ Yes 🗵 No	Length:	See GPS coord (ft)
BASE FLOW (TELANAME					
Depth of flow		(in)		ADJACENT ST	REAM CORRIDOR	
		(-) 1? □ Yes ☒ No		Available widt	th LT < 20	(ft) RT <u>/00+</u> (ft)
				Utilities Preser		Fill in floodplain?
% of channel	bottomi	<u>00</u> %		☐ Yes ☑ No		□Yes 🏻 No
POTENTIAL R	ESTORATIO	ON CANDIDATE] Structural repair 🔲 I	Base flow channel cre	eation Natural ch	annel design
no	1		De-channelization I	Fish barrier removal	√⊠ Bioengine	eering
CHANNEL-		n of concrete stream (>500') e water is very shallow (<1")') ,but channel stabilized ;		nel less than 100 ft with good water
IZATION SEVERITY:	deep) with no	natural sediments present				sediment bottom, and size and the unchannelized stream reaches
(Circle #)	the channel.	5		3	above and below	v impacted area.
NOTES:	<u> </u>			3	2	I
7.02.20	151	T-8				010,0
**			ngglad likelakelakelike in republike in republike in republike in distribution distribution in	eggesphagitallinistississississississississississississi		Company of the control of the contro
24"=	Ţ		Notifying the provider of the analysis of the contract of the			į v
	***Committee and in the second of the second	\IL4	upland (forces	the state of the s		Per Printers and process account of the contract of the contra
		4 - 7	at a Ciaina	1 20		

OT

WATERSHED/SUB	SHED: G-BST.	-02	DATE: 6 / 5 /6	ASSESSED BY: NOR	
SURVEY REACH I	D: 5	CIME: 12: 10 AM/PM			
SITE ID (Condition-4	t): OT- <u>O/</u> 1	LAT_ 0 ZOO IT	"SEBNOT OF SEEP (S		
			FLUENCE		
BANK: LT RT He FLOW: None Trice	Closed	MATERIAL: ☐ Concrete ☐ M ☐ PVC/Plastic ☐ Bi ☐ Other:		16/	
Moderate Substantial Other:	Open channel	☐ Concrete ☐ Eart ☐ Other:	11C11 [] To 1 11	Depth: (in) Width (Top): (in) " (Bottom): (in)	
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO □Gas □ Sewage □Rancid/Sou	☐ None ☑Oily	VEGGIE DENSITY: ☒ None ☐ Normal	PIPE BENTHIC GROWTH: ☑ None ☐ Brown ☐ Orange ☐ Green ☐ Other:	
Corrosion Other:	Sulfide Other:	Paint Other:	☐ Inhibited ☐ Excessive ☐ Other:	POOL QUALITY: ⊠ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:	
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:					
no		TE Discharge investi		🔀 Local stream repair/outfall stabilization	
If yes for daylighting Length of vegetative	•	ft Type of	existing vegetation:	Slope:°	
If yes for stormwat Is stormwater current Yes X No	er: ly controlled? Not investigated	GSVM [#] Land Us Area ava	e description: HIGHWA	4 (84	
OUTFALL SEVERITY: (circle #)		t of discharge is significant of normal flow in receiving rs to be having a	mail discharge; flow mostly clear and of ischarge has a color and/or odor, the an ischarge is very small compared to the ow and any impact appears to be minor	mount of stream's base Outfall does not have dry weather discharge; staining; or appearance	
	5	4	3	. 2 1	
SKETCH/NOTES:	WEKAND	SETT	Exorety 2	RT 84 REPORTED TO AUTHORITIES: YES NO	

WATERSHED/SUBSHED: Gods Bh South This DATE: 6/5/08 ASSESSED BY: 578 B							
URVEY REACH ID: 6357 - 07 TIME: 12:40					: (Camera-Pic	:#)ÞB{a	um # 1835
SITE ID: (Condition-#) SC-Ol LAT 40°51 127.0" LONG 77°74 151-8" LMK_ GPS (Unit ID)							
TYPE: Noad Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other:							
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Single Box Elliptical Double Circular Triple CHOAD Other: #BARRELS: The Boar Bottomless Single Coulon Double		ALIGNMENT: ☐ Flow-aligned ☐ Not flow-aligned ☐ Do not know		DIMENSIONS: (if variable, sketch) Barrel diameter:		
CROSSINGS ONLY CONDITION: (Evidence of) Cracking/chipping/corrosion Downstro Sediment deposition Failing en Other (describe):			ankment \square Slight $(2^{\circ} - 5^{\circ})$		Width:(ft) Roadway elevation:(ft)		
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re☐ Local stream r	moval	epair/rep	placement U	Jpstream s	torage retrofit
	G AS GRADE CONTROL	No □Y€	es Unknow	n			
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVER	RITY: (circ	:le #)
If yes for fish barrier	☐ Total ☐ Partial ☐ Unknot ☐ Temporary ☐ Unknot ☐ Unknot ☐ Drop too high ☐ Water D ☐ Flow too shallow Water D ☐ Other:	rop:(in)	A structure such as a c road culvert on a 3rd o greater stream blocking upstream movement o anadromous fish; no fis passage device preser	rder or g the f sh	A total fish blocka tributary that wou significant reach o or partial blockag interfere with the anadromous fish.	Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
Alomas/Gyram			5		4 3		2 (1)
NOTES/SKETCH: OF -03 SC-01 REPORTED TO AUTHORITIES YES NO							

Reach Level Assessment RCH

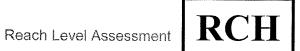


2.2.46.2016.00.00.00.00.00.00.00.00.00.00.00.00.00	8-9-40-20 SASSASASASASASASA						
SURVEY REACH	ID: <u>GBST-0</u> 3 w	TRSHD/SUBSHD:	Goge	a Brook	DATE: <u>6/5</u>	Assi	ESSED BY:
START TIM	ie: 11 : 30 AM)PN	A LMK:	E	END TIME:	: AM/PM	LMK:	GPS ID:
Nort 1	· ·	720 75.04	2" I	AT 41051		20 25 194	
D		1 2 0	7		LONG 1	<u> </u>	91,0
DESCRIPTION: CO	mf. ot 6-135T	501,02,X	05 L	ESCRIPTION:	5C-01		
D. 173. 23. 24. 24. 24. 24. 24. 24. 24. 24. 24. 24							
RAIN IN LAST 24 HO		☐ Steady rain		SENT CONDITIONS	•		n □ Intermittent
□ None	Nntermitten			Clear	☐ Trace	☐ Overcast	▶ Partly cloudy
SURROUNDING LAN		ıl □ Commer ırse □ Park		Jrban/Residential Crop	☐ Suburban/Res ☐ Pasture	Forested Other:	☐ Institutional
Average	E CONDITIONS (che	ck applicable)		•	SKETCH AND SI		RACKING
BASE FLOW AS %	□ 0-25%	□ 50%-75%	3	Simple planar sketch	of survey reach. Tro	ick locations and	IDs for all site impacts
CHANNEL WIDTH	□25-50 %	፟፟፟፟ 75-100		within the survey re	each (OT, ER, IB,SC,	UT, TR, MI) as w	ell as any additional
DOMESTA NIM Crimomo		7		features	deemed appropriate	. Indicate direction	on of flow
DOMINANT SUBSTR ☐ Silt/clay (fine or		obble (2.5 –10")		The state of the s	\ \C_1		9 04
Sand (gritty)		oulder (>10")		ero (hillian	1.7		
☐ Gravel (0.1-2.5		ed rock		Section (Section)	12		FM5ANUL EA
	,			symmetric to		W	
WATER CLARITY			r)	b	of French		and the second
☐ Stained (clear, n		Opaque (milky)		Barcot	LASIA	7//	Parameter Comments
☐ Other (chemicals,	dyes)		•	s proportion	N.XX.(I	777	
AQUATIC PLANTS	Attached: non	ie 🗆 some 🗀 1	ots	estable 2 de la constitución de	Fo	-\	
IN STREAM	Floating: none		97.50	and the second s	In-		And a second sec
	(Evidence of)	е д вогие д к	763		13 -	7 11	
WILDLIFE IN OR	☐ Fish ☐ Beav	er 🗆 Deer			12/	7	The all
AROUND STREAM	☐ Snails ☐ Othe				ON ISLAND	AND THE	JOHN DATION
	Mostly shaded	(>75% coverage)					
STREAM SHADING	☐ Halfway (≥50%	(<u>_</u> , _, , o oo , or ago)			$1 \setminus 2$		
(water surface)	☐ Partially shaded			V ₁			
	☐ Unshaded (< 25	5%)					
CHANNEL	Downcutting	☐ Bed scou	r		\ V	1	
DYNAMICS	Widening	Bank fail	- AP		150	y .	North 2000s
Non	☐ Headcutting	Bank sco	ur 🛝	1. MATER C	7	AS	on FOR
Unknown	Aggrading	Slope fail	ure	WWW DEV.	Y	> " ~ ~ ~	
☐ Clikilowii	Sed. deposition	n 🗌 🔲 Channeliz	zed		() () () () () () () () () ()		
141014	Haisht, ITI - 1	15	(0)		The state of the s		
CHANNEL	Height: LT bank	2 7-	(ft)				
DIMENSIONS	RT bank	<u> </u>	(ft)				
(FACING DOWNSTREAM)	Width: Bottom	12	(ft)		100		
	Top	16	(ft)		No.		
R	REACH ACCESSIBILI	TY			And the second		
Good: Open area in	Fair: Forested or	Difficult. Must cros	S				
public ownership,	developed area	wetland, steep slope					
sufficient room to	adjacent to stream. Access requires tree	sensitive areas to go stream. Few areas	. 1		200-american emerica	aga 7 ti sissa a sina di kalanda da ang pagabah da ang pagabah da ang pagabah da ang pagabah da ang pagabah da	700 byrn.
stockpile materials, easy stream channel	removal or impact to	stockpile available	" -	N 6851.02		CARA	t-01 m
access for heavy	landscaped areas.	and/or located a gre	at 🛮 🖍	200	gade of the design per mineral aggregation of the second specific the second specific design and the second specific the secon		101
equipment using	Stockpile areas small or distant from	distance from strear Specialized heavy	m. /	•			
existing roads or trails.	stream.	equipment required	.				
5 4		2 (1)					
NOTES: (biggest problem you see in survey reach)							
/ Toll	NOTASTERIN	MILL GI					
	- 1 - ME & B. 2 188 .	- 1 1/44 /					
					DEBOR	TED TO AUTUOF	HTHE T VEC TNO
					- REPUR	TED TO AUTHOR	ITIES YES NO

	Optimal	Suboptimal	Marginal	Poor		
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 (13)12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
Vegetated Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
****	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0		

Stream Crossing SC

WATERSHED/SUBSHED: Hoyes South trile DATE: 6/5/08 ASSESSED BY: DRIB									
JURVEY REACH ID: GREET-03 TIME: W: SOAM/PM PHOTO ID: (Camera-Pic #) /# /826 +2						1826 +27			
SITE ID: (Condition-#) SC-01 LAT 10.51 17.8" LONG 72.25 041 LMK GPS (Unit ID)									
TYPE: Roa	ad Crossing 🔲 Railroad Crossi	ng 🔲 Manmade l	Dam Beaver D	am 🔲	Geological Fort	nation 🔲	Other:		
SHAPE: # BARRELS: ☐ Arch ☐ Bottomless ☐ X Single ☐ Double ☐ Box ☐ Elliptical ☐ Triple ☐ AllROAD ☐ Other: ☐ Other:			MATERIAL: Concrete Metal Other:	ALIGNMENT: Flow-aligned Not flow-aligned Do not know		DIMENSIONS: (if variable, sketch) Barrel diameter:			
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n scour hole ankment	CULVERT SLOPE: Flat Slight (2° – 5°) Obvious (>5°)		Culvert length: 200(ft) Width: (ft) Roadway elevation: 30 (ft)				
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re☐ Local stream i	emoval	epair/rej	olacement 🔲 🛚	Jpstream st	orage retro	fit	
Is SC ACTING	G AS GRADE CONTROL	□ No □ Ye	es 🔲 Unknow	n					
If yes for fish barrier	h barrier CAUSE: Drop too high Water Drop: 48 (in) Flow too shallow Water Depth: (in)			A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish A total tribut significant or particular and the first or parti		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
4	Other:		5		1 (3)		2	1	
NOTES/SKETCH: S 4 3 2 1 NOTES/SKETCH: REPORTED TO AUTHORITIES YES NO									



SURVEY REACH ID: SEST-CHA WTRSHD/SUBSHD: Coas	BL South This DATE: 6/5/B ASSESSED BY:
START TIME: 2:35 AM/PM LMK:	END TIME: 3 : 05 AM/PM LMK: GPS ID:
LAT 41 ° 51 '14.1 " LONG 72 ° 25 '05.5"	LATUI ° 5/ ' 107.4" LONG 72 ° 25 1055"
DESCRIPTION:	DESCRIPTION:
	- 220
RAIN IN LAST 24 HOURS Heavy rain Steady rain	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent
□ None □ Intermittent □ Trace	☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy
SURROUNDING LAND USE: Golf course Park	☐ Urban/Residential ☐ Suburban/Res ☐ Forested ☐ Institutional ☐ Crop ☐ Pasture ☐ Other:
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % □ 0-25% □ 50%-75% CHANNEL WIDTH □ 25-50 % □ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE Silt/clay (fine or slick) Sand (gritty) Gravel (0.1-2.5") □ Bed rock	· ,
WATER CLARITY ☐ Ĉlear ☐ Turbid (suspended matter) ☐ Stained (clear, naturally colored) ☐ Opaque (milky) ☐ Other (chemicals, dyes)	
AQUATIC PLANTS Attached: ☐ none ☐ some ☐ lots IN STREAM Floating: ☐ none ☐ some ☐ lots	
WILDLIFE IN OR AROUND STREAM (Evidence of) Fish Beaver Other:	Strain Vell
STREAM SHADING (Water surface) ☐ Halfway (≥50%) ☐ Partially shaded (≥25%) ☐ Unshaded (<25%)	Stonewell
CHANNEL Downcutting Bed scour	To the second se
DYNAMICS Widening Bank failure	
Unknown Headcutting Aggrading Sed. deposition Bank scour Channelized	The State of
CHANNEL Height: LT bank (ft)	The supplier of the supplier o
DIMENSIONS RT bank (ft)	
(FACING Width: Bottom (ft)	
$\begin{array}{c c} DOWNSTREAM \end{array} \qquad \begin{array}{c} Top \end{array} \qquad \begin{array}{c} To$	
REACH ACCESSIBILITY	
Good: Open area in Fair: Forested or Difficult. Must cross	
nublic ownershin developed area wetland, steep slope, or	
sufficient room to adjacent to stream. sensitive areas to get to	CALLERY OT-
easy stream channel removal or impact to stockpile available	and a second transfer of the second s
access for heavy stockpile areas. and/or located a great	I-84
equipment using email or distant from Chapital hours	Manufacturing of the section of the
existing roads or trails. stream. equipment required.	
5 4 3 2 (1) NOTES: (biggest problem you see in survey reach)	
1101E5. (Olggest proviem you see in survey reach)	
{	
	REPORTED TO AUTHORITIES TYES TO NO

	Optimal	Suboptimal	Marginal	Poor	
N-STREAM HABITAT (May modify criteria based on appropriate	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.	
habitat regime)	that are <u>not</u> new fall and <u>not</u> transient).	rate at high end of scale). 15 14 13 12 11	10 9 8 7 6	5 4 2 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	10 9 8 7 6 50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambant surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 /9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION No HEOXPAIN		High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
7 - 7	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
		ALL BUFFER AND FLOODPLA	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0	
	Right Bank (0) 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetatior type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20/ 19/18/ 17/ 16	15 14 13 12 11	· · · · · · · · · · · · · · · · · · ·		

OT

WATERSHED/SUBS	HED: Company Company	Linda Trib	DATE: 6/5/0	ASSESSED BY:				
SURVEY REACH ID	GBT-OUR TI	ме: <u>2 : 4/0 ам/рм</u>	Рното ID: (Camera-F	Рното ID: (Camera-Pic #) (1,000 /# 18 39				
SITE ID (Condition-#	celebrat stranger in 2000a il coudificate.		"Long 72 ° 25 '05 5	" LMK	GPS: (Unit ID)			
BANK: LT RT Hea FLOW: None Trick	Closed	MATERIAL: Concrete PVC/Plastic Other:	SHAPE: Single Metal Circular Double Brick Elliptical Triple Other:	DIMENSIONS: e Diameter: (in)	SUBMERGED: No Partially Fully			
Moderate Substantial Other:	Open channel	Concrete Ear Other:	Parabolic v	Depth: 2.5 (in) Width (Top): 3 (in) " (Bottom): 3 (in)	NOT APPAICABLE			
CONDITION: None Chip/Cracked Peeling Paint	ODOR: ☑NO ☐Gas ☐ Sewage ☐Rancid/Sour	DEPOSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line	VEGGIE DENSITY: ☐ None ☐ Normal ☐ Inhibited	Other:	ge Green			
Corrosion Other:	Sulfide Other:	Paint Other:	Excessive Other:	POOL QUALITY: [Good Godors [Suds Algae Godher:	☐Colors ☐Oils			
FOR COL	OR: Clea	r 🔲 Brown 🔲 Gre	y Yellow Green] Orange 🔲 Red 🔲 O	u.			
FLOWING TUR	BIDITY: Non	territoria de la companya de la companya de la companya de la companya de la companya de la companya de la comp		JOIANGE LI REG LI O	iner:			
	ATABLES: Non-	Control of the contro	aper, etc.) Petroleum	(oil sheen) O	ther:			
	xcess Trash (paper/pla leeds Regular Mainten		mping (bulk)	Sedimentation				
			K 25051011					
POTENTIAL RESTOR	RATION CANDIDATI	Discharge investi	igation Stream daylighting	Local stream repair/o	outfall stabilization			
L no		Storm water retro	fit Other:					
If yes for daylighting	•							
Length of vegetative c	over from outfall:	ft Type of	existing vegetation:	Slope: _	•			
If yes for stormwater	r:							
Is stormwater currently		Land Us	se description:					
☐ Yes ☐ No ☐ N	ot investigated	Area ava	ailable:					
SEVERITY: (circle #)	Heavy discharge with a dist strong smell. The amount or compared to the amount of stream; discharge appears to significant impact downstreat	f discharge is significant normal flow in receiving to be having a	Small discharge; flow mostly clear and o ischarge has a color and/or odor, the an ischarge is very small compared to the s ow and any impact appears to be minor	nount of discharge; st	not have dry weather aining; or appearance ny erosion problems.			
	5	4	(3)	2	1			
SKETCH/NOTES:			- Control of the Cont					
		To Letters						
)			F	REPORTED TO AUTHORIT	IES: YES NO			

Stream Crossing ${
m SC}$

POTENTIAL RESTORATION CANDIDATE Potential Restoration Candidate Fish barrier removal Culvert repair/replacement Upstream storage retrofit	WATERSHED					15 108		SSED BY: Þ	100
TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other: SHAPE: MATERIAL: ALIGNMENT: Barrel diameter: (fi) Metal Not flow-aligned Not flow-aligned Height: (ft) Height: (ft)	Lie sakrados tibro libro de como constata.	Self-Character (Children Language) and construction of the Children Construction					:#) (an)		
SHAPE:	SITE ID: (Con	dition#) SC-2/ LAT	41.051 DTS	" Long <u>70</u>	<u> </u>	<u> </u>	МК	GPS (Un	nit ID)
Arch	TYPE: Roa	ad Crossing	ng 🔣 Manmade :	Dam 🔲 Beave	r Dam 🔲	Geological Forr	nation 🔲	Other:	
ONLY Content (or where et a) Cracking/chipping/corrosion Downstream scour hole Flat Width: (ft) Sediment deposition Failing embankment Slight (2° – 5°) Roadway elevation: (ft) Obvious (>5°) Roadway elevation: (ft) POTENTIAL RESTORATION CANDIDATE Fish barrier removal Culvert repair/replacement Upstream storage retrofit no	RAILROAD	☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical ☐ Circular	☐ Single☐ Double☐ Triple	☐ Concrete☐ Metal	☐ Flo	w-aligned t flow-aligned	Barrel dia	meter: Height:	(ft) (ft)
Is SC ACTING AS GRADE CONTROL No Yes Unknown EXTENT OF PHYSICAL BLOCKAGE: Notation of partial Temporary Unknown Unknown Unknown If yes for fish barrier CAUSE: Note of physical blockage at the very head of a stream with passage device present. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere	i i	☐ Cracking/chipping/corrosion☐ Sediment deposition			☐ Fla	t ght (2° – 5°)		Width:	(ft)
EXTENT OF PHYSICAL BLOCKAGE: Total	l l	RESTORATION CANDIDATE	7			A	-	orage retrofit	
If yes for fish barrier CAUSE: □ Drop too high Water Drop: □ (in) Other: Total Partial Temporary Unknown Unknown A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as a waterfalls. NOTES/SKETCH:	IS SC ACTING	G AS GRADE CONTROL	□ No 👢 Y	es 🔲 Unkn	own				
NOTES/SKETCH:	" " "	X Total			A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish		ige on a ld isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such	
The state of the s	7			5		1 3	<u>) </u>	2	1
		/							

Reach Level Assessment

RCH

SURVEY REACH	ID: <u>6355.24</u> 3 W	RSHD/SUBSHD:	Joy South Till	DATE: 6/5	108	Assessed by:	
	ie: <u>2 :25</u> am/pn		END TIME:	_:AM/PM	LMK		GPS ID:
LAT 0 0 51'	01.9" LONG ?	2-25 05.5"	LAT WO STORY	Kal" Long	2025	1000 11	
DESCRIPTION:			DESCRIPTION:				
RAIN IN LAST 24 HO	OURS Heavy rain	☐ Steady rain	PRESENT CONDITIONS	☐ Heavy rain	☐ Steady	rain 🗆 Inter	mittent
□ None	☐ Intermittent	☐ Trace	☐ Clear	☐ Trace	M Overc		y cloudy
SURROUNDING LAN	D USE: ☐ Industria ☐ Golf cou	l □ Commercial rse □ Park	☐ Urban/Residential ☐ Crop	☑ Suburban/Res ☑ Pasture	Foreste		
Averagi	E CONDITIONS (che	ck applicable)	REACH S	SKETCH AND ST	ге Імрас	r Tracking	
Base Flow as % Channel Width	□ 0-25% □25-50 %	≱ 50%-75% □ 75-100%	Simple planar sketch o within the survey rea	f survey reach. Tra ch (OT, ER, IB,SC, leemed appropriate,	UT, TR, MI)	as well as any	site impacts additional
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	slick) \square Co	obble (2.5 –10") oulder (>10") ed rock	A	7 - 60" (A	The second secon	is the section of flow	
	☑ Clear □Turbio aturally colored) □ dyes)			Low	overtypour .	and the second s	
AQUATIC PLANTS	, .	e □ some □ lots	7	J. Shirt			
IN STREAM		e □ some □ lots		lewsh.			
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beav □ Snails - ② Other	er Deer	### PERMITTERS OF THE PERMITTE				
STREAM SHADING (water surface)	☑ Mostly shaded ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25	5) 1 (≥25%)					,
CHANNEL	Downcutting	Bed scour			Medicine and an artist of the second		8
DYNAMICS	Widening	Bank failure	3	A l	Hilmself (go.), g.o.		
	Headcutting	Bank scour	33		**************************************		
Unknown		Slope failure Channelized	9	ノトー	respression		
	sea. aeposition	Chaimenzed	l doub	Control of the contro	of Company		7.3
CHANNEL	Height: LT bank	(ft)	werm				2
DIMENSIONS	RT bank	(ft)	J. Samuel Commission of the Co	/volan	4	**************************************	
(FACING DOWNSTREAM)	Width: Bottom	(ft)		(VV	256 among topons		
	Тор	(ft)	American Colores	The second secon	Mineter, conjugat	625.6	1 Vin
F	REACH ACCESSIBILI	ГУ	Troug -		900 advertop voj	and,	
Good: Open area in	Fair: Forested or	Difficult. Must cross	18-91	January Commencer	Primy that Appeal	8	当一日
public ownership,	developed area adjacent to stream.	wetland, steep slope, or sensitive areas to get to	1 75	4.11	Seevilla	Year and the second	
sufficient room to stockpile materials,	Access requires tree	stream. Few areas to		3/1	Telesanoro Sey Age	A	The second
easy stream channel	removal or impact to landscaped areas.	stockpile available		* [/	oppotosalian	V 1	15 4
access for heavy	Stockpile areas	and/or located a great distance from stream.		and the state of the same of t	M-10-10-10-10-10-10-10-10-10-10-10-10-10-	- Andrewson of the second	2 () E
equipment using existing roads or trails.	small or distant from	Specialized heavy	- property and the property of	WAShimmah DAN	1	Marie Carlo	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	stream.	equipment required.	i Menni		1	والمراواة والمراواة والمراواة والمراواة والمراواة والمراواة والمراواة والمراواة والمراواة والمراواة والمراواة	A
NOTES: (biggest prob		reach)			1 3-4		
)	,	,					
				-		_	
	***************************************			REPOR	TED TO AUT	HORITIES 🗌	Yes No

\	Optimal	Suboptimal	Marginal	Poor	
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	or bank failure absent or minimal; little potential for future problems.		Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0	
	Right Bank 10	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 (18)17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	OVER	ALL BUFFER AND FLOODPLA	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 (6)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

Impacted Buffer IB

WATERSHEDSUBSHED: Condition STARE LAT		gasteria.	- (- , 		
SITE ID: (Condition-#) START LAT	WATERSHED/SUBSHED: TEL	to BLSouth In	(1)D	DATE: 6/5/08	ASSESSED BY: DRR
STEID: (Condition:#) START LAT	URVEY REACH: (FST-C	548 TIME: 2	2: 30 AM(PM)	РНОТО ID: (Camera-Pi	ic #) /# // //
MPACTED BANK:			LONG 72°25	'055" LMK	GPS: (Unit ID)
Impacted Bank:					
LAND USE: Private Institutional Golf Course Park Other Public		A CONTRACTOR OF THE CONTRACTOR			
CFacing downstream LT Bank	LT KRT Both	,		•	vasive plants
DOMINANT	A.	·/	urse Park Ot	her Public	A /
DOMINANT	· .			: UNKNOW	
LAND COVER: LT Bank RT Bank RT Bank RT Bank REFORESTATION Length (ft): None Rare Partial coverage Extensive coverage unknown				<u></u>	
Invasive Plants:			wn Tall grass	1	Other
INVASIVE PLANTS:					□ :
STREAM SHADE PROVIDED? None Partial Full WETLANDS PRESENT? No Yes Unknown POTENTIAL RESTORATION CANDIDATE CActive reforestation Greenway design Natural regeneration Invasives removal Invasives removal Description of the continuous of the cont					
POTENTIAL RESTORATION CANDIDATE					
RESTORABLE AREA LT BANK RT POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) REFORESTATION POTENTIAL: (Circle #) S 4 3 2 1 POTENTIAL CONFLICTS WITH REFORESTATION POTENTIAL CONFLICTS	STREAM SHADE PROVIDED?	None Ly Partial L	J Full WETLA	ANDS PRESENT? No	X Yes Unknown
Length (ft): Where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting adequate Potential Conflicts With Reforestation Potential contamination Lack of sun			ion Greenway d	esign 🔯 Natural regeneral	tion Invasives removal
Length (ft):	RESTORABLE AREA		Impacted area on pub	olic land Impacted area on eith	er Impacted area on private
POTENTIAL CONFLICTS WITH REFORESTATION Widespread invasive plants Potential contamination Lack of sun Poor/unsafe access to site Existing impervious cover Severe animal impacts (deer, beaver) Other:	Length (ft): whitecessory 300	POTENTIAL:	where the riparian are not appear to be used specific purpose; plen	public or private land to presently used for a sparty of purpose; available are	that is land where road; building encroachment or other feature significantly limits
POTENTIAL CONFLICTS WITH REFORESTATION Widespread invasive plants Potential contamination Lack of sun Poor/unsafe access to site Existing impervious cover Severe animal impacts (deer, beaver) Other: Severe animal impacts (deer, beaver) NOTES:	" Vidth (ft):	-			
NOTES: Severe animal impacts (deer, beaver) Other: Severe anima	POTENTIAL CONFLICTS WITH DE	FORESTATION DIV	.1		
NOTES: Surb Surb Surb Surb Surb Surb					Sivucture, property
Shrip sand sand	NOTES:				

WATERSHED	SUBSHED: (-10013	Brooks	ach Trib		DATE: <u>6</u>	15 108	ASSE	SSED BY:	
JURVEY REA	.ch ID:6 <i>вэт 40</i> 4	в	TIME: 3 : 15	_AM/PM	Рното I	D: (Camera-Pic	:#) (wi	, /#	43
SITE ID: (Con	dition-#) SC- <u>&1</u>	LAT	41 051 03.	" Long 77	025	' <u>08.4</u> " L	MK	GPS	(Unit ID)
Type, Da	ad Crossing 🔲 Railr	and Canani	D Maumada 1	D D.D	. D [10-1		0.1	
TIPE. RO	SHAPE:	oau Crossii	#BARRELS:	MATERIAL:		GNMENT:			ariable, sketch)
FOR ROAD/ RAILROAD	☐ Arch ☐Bo	ttomless liptical	Single Double Triple Other:	Concrete Metal Other:	□ F	low-aligned ot flow-aligned o not know	Barrel dia	meter: Height:	
CROSSINGS ONLY	CONDITION: (Evid Cracking/chippin Sediment deposi Other (describe)	g/corrosion	☐ Failing emb		☐ F	VERT SLOPE: lat light (2° – 5°) bvious (>5°)	Culvert le	Width:	4 € (ft) 5 (ft) (D (ft)
	RESTORATION CAN	DIDATE	☐ Fish barrier re		-	eplacement 🔲 🛚	Jpstream s	torage retr	ofit
no Is SC ACTING	CACCDADE CONTR	nor.	Local stream						
18 SC ACTING	G AS GRADE CONTI		□No □Yo	es Unkn		OCKAGE SEVEI	DITV! /ai	<i>la #</i>)	
If yes for fish barrier				road culvert on a 3 greater stream bloo upstream moveme anadromous fish; r	A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. A total fish blockage of tributary that would iso significant reach of str or partial blockage that interfere with the migra anadromous fish.		ige on a Id isolate a of stream, e that may migration of	on a A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat	
<u> </u>	Other:			5	223324	4 3		2	(1)
NOTES/SKET	CH:	Lo	ehr ed	SC-1					
1									

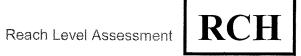


SURVEY REACH ID: GBST-9A WTRSHD/SUBSHD: 6	DATE: 6/5/08 ASSESSED BY: DB JHW SM
START TIME::AM/PM LMK:	<i>END</i> TIME::AM/PM LMK: GPS ID:
LAT41 °51 '03.1" LONG 72 °25 '069	" LAT 41 ° 51 '00.7" LONG 72° 25 ' 10.7"
DESCRIPTION:	DESCRIPTION:
RAIN IN LAST 24 HOURS Heavy rain Steady rain	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent
□ None □ Intermittent □ Trace	☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy
SURROUNDING LAND USE: Industrial Commerce	ial □ Urban/Residential ☑ Suburban/Res □ Forested □ Institutional
☐ Golf course ☐ Park	☐ Crop ☐ Pasture ☐ Other:
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % □ 0-25% □ 50%-75%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts
Channel Width	within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional
DOMINANT SUBSTRATE	features deemed appropriate. Indicate direction of flow
☐ Silt/clay (fine or slick) ☐ Cobble (2.5 –10")	
☐ Sand (gritty) ☐ Boulder (>10")	\ \ \ \
☐ Gravel (0.1-2.5") ☐ Bed rock	Pond
W C F.C F.C.	
WATER CLARITY Clear Turbid (suspended matter)
☐ Stained (clear, naturally colored) ☐ Opaque (milky) ☐ Other (chemicals, dyes)	
	5-22
AQUATIC PLANTS Attached: In none I some I lo	915
IN STREAM Floating: ☐ none ☐ some ☐ lo	ts
WILDLIFE IN OR (Evidence of)	execution to
APOUND STREAM LIBEAVER LIDEER	The Application of the Control of th
Snails \square Other:	
☐ Mostly shaded (≥75% coverage)	No. of the state o
STREAM SHADING Halfway (≥50%) (water surface) Partially shaded (≥25%)	
☐ Unshaded (< 25%)	or several records to the control of
CHANNEL Downcutting Bed scour	
DYNAMICS Widening Bank failu Headcutting Bank scou	₹ ¥
Aggrading Slope fails	
Unknown Sed. deposition Channeliz	
CHANNEL Height: LT bank 5	ft)
	ft)
(FACING Width: Bottom 3	ft)
DOWNSTREAM)	ft)
REACH ACCESSIBILITY	/ (30-1
Eair: Forested or Difficult Must gross	
nublic ownership developed area wetland, steep slope	or SC-10 GR: + 90
sufficient room to adjacent to stream. sensitive areas to ge	
stockpile materials, Access requires tree removal or impact to stockpile available	0
landscaped areas. and/or located a great	
equipment using Stockpile areas distance from stream	i.
existing roads or trails. small or distant from stream. Specialized heavy equipment required.	
5 4 3 2 1	· · · · · · · · · · · · · · · · · · ·
NOTES: (biggest problem you see in survey reach)	
2	
	REPORTED TO AUTHORITIES YES NO
	REPORTED TO AUTHORITIES TES NO

al colonization and gs, submerged cobble or other	40-70% mix of stable habitat; well-		1		
IN-STREAM HABITAT favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).		favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). favorable for epifaunal colonization and suited for full colonization potential adequate habitat for maintenance populations; presence of additions substrate in the form of newfall, but not yet prepared for colonization (rate at high end of scale).		20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0		
streambank ate riparian zone jetation, including jibs, or nonwoody ive disruption owing minimal or plants allowed to	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
9	8 7 6	5 4 3	2 1 0		
9	8 7 6	5 4 3	2 1 0		
nce of erosion int or minimal; iture problems. ed.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
9	8 G 6	5 4 3	2 1 0		
9	8 (2) 6	5 4 3	2 1 0		
enter floodplain. Stream not deeply to enter floodplain. Stream not not able to enter floodpl		High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Over	ALL BUFFER AND FLOODPLAI	N CONDITION			
ıal	Suboptimal	Marginal	Poor		
50 feet; human lots, roadbeds, os) have not	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
9	8 7 6	5 4 3	2 1 0		
9	8 7 6	5 4 3	2 1 0		
n vegetation type	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
nd non-wetland standing/ponded	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
lain	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
orm of fill oment, or					
orm of fill	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0		
2	rm of fill	rm of fill form of fill material, land	form of fill form of fill material, land development, or manmade structures, but not effecting floodplain function entropy floodplain function entropy floodplain function entropy filling, land development, or manmade structures, some effect on floodplain function		

WATERSHED	/SUBSHED: Gazes Ble S	. Trib		DATE:	615 108	ASSE	SSED BY:
URVEY REA	URVEY REACH ID: GBST-9A TIME: : AM/PM PHOTO ID: (Camera-Pic #) /# 1844						
SITE ID: (Con	dition-#) SC LAT	41 0 51 102.	6" Long ?	<u>2°25</u>	'/0.2" LN	<u>/IK</u>	GPS (Unit ID)
TYPE: Roa	ad Crossing	ng Manmade	Dam 🔲 Beave	r Dam	Geological Form	nation [Other:
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	#BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:	AI	Flow-aligned Not flow-aligned Do not know	DIMENS Barrel dia	IONS: (if variable, sketch) ameter: (ft) Height: (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n Downstrean Failing emb			ULVERT SLOPE: KFlat Slight (2° - 5°) Obvious (>5°)		ength: 30 (ft) Width: 10 (ft) elevation: 4 (ft)
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re ☐ Local stream			r/replacement 🔲 U	pstream st	torage retrofit
IS SC ACTING	G AS GRADE CONTROL	ĭNo ☐ Y	es Unkr				
If yes for fish barrier	EXTENT OF PHYSICAL BLC Total Partial Temporary Unknow CAUSE: Drop too high Water Delication of the property	wn rop:(in)	A structure such a road culvert on a 3 greater stream blo upstream moveme anadromous fish; passage device pr	s a dam o Brd order o ocking the ent of no fish	tributary that would significant reach o or partial blockage interfere with the n anadromous fish.	ge on a d isolate a f stream, that may	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
NOTES/SKET		<u>,</u>	5		4 3	(2 1
NOTES/SKET	**************************************	Loed	ar Rd				
7					Report	TED TO AU	THORITIES ☐ YES ☐ NO

WATERSHED	SUBSHED: Gazes Bh	s Trib		DAT	re: <u>6</u>	15/08	ASSE	SSED BY: <	THW
URVEY REA	CHID: GBST-9A					: (Camera-Pic	: #)	/# //	846-48
SITE ID: (Con	ndition-#) SC-2 LAT	41 0 51 1 00	<u>'</u> → " Long <u> 7</u>	Z°_6	23	(0,7" LI	МК	GPS (Unit ID)
TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other:									
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		ALIGI Flo	NMENT: ow-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if vari	<u>unk</u> (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n ☐ Downstrean ☐ Failing emb			☐ Fla	t ght (2° – 5°) vious (>5°)	Culvert le	_	(ft) (ft) (ft)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re			pair/rep	olacement 🔲 U	Jpstream s	torage retrofi	t
Is SC ACTIN	G AS GRADE CONTROL	□ No □ Ye	es 🔲 Unkı	nown					
If yes for fish barrier	1 * * * * ~				Itibutary that would isolate a stream blocking the significant reach of stream, or partial blockage that may movement of interfere with the migration of stream.		A temporary beaver dam of the very head very little viab	parrier such as a or a blockage at of a stream with le fish habitat ral barriers such	
,	Other:		5			1 3		2	1
NOTES/SKET		Empanhmen	ion under			REPOR	тер то ди	THORITIES]Yes □ No



SURVEY REACH I	D: <u>G851_01</u> 6 Wi	RSHD/SUBSHD:	res Bonic Salua	DATE: 6 / 5	_/OZ Assi	ESSED BY:
START TIM	e: <u>3</u> : <u>45</u> AM/PM	l) LMK:	END TIME:	:22AM/PM	LMK:	GPS ID:
LAT41 0 50 13	54.7" LONG _	72° 25 '115"	LAT4/0 50'	14.5" Long 7	2°25 1/24	11
DESCRIPTION:			DESCRIPTION:		94	
RAIN IN LAST 24 HO		☐ Steady rain	PRESENT CONDITIONS	☐ Heavy rain	☐ Steady rain	n □ Intermittent
□ None	□Intermittent		☐ Clear	☐ Trace	☐ Overcast	☐ Partly cloudy
SURROUNDING LAND		l □ Commercial rse □ Park		☐ Suburban/Res ☐ Pasture	Forested Other:	☐ Institutional
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND ST	ΓΕ ΙΜΡΑCT ΤΙ	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	☑ 50%-75% □ 75-100%	within the survey re	of survey reach. Tra ach (OT, ER, IB,SC, deemed appropriate.	UT, TR, MI) as w	IDs for all site impacts vell as any additional
DOMINANT SUBSTR. ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick) □ Çe	obble (2.5 –10") oulder (>10") od rock	- Jealures		t-02	on oj jiow
WATER CLARITY ☐ Stained (clear, no	aturally colored) 🛚			TO THE	area area area area area area area area	
AQUATIC PLANTS IN STREAM	and the same of th	e □ some □ lots e □ some □ lots		esa essa esta de la composição de la com		
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☑ Fish ☐ Beav ☐ Snails ☐ Other					
STREAM SHADING (water surface)	✓ Mostly shaded ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25	5) I (≥25%)	ER-1	\$€.	R-1	
CHANNEL DYNAMICS Unknown	Downcutting Widening Headcutting Aggrading Sed. deposition	☐ Bed scour ☐ Bank failure ☐ Bank scour ☐ Slope failure ☐ Channelized				
CHANNEL DIMENSIONS (FACING DOWNSTREAM)	Height: LT bank RT bank Width: Bottom Top	6 (ft) 6 (ft) (ft) 7 (ft) 8 (ft)		The state of the s		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	17.3	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	Pon			
NOTES: (biggest prob	lem you see in survey	reach)		Repor	TED TO AUTHOR	RITIES 🗌 YES 🗌 NO

\	Optimal	Suboptimal	Marginal	Poor	
AN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetatior has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
22	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0	
	Right Bank 107 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

Goges Bk South Thib 6/5/08 DRB ER GBST-093 4:00 1852 ER-01 40 50' 53.8' 72° 25 12. 720 251 12.0" Boul Scow/Jailure Back of concern: ordered novem of wearders bength Z sections 80' each older seconers Bot width = 8' Top w = 25 welled w= 3 1-000 Bonh stabilization, glade could No threat is prepared Scow height => A mat existing upanon width = 100 1 ft enosion sevenly = Y Access = 1

WATERSHED	SUBSHED: Crass Garde	SANGE Tri	3	DA	те: <u>6</u>	15 108	ASSE	SSED BY:	
URVEY REA	CHID: GBSA-ORB	TIME: 4: 12	AM/PM	PH	ото ID	: (Camera-Pic	:#) [/_n	DA 1#	1453
SITE ID: (Cor	adition-#) SC- <u>D1</u> LAT	41° 50 ' 50	½" Longℤ	2°2	245 1	<u>(0" LI</u>	ИК	GPS	S (Unit ID)
TYPE: Ro	ad Crossing 🔲 Railroad Crossi	ng 🔲 Manmade l	Dam Beave	er Da	am 🔲	Geological Form	nation 🔲	Other:	
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	#BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		Flo	w-aligned t flow-aligned not know	Barrel dia		rariable, sketch) 15 (n) (ft) 15 (n) (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n Downstrean Failing emb			☐ Fla	ERT SLOPE: t ght (2° – 5°) vious (>5°)		ength: Width:	(ft) (ft) (ft) (ft)
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re			epair/rep	placement 🔲 U	Jpstream st	torage retr	ofit
IS SC ACTIN	G AS GRADE CONTROL	□No □Ye	es Unk	nowi	n				
	EXTENT OF PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVER	HTY: (circ	le #)	
If yes for fish barrier	Total Partial Unknow Unknow CAUSE: Drop too high Water D	rop: <u>5</u> (in)	A structure such a road culvert on a greater stream blo upstream movem anadromous fish; passage device p	3rd or ocking ent of no fis	der or the h	A total fish blocka tributary that woul significant reach o or partial blockage interfere with the anadromous fish.	ld isolate a of stream, e that may	beaver dan the very he very little v	ory barrier such as a m or a blockage at ead of a stream with viable fish habitat latural barriers such ills.
<u>) </u>	Other:		5		4	1 (3)	2	1
NOTES/SKET				Ver	furi				s □ Yes □ No

GB07.096 4:15pm 6/5/06 Canon, 57.58

SC.02 Lat 41051:495" Long. 72025'09.1"

Type: Tood crossing
Shipe: bottombes Resirel: one material concrete Atgnment flower.

Onemotions.

Onemotions.

Chivert Length: WOGL

Andring elevation: 35ff

Condition: Chipping Culvert slope: 20250

Pestoration Candidate: No

Biologe severity. 4

Water Orop: 40ft

Reach Level Assessment



SURVEY REACH ID: 60 WTRSHD/SUBSHD: 6	DATE: 6/5/08 ASSESSED BY:
START TIME: Q : Q SAMYPM LMK:	END TIME: 0: 32 AM/PM LMK: GPS ID:
LAT 10 51 1 115" LONG 120 25 137.1"	LAT 41° 51 '25.4" LONG 71° 25 '29.1"
DESCRIPTION:	DESCRIPTION:
RAIN IN LAST 24 HOURS Heavy rain Steady rain None Trace	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy
	☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy ☐ Urban/Residential ☐ Suburban/Res ☐ Forested ☐ Institutional
☐ Golf course ☐ Park	☐ Crop ☐ Pasture ☐ Other:
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % □ 0-25% □ 50%-75%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts
CHANNEL WIDTH □25-50 % □ 75-100%	within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE ☐ Silt/clay (fine or slick) ☐ Cobble (2.5 –10")	
\square Sand (gritty) \square Boulder (>10")	
☐ Gravel (0.1-2.5") ☐ Bed rock	Bridge
WATER CLARITY	
☐ Stained (clear, naturally colored) ☐ Opaque (milky)	
☐ Other (chemicals, dyes)	
AQUATIC PLANTS Attached: ☐ none ☐ some ☐ lots	1 10857-01
IN STREAM Floating: ☐ none ☐ some ☐ lots	** The state of th
WILDLIFE IN OR (Evidence of) Description	
AROUND STREAM Snails Other: Proceeding to	1 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1
✓ Mostly shaded (≥75% coverage)	
STREAM SHADING ☐ Halfway (≥50%) (water surface) ☐ Partially shaded (≥25%)	+0
☐ Unshaded (< 25%)	ER-2 ER-2
CHANNEL Downcutting Bed scour	T TOTAL TOTA
DYNAMICS Widening Bank failure	
Headcutting	The state of the s
Unknown Sed. deposition Channelized	
CHANNEL Height: LT bank 4 (ft)	Tatural >
CHANNEL PIEGIT. ET BAIK (ft) DIMENSIONS RT bank (ft)	Reloris
(FACING Width: Bottom (ft)	baller of
$\frac{DOWNSTREAM)}{Top} \frac{10.25}{20.25} \text{ (ft)}$	The second secon
REACH ACCESSIBILITY	
Good: Open area in	A to later
public ownership, sufficient from to	ER-1 (+rec)
stockpile materials, Access requires tree stream. Few areas to	enstayof & CM-61
landscaped areas. and/or located a great	A Cloris
equipment using Stockpile areas distance from stream.	
existing roads or trails. stream. equipment required.	Rood
Norra (Line 1)	014 00 3
Consider making pre-tributary part of	614 02 /
	REPORTED TO AUTHORITIES YES NO

	Optimal	Suboptimal	Marginal	Poor
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 / 16/	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetatio has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 (8 7 6	5 4 3 2 1 0
		ALL BUFFER AND FLOODPLA	I	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetatior type is turf or crop land
	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

13 4

Trash and Debris



WATERSHED/SUE	SHED: GOOG	>		DATE: <u>6/</u> 5	108	ASSESSED BY:
URVEY REACH I	D: GB-61	TI	me: <u>9</u> :33am/pm	РНОТО ID: (Са	mera-Pic #) 🕼 🕕	n /# 1810
SITE ID: (Condition	ı#) TR- <u>⊘1</u>	LAT°	'" Lon	[G°'	'' LMK	GPS: (Unit ID)
Entered of Industr	Appliances	☐ Paper ☐ Constru ☐ Yard W	☐ Metal uction ☐ Medical Vaste Chicks brush feet		LOCATION: Stream Riparian Ar Lt bank	AMOUNT (# Pickup truck
POTENTIAL REST	ORATION CANDI	DATE S	tream cleanup Stre Other:	L.	Removal/pi	revention of dumping
If yes for trash or debris removal	EQUIPMENT NEE WHO CAN DO IT:		Heavy equipment	-		DUMPSTER WITHIN 100 FT: ☐ Yes No ☐ Unknown
CLEAN-UP POTENTIAL: (Circle #)	A small amount of to than two pickup truck inside a park with eas	loads) located	with easy access. Trash	or bulk items, in a small as may have been dumped or t it could be cleaned up in small backhoe.	ver area, where a	nt of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials
<u> </u>	5		(4)	3	2	1
NOTES:		X	Jence Boushpiles			
<u></u>					KEPORTE	D TO AUTHORITIES YES NO

Channel Modification

CM

WATERSHED/SUBSHED	: Corres			DAT	E: 6 / 3	5100	ASSESSED BY:	
SURVEY REACH ID:	13-101	TIME: <u>///</u> :_	AM/PM		Рното II	D: (Camera-Pic #)	a 1817 # 1815	
SITE ID: (Condition-#)	START LAT 41 °	<u>5/ '224"</u>	Long <u>72</u>	<u>°25</u>	<u>137,2 "</u>	LMK	GPS: (Unit ID)	
CM- <u>(3)</u>	END LAT 4/ °	<u>5/ '26,5''</u>	Long 72	<u>25</u>	<u> 137: "</u>	LMK		
TYPE: M Channelization	TYPE: Channelization Bank armoring concrete channel Floodplain encroachment Other:							
MATERIAL:	Does channel have	Does channel have perennial flow?			es 🗌 No	DIMENSIONS:		
Concrete Gabion Rip Rap Earthen	Is there evidence of	f sediment d	eposition?	ΔÝ	es 🗌 No	Height Bottom Width	(ft)	
Metal	Is vegetation grow	ing in channe	e1?	₽ Y	es 🗌 No	Top Width:	$\frac{14}{32} \qquad \text{(ft)}$	
Other:	Is channel connect	ed to floodpl	ain?	☐ Y	es No	Length:		
BASE FLOW CHANNEL Depth of flow	Depth of flow (in) ADJACENT STREAM CORRIDOR							
Defined low flow chann	iel? 🔽 Yes 🗌 No				ties Presen		(20)	
% of channel bottom	89_%			i .	es Mo	l :	Fill in floodplain? ■Yes □ No	
POTENTIAL RESTORAT	ION CANDIDATE	Structural rep	oair 🔲 Bas	se flow	channel cre	ation 🗌 Natural o	channel design	
no		De-channeliz	ation Fis	h barri	er removal	☐ Bioengir	neering	
IZATION channel wh		n A moderate beginning to Vegetated be	length (> 200'), function as a na ars may have for	atural stre	eam channel.	depth, a natura shape similar t above and belo	annel less than 100 ft with good water al sediment bottom, and size and o the unchannelized stream reaches ow impacted area.	
NOTES:	5	4	3			2	1	
): 220								

WATERSHED/SUBSE	HED: Gogl	4	DATE: _6/	DATE: 6/5/08 ASSESSED BY: DES			
SURVEY REACH ID:	GB-01	TIME: 10:30 AM/P	м Рното ID:	(Camera-Pic #)	78 lang 1# /	417	
SITE ID (Condition-#):	от- <u>02</u>	LAT41 . 51 . 21.	1"LONG 72° 28	36.9"	LMK	GPS: (Unit ID)	
BANK: X LT	Closed	MATERIAL: Concrete PVC/Plastic Other:	Metal	☐ Double	DIMENSIONS: Diameter: (in)	SUBMERGED: No Partially Fully	
Moderate Substantial Other:	Open channel	☐ Concrete ∕ 【X E	Earthen Trapezoid Parabolic Other:	Width	: <u>3 (in)</u> (Top): <u>12 (in)</u> (ottom): <u>6 (in)</u>		
CONDITION: None Chip/Cracked Peeling Paint	ODOR: A N Gas Sewage Rancid/So	None Oily	S: VEGGIE DEI None Normal Inhibited		Other:	ge Green	
Corrosion Other: Dense Veg., They belo	Sulfide	☐ Paint ☐ Other:	☐ Excessive☐ Other:	.	OOL QUALITY: 1 Good Odors Suds Algae [Other:	Colors Oils	
FLOWING TURE ONLY FLOAT	FLOWING ONLY None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation						
POTENTIAL RESTOR	RATION CANDID	ATE Discharge inve	optigation D Stupper de		1	C 11	
I no	CATION CANDID	ATE Discharge inve		ylighting L	ocal stream repair/	outfall stabilization	
If yes for daylighting	ŗ.·		Liour Liber.				
Length of vegetative co	over from outfall:	ft Type	of existing vegetation:		Slope:	0	
If yes for stormwater Is stormwater currently ☐ Yes ☑ No ☑ N	controlled?	_ 165cmed Land Area	Use description: To available: Acre	6	au (17184)	
SEVERITY: (circle #)	strong smell. The amou	a distinct color and/or a unt of discharge is significant nt of normal flow in receiving ears to be having a nstream.	Small discharge; flow mos discharge has a color and/o discharge is very small con flow and any impact appea	or odor, the amount on pared to the stream	of discharge; s	not have dry weather staining; or appearance uny erosion problems.	
		5	4 3		(2)	1	
SKETCH/NOTES:		note.	GIS data shoot this dito	ows 6-Bi h. In vec ev other	ST in the disy, abstrand of G	location & GB B-01	
)	TRACE -			Repo	RTED TO AUTHORIT	TIES: YES NO	

OT

WATERSHED/SUB	SHED: Gazes	34	DATE: _//	15 108	ASSESSED BY:	JHW
SURVEY REACH II	D: 68-01 TI	ME: 10:25 AM/PM	Рното ID:	(Camera-Pic#)	/#	18 18
SITE ID (Condition-	#): OT- <u>l</u> L	AT4/ 0 51 1209	"Long <u>72° 2</u> 3	5 1 37.5 11	LMK	GPS: (Unit ID)
BANK:	TYPE:	MATERIAL: ☐ Concrete ☐ M		☐ Single I ☐ Double	DIMENSIONS:	SUBMERGED:
FLOW:	☐ Closed	☐ PVC/Plastic ☐B			Diameter: <u>(ir</u>	
None Tric	kle pipe	Other:	Other:			Fully
Moderate Substantial	🔏 Open	Concrete ExEar	then Trapezoid	l Depth	n: <u>(</u> (in)	
Other:	channel	Other:	Parabolic Other:	Widu:	(Top): 36 (in)	NOT APPEICABLE
Commence		—			ottom): <u>/</u> 8 (in)	
CONDITION:	ODOR: ☑ No ☐ Gas	DEPOSITS/STAINS:	VEGGIE DE		I PE BENTHIC GR] Brown □ Orai	
☐ Chip/Cracked	Sewage	Oily	✓ Normal		Other:	nge Green
☐ Peeling Paint☐ Corrosion	Rancid/Sour	☐ Flow Line☐ Paint	Inhibited	Po	OOL QUALITY:	No pool
Other:	Other:	Other:	Excessive Other:	_	Good Odors	
Venetated					Suds Algae Other:	☐ Floatables
			70			
	LOR: Clea		Section of the telephone with the property of	」Green Ora] Opaque	ange 🗌 Red 🔲 (Other:
10000020	DATABLES: Non			Petroleum (oil)	sheen)	Other:
	Excess Trash (paper/pl	*		Excessive Sed	imentation	
CONCERNS: L	Needs Regular Mainter	nance Ban	k Erosion	Other:		
POTENTIAL RESTO	ODATION CANDIDATI	F Discharge investi	igation [] Standard de			/C. II 1 . 1
no	SKATION CANDIDATI	E Discharge investi		yngnung LL	ocai stream repair	outfall stabilization
If yes for daylighting	ng:					
Length of vegetative	cover from outfall:	ft Type of	existing vegetation:		Slope:	•
If yes for stormwat	ov.					
Is stormwater current		Land Us	se description:			
☐ Yes ☐ No ☐	Not investigated	Area av				-
OUTFALL	Heavy discharge with a dis strong smell. The amount of	of dispharas is significant	Small discharge; flow mos	stly clear and odorles	ss. If the	
SEVERITY: (circle #)	compared to the amount of	normal flow in receiving	lischarge has a color and/ lischarge is very small cor	or odor, the amount	n's hase discharge;	es not have dry weather staining; or appearance
(stream; discharge appears significant impact downstre	to be naving a	low and any impact appea	ars to be minor / loca	lized. of causing	any erosion problems.
	5	4	(3))	2	1
SKETCH/NOTES:						
A						
η	OT.	01				
	2					
	The state of the s	The second secon	//			
		Box CN/V	Tolerature en anno en commence en en en en en en en en en en en en en	Powe-injugacy		
	get ex	I84 DOX CRIVE	3	_		
1				REPC	PRTED TO AUTHOR	ITIES: YES NO

Severe Bank Erosion



WATERSHED/SUBS	SHED: Goges	Brook		DATE: 6 / 5	106	ASSESSED BY: DIZIB
SURVEY REACH:	GB-0(TIME: 10 :		РНОТО ID (САМ	ERA-PIC#	#): /# /611 1812
SITE ID: (Condition-	#) START LAT L	11051.245	" Long 72 ° 2	5'323'	LMK	GPS: (Unit ID)
ER- <u>01</u>	END LAT	1105123.6	" Long <u>72°2</u>	5 1343"	LMK	
		I				
	Currently unknown	BANK OF CO	ONCERN: LT	RT Both (lo	ooking dow	onstream) slope/valley wall
Downcutting	Bed scour	DIMENSIONS		s light meands		
Widening	Bank failure	ŧ		t and/or RT		1
Headcutting	Bank scour	Bank Ht				Top width $\frac{10-20}{1}$ ft
Aggrading Sed. deposition	Slope failure Channelized		LT	° and/or RT		Wetted Width $6 - 12$ ft
	P: Private Publi			: X Forest F		Developed:
ZAND OWNERSHII	Turate [1 doing	C CIIKIIOWII	DAILD COVER	· Miorest Mi	iciu/Ag	Developed.
POTENTIAL RESTO	ORATION CANDIDATI	E: ☐ Grade		☑ Bank stabilization		A1000
THREAT TO PROP	ERTY/INFRASTRUCT	URE: 🔀 No	Yes (Describ	pe):		
EXISTING RIPARIA	AN WIDTH:	≤25 ft	☐ 25 - 50 ft [50-75ft	100ft J	☑ >100ft
EROSION	Active downcutting; tall ban of the stream eroding at a f		Pat downcutting evide		Grado and	width stable; isolated areas of bank
SEVERITY(circle#)	contributing significant amo	unt of sediment to	widening, banks activ moderate rate; no three		failure/eros	sion; likely caused by a pipe outfall, local
Channelized= 1	stream; obvious threat to prinfrastructure.	operty or	infrastructure	out to proporty of	scour, imp	aired riparian vegetation or adjacent use.
	5 Good access: Open area i		4 3		2 Difficult o	1 ccess. Must cross wetland, steep slope or
ACCESS:	ownership, sufficient room t	o stockpile	Fair access: Foreste adjacent to stream. A		other sens	itive areas to access stream. Minimal
	materials, easy stream chai heavy equipment using exis		removal or impact to I	landscaped areas. or distant from stream.	distance fr	reas available and/or located a great om stream section. Specialized heavy
	trails.	4	1 3	or distant from stream.	equipment	required.
NOTES/CROSS SEC	CTION SKETCH:					A constitution of the second s
			Ér.			
		\mathcal{T}	1	undercot >	.41	
	DENSE	$\langle \langle \rangle \rangle$				
	DENSE ENCROACH JAVASIVA	(M) (DENS	I	
		CK	7 / /		Edwa A.C	H/WG
	JWASIV			ENC	RONG	
	•			エ ル	VASI	H/WC UES
			4			
			::	~	2 N	
		1	cont	hues for ~ 3	007 ti	
		Alectica interfeditable and electrical	and the second second		REPORTE	d to authorities 🗌 Yes 🔲 No
		1			~	

WATERSHED/SUBS	SHED: Gage	Brook		DATE: <u>6</u> / 5	108	ASSESSED BY:	ZR
SURVEY REACH:	C3-01	TIME: 10:	10 AM/PM	Рното ID (САМ	ERA-PIC#): DB(sm/# &	15
SITE ID: (Condition-	#) START LAT	11.051.224	" LONG 72 2		LMK		
ER- <u>01</u>	END LAT_		" LONG°_		LMK		:
De comos							
	Currently unknown	BANK OF CO	NCERN: LT	RT Both (lo	ooking dow	<i>nstream)</i> ope/valley wall 🔲 O	ith our
☐ Downcutting ☐ Widening	Bed scour	DIMENSIONS		Strangitt section	□ steep s	ope/vaney wan 🔲 O	mer.
Headcutting	Bank failure Bank scour			and/or RT_/5	O ft	Bottom width /C) ft
Aggrading	Slope failure	Bank Ht		and/or RT	3		400
Sed. deposition	Channelized	Bank Angle		° and/or RT			
	P: N Private Public			Forest F		Developed:	
				7			
POTENTIAL RESTO	ORATION CANDIDATI	E: ☐ Grade ☐ Other		Bank stabilization	l		
THREAT TO PROP	ERTY/INFRASTRUCT	JRE: 🔀 No	Yes (Describ	pe):			
EXISTING RIPARIA	AN WIDTH:	≤25 ft	25 - 50 ft [☐ 50-75ft ☐ 75-	100ft [₹] >100ft	
EROSION	Active downcutting; tall ban of the stream eroding at a fa		Pat downcutting evide	ent, active stream	0		
SEVERITY(circle#)	contributing significant amo	unt of sediment to	widening, banks active moderate rate; no three		failure/eros	width stable; isolated areas on; likely caused by a pipe	outfall, local
Channelized= 1	stream; obvious threat to pr infrastructure.	operty or	infrastructure	sacto property of	scour, impa	ired riparian vegetation or a	ıdjacent use.
<u> </u>	Good access Open grap i		4 3		2	1	
ACCESS:	Good access: Open area i ownership, sufficient room t	o stockpile	Fair access: Forested adjacent to stream. A		other sensi	cess. Must cross wetland, s ive areas to access stream.	. Minimal
	materials, easy stream char heavy equipment using exis		removal or impact to I	andscaped areas.	stockpile ar	eas available and/or located m stream section. Speciali:	i a great zed heavy
	trails.	4	<u> </u>	or distant from stream.	equipment	equired.	
NOTES/CROSS SEC			3			1	
**************************************	WASHELL.	To See See See See See See See See See Se	evosion	rdenut			
1					Reportei	TO AUTHORITIES [YES 🗌 No

Reach Level Assessment RCH

SURVEY REACH]	D:合格のZ Wtrshd/Subshd: ()	ates Brook DATE: 6/3/08 ASSESSED BY:
START TIM	E: 10: 30 AM/PM LMK:	END TIME::AM/PM LMK: GPS ID:
LAT 410 5/	26.1" LONG 17° 25 '79.4"	LAT 41° 51 '329" LONG 72° 25 '242"
DESCRIPTION:	OOTRIDGE A TAC	DESCRIPTION: BATES WIEL TENCI
	OU SKINGE () TE	Only WILE TENCI
RAIN IN LAST 24 HO	OURS Heavy rain Steady rain	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent
None	☐ Intermittent ☐ Trace	Clear □ Trace □ Overcast □ Partly cloudy
SURROUNDING LAN	D USE: Industrial Commercial	☐ Urban/Residential ☐ Suburban/Res Æ Forested ☐ Institutional
	☐ Golf course ☐ Park	□ Crop □ Pasture □ Other: WETLANT
	CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional
DOMINANT SUBSTR ☐ Silt/clay (fine or ☒ Sand (gritty) ☒ Gravel (0.1-2.5	slick)	features deemed appropriate. Indicate direction of flow K K K K K K K K K K K K K
		WODELD CHOPED
AQUATIC PLANTS IN STREAM	Attached: ☐ none ☐ some ☒ lots Floating: ☐ none ☐ some ☒ lots	TE-U
WILDLIFE IN OR AROUND STREAM	(Evidence of) Fish Beaver Deer Const. Snails Other: Toxon'n Fires	DEED TO
STREAM SHADING (water surface)	Mostly shaded (≥75% coverage) ☐ Halfway (≥50%) ☐ Partially shaded (≥25%) ☐ Unshaded (< 25%)	BOHOM
CHANNEL	☐ Downcutting ☐ Bed scour	woods (wobs
DYNAMICS	Widening Bank failure	SAND SICT
Unknown	☐ Headcutting ☐ Bank scour ☐ Aggrading ☐ Slope failure ☐ Sed. deposition ☐ Channelized	PHOTO SUBSTITUTE WERENTS
CHANNEL	Height: LT bank 1 1 (ft)	BANK VI'H
DIMENSIONS	RT bank2 (ft)	
(FACING	Width: Bottom (ft)	GRALFLLY GRALFLLY
DOWNSTREAM)	Top (ft)	SUBSTEATE
R	REACH ACCESSIBILITY	NOSIRATE
Good: Open area in	Fair: Forested or Difficult. Must cross	GRAKI (
public ownership,	developed area wetland, steep slope, or adjacent to stream.	SHRUES SHRUES SHRUES
sufficient room to stockpile materials,	Access requires tree stream. Few areas to	11/2" M Jazin
easy stream channel	removal or impact to stockpile available and/or located a great	A'gae A'gae
access for heavy	landscaped areas. Stockpile areas and/or located a great distance from stream.	SIT could be found sond sond
equipment using existing roads or trails.	small or distant from Specialized heavy	60 Ham Surface Surface
5 4	stream. equipment required.	- FOUTERIDGE A
	olem you see in survey reach)	1 1 2 2
(-
		REPORTED TO AUTHORITIES YES NO

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambes surfaces covered by vegetation disruption of streambank vegetation is very high; vegeta has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks of both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment stream; obvious threat to proper or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfunot able to enter floodplain. Stream deeply entrenched.
	0 19 18 17 16 Over	(15) 14 13 12 11 ALL BUFFER AND FLOODPLAI	10 9 8 7 6 IN CONDITION	5 4 3 2 1 0
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: li or no riparian vegetation due to human activities.
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetat type is turf or crop land
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	No evidence of floodplain encroachment in the form of fill	Minor floodplain encroachment in the form of fill material, land	Moderate floodplain encroachment in the form of filling, land development, or	Significant floodplain encroachment (i.e. fill material, land development, or man-mad
FLOODPLAIN ENCROACH- MENT	material, land development, or manmade structures 20 (19) 18 17 16	development, or manmade structures, but not effecting floodplain function 15 14 13 12 11	manmade structures, some effect on floodplain function 10 9 8 7 6	structures). Significant effect of floodplain function 5 4 3 2 1 0

Trash and Debris



WATERSHED/SUE	WATERSHED/SUBSHED: GAGES TOROCK			108	ASSESSED BY: ファリ		
JURVEY REACH I	D: 68-02	TIME: 11: / (AM/PM	M PHOTO ID: (Camera-Pic #) /# 170 \$				
SITE ID: (Condition	1-#) TR- <u>01</u> Lat <u>4</u>	<u>(° 51 ' 24,4</u> " Long	12.25.27	g '' LMK_	GPS: (Unit ID)		
TYPE: Industrial Commercial Residential		per	SOURCE: ☐ Unknown ☑ Flooding ☐ Illegal dump ☐ Local outfall	LOCATION: Stream Riparian Are Lt bank Rt bank			
POTENTIAL REST	ORATION CANDIDATE [,		evention of dumping w/ (-Z people		
If yes for trash or debris removal	_	Heavy equipment Tr		wn	DUMPSTER WITHIN 100 FT: ☐ Yes . ☑ No ☐ Unknown		
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., I than two pickup truck loads) loca inside a park with easy access		ay have been dumped ov t could be cleaned up in	er A large amour	of trash or debris scattered over a large ess is very difficult. Or presence of drums hazardous materials		
	(5)	4	3	2	1		
NOTES:							
)				Reportei	D TO AUTHORITIES YES NO		

Reach Level Assessment



SURVEY REACH ID: 65 03 WTRSHD/SUBSHD: 60	DATE: 6/3/06 ASSESSED BY:
START TIME: 12: 14 AM/PM LMK:	END TIME: 1: 23AM/PM LMK: GPS ID:
LAT 41 ° 51 '32 9" LONG 72 ° 25 '27.2"	
DESCRIPTION: BARR WIZE TENLE	DESCRIPTION: WY DOUGLE CONVOIT
D. W. C. C. C. C. C. C. C. C. C. C. C. C. C.	
RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☐ None ☐ Intermittent ☐ Trace	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy
/	Urban/Residential □ Suburban/Res □ Forested □ Institutional
☐ Golf course ☐ Park	☐ Crop ☐ Pasture ☐ Other: OD Files
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % □ 0-25% □ 50%-75%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional
CHANNEL WIDTH □25-50 % □ 75-100%	features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE □ Silt/alay (fine or slick) □ Cobble (2.5 –10")	
Sand (gritty) ☐ Boulder (>10")	300
☐ Gravel (0.1-2.5") ☐ Bed rock	
WATER CLARITY Clear Turbid (suspended matter)	
☐ Stained (clear, naturally colored) ☐ Opaque (milky) ☐ Other (chemicals, dyes)	The ways
	- E - 6
AQUATIC PLANTS Attached: ☐ none ☐ some ☐ lots IN STREAM Floating: ☐ none ☐ some ☐ lots	Ser Franchister
(Fridence of Paul Can Dealt 100 d Was	Str. a.k. a keep to
WILDLIFE IN OR Strike of Beaver Deer	See from more and
Snails □ Other: 5000000000000000000000000000000000000	
STREAM SHADING ☐ Halfway (≥50%)	The David
(water surface) ☐ Partially shaded (≥25%) ☐ Unshaded (< 25%)	A con so city bear
CHANNEL Downcutting & Bed scour Dynamics Widening Bank failure	W. Lary 250
Headcutting Sank scour	There's war
Unknown Aggrading Slope failure Sed. deposition Channelized	
CHANNEL Height: LT bank 2.75 (ft) DIMENSIONS RT bank 2.0 (ft)	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
(FACING Width Bottom 8-9 (ft)	
DOWNSTREAM) Top (ft)	
REACH ACCESSIBILITY	
Good: Open area in developed area Wetland, steep slope, or	By Andrews
adjacent to stream. sensitive areas to get to	35h he work
stockpile materials, easy stream channel easy	31 (316 sero45)
access for heavy landscaped areas. Stockhile areas. dietance from stroom	want Vet
existing roads or trails small or distant from Specialized heavy	
stream. equipment required. 5 4 3 2 1	X X X X X
NOTES: (biggest problem you see in survey reach)	Bornes With
	Section 2.1
	REPORTED TO AUTHORITIES TYES TO NO

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
habitat regime)	that are <u>not</u> new fall and <u>not</u> transient).	rate at high end of scale).			
-3,	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6		2 1 0	
	Right Bank 10 9	8 7 6	(§) 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLA	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 (12)11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures 20 19 18 (17) 16	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
		15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

Severe Bank Erosion | ER

WATERSHED/SUBS	SHED: GLACS		DATE: 6 / 3	108 AS	SSESSED BY:	
SURVEY REACH: (7	TIME: /2 :	30 AM/PM	РНОТО ID (САМ	IERA-PIC#): /	7/11 1#
SITE ID: (Condition-				1 11		
ER- <u>01</u>	END LAT_		" Long°_		LMK	
		T			· · · · · · · · · · · · · · · · · · ·	
	Currently unknown	BANK OF CO	NCERN: LT	RT Both (l	ooking downstr	eam)
Downcutting	Bed scour			Straight section	☐ Steep slope	/valley wall Other:
Widening	Bank failure	DIMENSIONS	-		D	
Headcutting	Bank scour	Bank Ht		t and/or RT <u>/0</u> t and/or RT <u>/</u> 3		Sottom widthft
Aggrading	Slope failure					op widthft Vetted Widthft
Sed. deposition	Channelized	Dalik Aligie		and/or R1 60		vetted widthft
LAND OWNERSHIP	Private Publi	C 🔀 Unknown	LAND COVER	Forest F	ield/Ag∜`□ D	Developed:
POTENTIAL RESTO	ORATION CANDIDATI	E: Grade	control	Bank stabilization	1	
☐ No		Other			•	
THREAT TO PROP	ERTY/INFRASTRUCT	URE: 🛛 No	Yes (Descri	be):		.4.
EXISTING RIPARIA	AN WIDTH:	≤25 ft	☐ 25 - 50 ft	□ 50-75ft □ 75-	-100ft 💢 >	100ft
EROSION	Active downcutting; tall ban		Pat downcutting evic	ent. active stream		
SEVERITY(circle#)	of the stream eroding at a fa contributing significant amo		widening, banks acti	vely eroding at a		n stable; isolated areas of bank ikely caused by a pipe outfall, local
Channelized= 1	stream; obvious threat to pr infrastructure.	operty or	moderate rate; no th infrastructure	eat to property or		riparian vegetation or adjacent use.
Chamienzed- 1	5		4 3	· · · · · · · · · · · · · · · · · · ·	2,	1
ACCESS:	Good access: Open area i ownership, sufficient room t		Fair access: Foreste			s. Must cross wetland, steep slope or reas to access stream. Minimal
	materials, easy stream char	nnel access for	adjacent to stream. A removal or impact to		stockpile areas a	available and/or located a great
	heavy equipment using existrails.		Stockpile areas small	I or distant from stream.	distance from streequi	ream section. Specialized heavy red.
	5	(2	3		2	1
NOTES/CROSS SEC	CTION SKETCH:					
					REPORTED TO	AUTHORITIES YES NO

_		_
()	'	١
V		L

WATERSHED/SUBSHED: (20 2005			DATE: 6/3/05 ASSESSED BY:					
SURVEY REACH ID:	63.03 M TH	ME: <u>12</u> : <u>55</u> AM/PM		РНОТО ID: (Camera-Pic #) (Само /# 1715				
SITE ID (Condition-#): (OTLA	T°	_" Lo	ONG°'	LMK	GPS: (Unit ID)		
BANK: LT ART Head FLOW: None Trickle Moderate Substantial Other:	TYPE: Closed pipe Open channel	MATERIAL: Concrete N PVC/Plastic E Other: Opportunities Concrete Ear Other: 2 7207	rthen		DIMENSIONS Diameter:	No No Partially Fully Fully		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: No Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:		VEGGIE DENSITY: None Normal Inhibited Excessive Other:	Brown Other: POOL QUALIT	C GROWTH: None Orange Green TY: No pool dors Colors Oils lgae Floatables		
FLOWING TURBII ONLY FLOAT OTHER	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER □ Excess Trash (paper/plastic bags) □ Dumping (bulk) □ Excessive Sedimentation							
POTENTIAL RESTORA	TION CANDIDATE	☐ Discharge invest☐ Storm water retro	tigation ofit	n Stream daylighting Stream Country	Local stream r	epair/outfall stabilization		
If yes for daylighting:				ing vegetation:	*			
If yes for stormwater: Is stormwater currently c ☐ Yes ☐ No ☐ Not		Land U Area av		cription:e:				
SEVERITY: str (circle #) str	avy discharge with a distiong smell. The amount of mpared to the amount of pam; discharge appears to inificant impact downstreations.	discharge is significant normal flow in receiving o be having a	discharç discharç	ischarge; flow mostly clear and od ge has a color and/or odor, the am ge is very small compared to the st d any impact appears to be minor /	ount of disch	iall does not have dry weather harge; staining; or appearance ausing any erosion problems.		
	5	4		3	2	1		
SKETCH/NOTES:				R	EPORTED TO AUT	THORITIES: □ YES □ NO		

WATERSHED	WATERSHED/SUBSHED: 108 ASSESSED BY: Team								
URVEY REA	.ch ID: <i>6ВОЗА</i>	TIME: 1:05	AMPM	Рно	ото ID	: (Camera-Pic	: #)	/#	
SITE ID: (Cor	dition-#) SC LAT	1011	" LONG T	<u> </u>	<u> 25 </u>	ng" Li	MK	GPS (Ur	nit ID)
TYPE: Ro	ad Crossing 🔲 Railroad Crossi	ng Manmade	Dam 🔲 Beav	er Da	m 🔲 (Geological Form	nation 🔲	Other:	
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		Flo	NMENT: w-aligned flow-aligned not know	Barrel dia	Height: 4	(ft) (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosio Sediment deposition Other (describe):	m scour hole pankment CULVERT SLOPE: Flat Slight (2° – 5°) Obvious (>5°)		Culvert length: 75-100 (ft) Width: 7 (ft) Roadway elevation: 14/ (ft)					
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	,			placement U	Jpstream s	torage retrofit	
Is SC ACTIN	G AS GRADE CONTROL	□No ☑Y			- 12	7.00.0			
	EXTENT OF PHYSICAL BLO	OCKAGE:			BLO	CKAGE SEVER	UTY: (circ	le #)	
If yes for fish barrier	Total Partial Unkno CAUSE: Drop too high Water D Flow too shallow Water D Other:	rop:(in)	A structure such road culvert on a greater stream b upstream moven anadromous fish passage device	3rd ord locking nent of and fish	der or the	A total fish blocka tributary that wou significant reach o or partial blockage interfere with the anadromous fish.	ld isolate a of stream, e that may migration of	A temporary bar beaver dam or a the very head o very little viable above it; natura as waterfalls.	a blockage at f a stream with fish habitat
) NT = == = (C++==			5		4	3		<u>(2) </u>	1
NOTES/SKET	CH:					Ревор	TED TO ALL	THORITIES	Ves □ No.

Reach Level Assessment RCH

SURVEY REACH	D: <u>63-03</u> 3 wт	rshd/Subshd: ြայհ	es Blu	DATE: 6/3	Ass	ESSED BY: DB JW SM
	E: 3 13 AM PM	/		4:06 AM/PM	LMK: _	GPS ID:
LAT-11 . 51 .	32.7" Long 3	2°25 '129"	LAT 41 0 51 1	37.5" LONG 72	025 11	4.5"
DESCRIPTION:	C-01 (GB-03A		DESCRIPTION: 5	2-07 (GB-3	8)	
RAIN IN LAST 24 HO	•	☐ Steady rain	PRESENT CONDITIONS	☐ Heavy rain [☐ Steady rai	n 🗆 Intermittent
None	☐ Intermittent		□ Clear	☐ Trace	☐ Overcast	☐ Partly cloudy
SURROUNDING LAN	D USE: M Industrial Golf cour		☐ Urban/Residential ☐ Crop		☐ Forested☐ Other:	☐ Institutional
AVERAGE	CONDITIONS (chec	ck applicable)	REACH	SKETCH AND SITE	Імраст Т	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% ☑ 75-100%	within the survey re	of survey reach. Track each (OT, ER, IB,SC, UT deemed appropriate. In	T, TR, MI) as v	well as any additional
	slick) CC BC "") Be Clear Turbid aturally colored)		The second secon	Industrial Ro	المنافقة والمناب وسيدن المناسنة والتستعمين ويسيس	от су дом
AQUATIC PLANTS IN STREAM	Attached: ☐ none Floating: ☑ none	some 🗆 lots				
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☑ Fish ☐ Beave ☐ Snails ☐ Other	er 🗆 Deer :Kacoon Govaleicd				
STREAM SHADING (water surface)	✓ Mostly shaded (☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25) (≥25%)	uin of arms of out this sal			
CHANNEL	Downcutting	☐ Bed scour	leser of wall			
DYNAMICS	Widening	Bank failure				
Unknown	Headcutting Aggrading Sed. deposition	Bank scour Slope failure Channelized			i de de la la la la la la la la la la la la la	
CHANNEL	Height: LT bank	2,5 (ft)	The second secon	A STATE SEA NORTH		
DIMENSIONS	RT bank	<u>).5(ft)</u>	S S	Personal Services	The same of the sa	
(FACING DOWNSTREAM)	Width: Bottom	(ft)		- 1000 and 1	Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Sa	
	Тор	(ft)	Topological /	Townson, and the second	\mathcal{O}	
R	EACH ACCESSIBILIT		The second secon	The second secon	Ā	
Good: Open area in	Fair: Forested or developed area	Difficult. Must cross wetland, steep slope, or	1	3.7	(
public ownership, sufficient room to	adjacent to stream.	sensitive areas to get to		KYP) T	1	
stockpile materials,	Access requires tree	stream. Few areas to	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Long-bridge (Constitution of Constitution of C)	
easy stream channel	removal or impact to landscaped areas.	stockpile available and/or located a great		A SECURE OF SECURE		
access for heavy equipment using	Stockpile areas	distance from stream.		gerber Rd		
existing roads or trails.	small or distant from	Specialized heavy	- Contraction of the Contraction	11 - The second	ale de la company de la company de la company de la company de la company de la company de la company de la co	
5 14	stream. 2	equipment required.				
NOTES: (biggest prob	lem you see in survey r					
)	Chancelreado	n, impodul b	Hert trush			
				Reporte	D ТО АНТНОІ	RITIES TYES NO

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; la of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankful not able to enter floodplain. Stream deeply entrenched.	
			10 9 8 7 (6)		
7 To 1 Co. 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 /6)	5 4 3 2 1 0	
		15 14 13 12 11 ALL BUFFER AND FLOODPLAI	L	5 4 3 2 1 0	
			L	Poor Poor	
VEGETATED BUFFER WIDTH	OVER	ALL BUFFER AND FLOODPLAI	IN CONDITION	Poor	
BUFFER	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: lift or no riparian vegetation due to human activities.	
Buffer Width	Over Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: lit or no riparian vegetation due to human activities.	
BUFFER WIDTH FLOODPLAIN	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation type is young forest	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: lit or no riparian vegetation due to human activities.	
BUFFER WIDTH FLOODPLAIN	Over Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type	Suboptimal Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. 3 4 3 5 4 3 Predominant floodplain vegetation type is shrub or old	Poor Width of buffer zone <10 feet: lit or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation	
BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation type is young forest	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. 3 4 3 5 4 3 Predominant floodplain vegetation type is shrub or old field	Poor Width of buffer zone <10 feet: lit or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation type is turf or crop land	
BUFFER	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest 20 19 18 17 16 Even mix of wetland and non-wetland habitats, evidence of standing/ponded	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation type is young forest 15 14 13 12 11 Even mix of wetland and non-wetland habitats, no evidence of	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. (3) 4 3 5 4 3 Predominant floodplain vegetation type is shrub or old field 10 9 8 7 6 Either all wetland or all nonwetland habitat, evidence of	Poor Width of buffer zone <10 feet: lit or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation type is turf or crop land 5 4 3 2 1 0 Either all wetland or all nonwetland habitat, no evidence of	
BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN	OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest 20 19 18 17 16 Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Suboptimal Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6 8 7 6 Predominant floodplain vegetation type is young forest 15 14 13 12 11 Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. 3 4 3 5 4 3 Predominant floodplain vegetation type is shrub or old field 10 9 8 7 6 Either all wetland or all nonwetland habitat, evidence of standing/ponded water	Poor Width of buffer zone <10 feet: lit or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation type is turf or crop land 5 4 3 2 1 0 Either all wetland or all nonwetland habitat, no evidence of standing/ponded water	

OT

WATERSHED/SUBSHED: / 3 / 3 /			DATE: 6/3/08 ASSESSED BY: DES					
SURVEY REACH ID: &	12 1	IME: 3:40 AM/PM	Рното ID: (Camera-Pic #) /# 172 Ч					
SITE ID (Condition-#): O	T- <u>02</u> L	AT 410 51 1 54.0"	LONG 72° 25 ' 16.1					
BANK: LT RT Head FLOW:	TYPE: Closed pipe	MATERIAL: Concrete Meta PVC/Plastic Bric	k	Diameter: (in) Partially				
Mone Trickle Moderate Substantial Other:	☑ Open channel	☐ Concrete ☐ Earthe ☐ Other:	Parabolic W	Fully				
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: A NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GROWTH: None Brown Orange Green Other: POOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables Other:				
FLOWING ONLY FLOATA OTHER CONCERNS: Need	FLOWING ONLY None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization							
SEVEDITY: stroi	ontrolled? investigated vy discharge with a dis ng smell. The amount o	Land Use of Area available stinct color and/or a Smanf discharge is significant	description:	dorless. If the Outfall does not have dry weather				
(circle #) strea	pared to the amount of am; discharge appears ificant impact downstre	to be having a disci	narge is very small compared to the sand any impact appears to be minor	stream's base discharge; staining; or appearance				
SKETCH/NOTES:	SKETCH/NOTES:							
)		TEASH	PARNING F	REPORTED TO AUTHORITIES: \(\subseteq \text{ yes } \subseteq \text{ no } \)				

WATERSHED/SUBSE	HED: GFOGES	BL	DATE: 6/3/06 ASSESSED BY: DES				
SURVEY REACH ID	: 635-0315 TI	ME: 3: 25 AM/PM	PHOTO ID: (Camera-Pic #)) K (SMOV /# /722				
SITE ID (Condition-#):	(2) (1) (1) (2) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	T <u>U[° 5/ ' 37.1"</u> Le			GPS: (Unit ID)		
BANK: LT RT Head FLOW: None Trick	Closed	MATERIAL: ☑ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: ☐ Single ☐ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:	DIMENSIONS: Diameter: 12 (in	I railiany		
Moderate ☐ Substantial ☑ Other: ₩₤७	☐ Open channel	Concrete Earthen Other:	☐ Trapezoid D☐ Parabolic W☐	Pepth: (in) Vidth (Top): (in) ' (Bottom): (in)	Fully NOT APPESCABLE		
CONDITION: None Chip/Cracked Peeling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: ⟨□ None □ Oily □ Flow Line	VEGGIE DENSITY: ☑ None ☐ Normal ☐ Inhibited	Other: MOG	nge 🗹 Green		
Corrosion Other:	Sulfide Other:	☐ Paint ☐Other:	Excessive Other:	POOL QUALITY:			
	BIDITY: None	e Slight Cloudiness	Cloudy Dpaque	Orange Red .	A PARTY		
OTHER	ATABLES: None xcess Trash (paper/placeds Regular Mainten	astic bags)	g (bulk)	(oil sheen)	Other:		
	10170050						
POTENTIAL RESTOR	RATION CANDIDATE	Discharge investigation		Local stream repair	outfall stabilization		
If yes for daylighting	7.	Storm water retrofit	Other:				
Length of vegetative co	•	ft Type of exist	ting vegetation:	Slope:	0		
If yes for stormwater Is stormwater currently ☐ Yes ☐ No ☑ N	controlled?	Land Use des Area availabl	scription: Thdusty's l	parking lot	▶ -		
SEVERITY: (circle #)	Heavy discharge with a dist strong smell. The amount or compared to the amount of stream; discharge appears significant impact downstrea	f discharge is significant normal flow in receiving to be having a	lischarge; flow mostly clear and or ge has a color and/or odor, the an ge is very small compared to the s d any impact appears to be minor	nount of discharge	es not have dry weather staining; or appearance any erosion problems.		
	5	4	3	(2)	1		
SKETCH/NOTES:							
	PA	EURIS By POOL	year -				
		~~ <u>></u>					
<u>) </u>	4-11	The state of the s	P	REPORTED TO AUTHOR	ITIES: YES 🛮 NO		

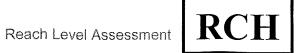
WATERSHED/SUBS	HED:	AB		DATE: 6 / 3 / 0	8 Asse	SSED BY:	Team
SURVEY REACH ID	: GB- 3B TH	ме: <u>З :40</u> ам/р́й	1)	PHOTO ID: (Camera-l			ica pr
SITE ID (Condition-#)	OT- <u>3</u> LA	T41°51 · 35	2" Lo	NG 72° 25 · 16.3	. , , , , ,		GPS: (Unit ID)
					-		
BANK: LT RT Hea FLOW: None Trick	Closed nine	MATERIAL: ☐ Concrete ☐ I ☐ PVC/Plastic ☐ I ☐ Other:	Metal Brick	SHAPE: Single Circular Doubl Elliptical Triple Other:		sions: r: 24 (ir	SUBMERGED: No Partially Fully
Moderate Substantial Other:	Open channel	Concrete Ea	arthen		Depth: Width (Top):_ " (Bottom):_		NOT APPECABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS None Oily Flow Line	S:	VEGGIE DENSITY: None Normal Inhibited	Brown Other:	ı 🔲 Oraı	ROWTH: None
Corrosion Other:	Sulfide Other:	Paint Other:	Î	Excessive Other:	Good	☐Qdors	☐ No pool ☐ Colors ☐ Oils ☐ Floatables
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:							
}	- Aller						
	RATION CANDIDATE			n ☐ Stream daylighting	☐ Local str	eam repair	outfall stabilization
no la la la la la la la la la la la la la		Storm water retro	ofit	Other:			
If yes for daylighting Length of vegetative of	~	ft Type (of existi	ng vegetation:		Slope:	0
If yes for stormwate Is stormwater currentl Yes No	r: y controlled?	Land U		cription:			
SEVERITY: (circle #)	Heavy discharge with a disti strong smell. The amount of compared to the amount of stream; discharge appears t significant impact downstrea	f discharge is significant normal flow in receiving to be having a	discharge discharge	scharge; flow mostly clear and e has a color and/or odor, the a e is very small compared to the any impact appears to be mino	mount of stream's base	discharge;	es not have dry weather staining; or appearance any erosion problems.
	5	4		3		2	1
SKETCH/NOTES:		30%) No see	dend			
)					REPORTED T	O AUTHOR	ITIES: YES NO

Impacted Buffer

IB

						1 -		
WATERSHED/SUBSHED: Gag	s Br				DATE: _	<u>613108</u>	ASS	ESSED BY: DRB
URVEY REACH: 03 - 037	3	Time:	_: <u>15</u> am	/PM	Рното I	D: (Camera-P	ic #) 💪	mm #17/9,1726
SITE ID: (Condition-#) START L	AT°	_''']	LONG	0	1 11	LMK		GPS: (Unit ID)
B-Ol END L	AT°	_'" I	LONG	0	1 11	LMK		DB GAEVIN
IMPACTED BANK: REASON IN LT RT Both LAND USE: Private	IADEQUATE: Institutional	Recently	vegetation y planted arse Park	Oth	o narrow [er: Vefoc		vasive p	olants TET BANK
(Facing downstream) LT Bank RT Bank						I NOVSTEVA I NOVSTEVA		
DOMINANT Paved	Bare ground	d Turf/lav			Shrub/scru		Other	
LAND COVER: LT Bank RT Bank] [io Trees ☑ ☑	\mathbb{X} :	Retaining wall
INVASIVE PLANTS: None	☐ Rare	<u></u>	artial covera			nsive coverage	unk	W
STREAM SHADE PROVIDED? No	ne 🔲 Part	ial 🔯] Full	WETL.	ANDS PRES	SENT? No		es Unknown
POTENTIAL RESTORATION CANDID.		ve reforestation: F16#				Natural regenera たいいがシ	tion 🔽	Invasives removal
RESTORABLE AREA LT BANK RT Length (ft): $\sqrt{400}$ $\sqrt{1000}$	REFOREST POTENTIAI (Circle #)	ATION	Impacted are where the rip not appear to specific purp area availab	ea on pul parian are o be used ose; pler	blic land lipea does professional profession	mpacted area on eith public or private land presently used for a s purpose; available are planting adequate	that is pecific	Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting
POTENTIAL CONFLICTS WITH REFORM Poor/unsafe access to site Existing		☐ Wi	despread in	vasive impact	4 plants s (deer, bea	Potential containver) Other:	mination	Lack of sun
NOTES:	SICTION							
P.P.P.A.P.				-E0 M)			(facin	(2)0 &
)								

WATERSHED				<u> Date: 💪</u>	<u> 13 1 08</u>	ASSE	SSED BY:	fam
URVEY REA	URVEY REACH ID: 66-38 TIME: 3:53AM/PM				D: (Camera-Pio	:#) 17 :	27 /#	
SITE ID: (Con	SITE ID: (Condition-#) SC1					Unit ID)		
TYPE: Ros	ad Crossing Railroad Crossi	ng Manmade	Dam 🔲 Beave	r Dam 🔲	Geological Forr	nation [Other:	
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:	ALIG	ENMENT: ow-aligned ot flow-aligned o not know	DIMENS Barrel dia	IONS: (if var ameter:	iable, sketch)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	☐ Failing emb	ankment	☑ FI	VERT SLOPE: at ight (2° – 5°) ovious (>5°)	Culvert lo	ength: Width: elevation:	(ft) (ft) (ft)
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re☐ Local stream		-	placement 🔲 l	Jpstream s	torage retrof	it
IS SC ACTING	G AS GRADE CONTROL	□ No □ Y	es 🔲 Unkr	nown				
If yes for	EXTENT OF PHYSICAL BLO Total Partial Temporary Unknow		A structure such a road culvert on a 3 greater stream blo	s a dam or Brd order or ocking the	A total fish blocka tributary that wou significant reach of	ge on a ld isolate a of stream,	A temporary beaver dame the very head	barrier such as a or a blockage at d of a stream with
fish barrier		rop: (in) epth: <u>\[\black{\lambda}{\lambda} \] (in)</u>	upstream movemer anadromous fish; passage device pr	no fish	or partial blockage interfere with the anadromous fish.		above it; natu as waterfalls.	ole fish habitat ural barriers such
NOTES/SKET	······································		3		4 (3')		2	1
					top 13 As fo	rred		
					Repor	TED TO AU	THORITIES [_] Yēs ∏ No



SURVEY REACH	m: <u>GB-4</u>	WTRSHD/SUBSHD:	Gages Brook	DATE: 6 14	10%	ESSED BY:
START TIM	1E: 7 :10 KR	MPM LMK:	END TIME:	7:45 AM/PM	LMK: _	GPS ID:
LAT41 0 55 1	<u>589</u> " Lon	NG 72 0 20 1489	" LAT 41 ° 51 '	43.8" Long	120 25 1	1.1"
DESCRIPTION:			DESCRIPTION:	Photo 1738	Ž	·
RAIN IN LAST 24 HO		-	PRESENT CONDITION	•	•	n 🗆 Intermittent
□ None	☑Intermi		☐ Clear	☐ Trace	☐ Overcast	☐ Partly cloudy
SURROUNDING LAN		strial 🗹 Commerci	al □ Urban/Residential □ Crop	☐ Suburban/Res☐ Pasture	☐ Forested ☐ Other:	☐ Institutional
AVERAGE	CONDITIONS	(check applicable)	REACH	I SKETCH AND SI	TE IMPACT T	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% □ 75-100%	within the survey r	n of survey reach. Tra reach (OT, ER, IB,SC, s deemed appropriate.	UT, TR, MI) as v	IDs for all site impacts vell as any additional ion of flow
DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick)	□ Cobble (2.5 –10") □ Boulder (>10") □ Bed rock		successed appropriate.	. Maleure un cen	on o y non
	aturally colored)	arbid (suspended matter) Opaque (milky)		and the second second second second second second second second second second second second second second seco	No description of the second s	
AQUATIC PLANTS IN STREAM	,	none \square some \square lot	S J	idestrial De	st	
WILDLIFE IN OR AROUND STREAM	(Evidence of) ⊠-Fish □ E	Beaver Deer Other: Vaccon Suns	न न न	7900		
STREAM SHADING (water surface)		ded (≥75% coverage) (50%) aded (≥25%)	ois adfall	egeneration and the control of the c		
CHANNEL	Downcutti	ing Bed scour	012	*		
DYNAMICS	Widening	Bank failur	The state of the s	0		
Unknown	Headcuttin Aggrading Sed. depos	Slope failu	te d sedingut	P		
CHANNEL	Height: LT ba	ank <u>2</u> (f	i) Retural dibing			
DIMENSIONS	RT ba	ank <u>3</u> (f		and the second s		
(FACING DOWNSTREAM)	Width: Botto	·	t) Galler ->			
Downshie Many	Тор		t) tree	127		
F	REACH ACCESSI	And the second s				
Good: Open area in	Fair: Forested or developed area	Difficult. Must cross wetland, steep slope,	or	かいつ	ggggggtt William betydd a glygggggan ar ar ar a a a a a a a a a a a a a a	
public ownership, sufficient room to	adjacent to stream	n. sensitive areas to get	to management	V I		
stockpile materials,	Access requires tr removal or impact		Ind	votrial 60.57	Secretary of the second	ļ
easy stream channel access for heavy	landscaped areas	. and/or located a great		_		
equipment using	Stockpile areas small or distant fro	distance from stream. Specialized heavy				
existing roads or trails.	stream.	equipment required.				THE PERSON NAMED IN COLUMN TO THE PE
NOTES: (biggest prot	1) 3 Tem vou see in sui	2 1 rvev reach)				
)	,	V 4				
				PEROD	TED TO AUTUO	DITIES TVES TNO

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lact of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 (13) 12 11 10 9 8 7 6		5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLA	N CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetatior type is turf or crop land
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on flood <u>pla</u> in function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5)43210

WATERSHED/SUBSHED: GB-04 GB45 BK			DATE: 6 / 4 / 0	ASSESSED BY	D KE	
SURVEY REACH ID: 68 - 84 TIME: 7: 10 AM/PM			РНОТО ID: (Camera-Pi	ic#) \\ \(\(\) \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	1728 1720	
SITE ID (Condition-#); C	T- <u>01</u> LA	T41.0 65 158	.du Lo	ong 17.20 146,91	' LMK	GPS: (Unit ID)
BANK: XLT RT Head	Түре:	MATERIAL:	, A.G. 4. 1	SHAPE: Single	DIMENSIONS:	SUBMERGED:
	Closed	☐ Concrete ☐ PVC/Plastic ☐ I	Metal Brick	☑ Circular ☐ Double☐ Elliptical ☐ Triple	*-/	in) Doutielle
FLOW:	pipe	Other:	DITCK	Other:	Diameter	— Fartially
Moderate						Fully
Substantial	☐ Open	Concrete Ea	erthen		epth: (in	
Other:	channel	Other:			/idth (Top):(in)	
COMPANYON	On on Fly	D			' (Bottom): (in)	
CONDITION: None	ODOR: ⊠ No □Gas	DEPOSITS/STAINS None	3:	VEGGIE DENSITY: None	PIPE BENTHIC G	
☐ Chip/Cracked	Sewage	Oily		∏ Normal	Brown Ora	ange [Green
Peeling Paint	Rancid/Sour	☐ Flow Line		☐ Inhibited	POOL QUALITY:	[V] No mont
Corrosion	Sulfide	Paint		□ Excessive	Good Odors	
Other:	Other:	Other:		⊠ Other:	Suds Algae	
		•		Division DISCHARGE	Other:	
FOR COLOR	: Clea	r 🔲 Brown 🔲 Gi		Yellow Green	lo - Finit	04
FLOWING TURBID			A	Cloudy Opaque	Orange Red	Otner:
- 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A 100 A	Larrance Divide Diought Ordanics Dictionary Diopartic					
OTHER						
CONCERNS: Nee	ds Regular Mainten	ance 🔲 Ba	nk Eros	sion 🖸 Other: 🔏	lone	
1						
POTENTIAL RESTORA	TION CANDIDATE	Discharge inves	stigation	n Stream daylighting	Local stream repa	ir/outfall stabilization
no		Storm water retro	ofit	Other:		·
If yes for daylighting:						
Length of vegetative cover	er from outfall:	ft Type o	of existi	ing vegetation:	Slope	e:°
If yes for stormwater:					and the same of th	
Is stormwater currently co	ontrolled?	. Land I	Ise desi	cription: Finducial)	Pondens	
☐ Yes ☐ No ☑ Not				ENBAUNA	IN OP NA dela	- tall
	vy discharge with a dist	inct color and/or a		scharge; flow mostly clear and or	1	V! \M71 *
	ng smell. The amount on spared to the amount of	normal flow in receiving	discharg	ge has a color and/or odor, the am	nount of	oes not have dry weather
(circle #) stre	am; discharge appears	to be having a	discharg	ge is very small compared to the s I any impact appears to be minor	nicani s base	e; staining; or appearance g any erosion problems.
sigr	nificant impact downstrea	AIII.				
SKETCH/NOTES:	5	4		3	2	1
SKETCH/NOTES:						
-					1 8	1 Louis
1	v . \$	minued r	uls	of al soul	or early A	JUNE 10 -
) Ko						
		war we	r 20%	y want		
				of as evel.		
** Tanggopalo Maria		*Super				RITIES: YES NO

0	T
V	1

WATERSHED/SUBSHED:			DATE: 6 1 4 1 1 1 1 1 ASSESSED BY:			
SURVEY REACH ID:		ME: 7: 3) AM/PM	PHOTO ID: (Camera-Pic #) /#			
SITE ID (Condition-#): OT-	LA	т <u>Щ°51'ваа</u> "L	ong 72°25 '10 2"	LMK	GPS: (Unit ID)	
FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS: Diameter: 6 (in	SUBMERGED: No Partially Fully	
✓ Moderate ☐ Substantial ☐ Other:	Open channel	Concrete Earthen Other:	Parabolic W	epth: (in) idth (Top): (in) (Bottom): (in)		
☑ None ☐ ☐ Chip/Cracked ☐ ☐ Peeling Paint ☐	DDOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line	VEGGIE DENSITY: None Normal Inhibited	PIPE BENTHIC GR Brown Ora Other: POOL QUALITY:	nge Green	
	Sulfide Other:	☐ Paint ☐ Other:	Excessive Other:	☐ Good ☐ Odors		
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:						
POTENTIAL RESTORATIO	ON CANDIDATE	Discharge investigation	n 🗌 Stream daylighting [Local stream repair	r/outfall stabilization	
no la la la la la la la la la la la la la		Storm water retrofit	Other:	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
If yes for daylighting: Length of vegetative cover fi	rom outfall:	ft Type of exist	ing vegetation:	Slope:	•	
If yes for stormwater:						
Is stormwater currently control	olled?	Land Use des	scription:			
Yes No Not inve	estigated	Area availabl	e:		-	
SEVERITY: strong si compare stream; d	fischarge with a disti mell. The amount of ed to the amount of i discharge appears t int impact downstrea	discharge is significant dischar obe having a	ischarge; flow mostly clear and od ge has a color and/or odor, the am ge is very small compared to the st d any impact appears to be minor /	ount of ream's base	es not have dry weather ; staining; or appearance any erosion problems.	
	5	4	3	2	1 4	
SKETCH/NOTES:						
)			R	EPORTED TO AUTHOR	ITIES: YES NO	

WATERSHED/SUBSI	ED/SUBSHED: Ondate TSK			DATE: 6/4/00 ASSESSED BY:			
SURVEY REACH ID	: 673704	TIME: <u>7:30</u> am/pr	м Рн	PHOTO ID: (Camera-Pic#) SS CAN W# 1736			
SITE ID (Condition-#):	OT- <u>23</u>	LAT <u>切(。方) ・</u> 位	" Long	2025 1	[P ,,	LMK_	GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trick	Closed	MATERIAL: ☐ Concrete ☐ ☐ PVC/Plastic ☐ ☐ Other:	Metal [APE: Since S	Double	DIMENSIONS:	SUBMERGED: No Partially Fully
Moderate Substantial Other:	Open channel	Concrete E	artnen	Trapezoid Parabolic Other:		: (in) (Top): (in) ottom): (in)	NOT APPELCABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO NO NO NO NO NO NO NO NO NO NO NO NO	☐ None ☐Oily		GGIE DENSIT None Normal Inhibited		Brown	ROWTH: None
Corrosion Other:	Sulfide Other:	Paint Other: SEP IN STR		Excessive Other:		OOL QUALITY: Good Godors Suds Algae Other:	□Colors □Oils
FOR COLOR:					Other:		
H		ATE Discharge inve			nting 🛣 L	ocal stream repai	r/outfall stabilization
no la la la la la la la la la la la la la		Storm water ret	rofit 🔲	Other:			
If yes for daylighting Length of vegetative co	•	ft Type	of existing ve	egetation:		Slope	
If yes for stormwater Is stormwater currently ☐ Yes ☐ No 🛣 N	controlled?	Land Area	Use descripti available:	on:	<u>wata</u>	1/Road	_
SEVERITY: (circle #)	Heavy discharge with a strong smell. The amou compared to the amoun stream; discharge appe significant impact downs	nt of discharge is significant t of normal flow in receiving ars to be having a	discharge has discharge is ve	e; flow mostly cle a color and/or odo ery small compared npact appears to b	or, the amount d to the stream	of discharge	es not have dry weather e; staining; or appearance g any erosion problems.
	4	5	4	3		2	1
SKETCH/NOTES:	437	Dy weo dischor	ober v				
<u></u>					REPO	RTED TO AUTHOR	RITIES: YES NO

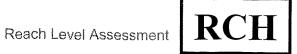
WATERSHED/SUBS	SHED: GAGES	BK	DATE://_	_ ASSESSED BY:	
SURVEY REACH II		ME::AM/PM	Рното ID: (Camera-F	Pic #) *********** /# /*	776
SITE ID (Condition-#): OT-OTA LA	T41° 51 '36.2"	Long 22 °25 '15.0		GPS: (Unit ID)
BANK: LT RT Header FLOW: None Trice	Closed	MATERIAL: Concrete Meta PVC/Plastic Bric Other:		DIMENSIONS: Diameter: 1Z (in) FLARED END	SUBMERGED: No Partially Fully
Moderate Substantial Other:	Open channel	○ Concrete □ Earthe □ Other:	"	Depth: (in) Width (Top): (in) " (Bottom): (in)	NOT APPECABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: None Oily Flow Line	VEGGIE DENSITY: ☐ None ☐ Normal ☐ Inhibited	Other:	ge Green
Corrosion Other:	Sulfide Other:	Paint Other:	Excessive Other:	POOL QUALITY: Good Godors Suds Algae Other:	Colors Oils
FOR CoLor: Clear Brown Grey Yellow Green Orange Red Other: FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:					
POTENTIAL RESTO	DRATION CANDIDATE	☐ Discharge investiga☐ Storm water retrofit	tion Stream daylighting Other:	Local stream repair/	outfall stabilization
If yes for daylighting Length of vegetative	~	10000000	cisting vegetation:	Slope:	0
If yes for stormwate Is stormwater current ☐ Yes ☐ No ☐	ly controlled?	Land Use of Area avails	description: <u>Tadostri</u>	<u>0</u>	
OUTFALL SEVERITY: (circle #)	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.			mount of discharge; stream's base	s not have dry weather staining; or appearance any erosion problems.
Cremmon /NI -	5	4	3	2	1
REPORTED TO AUTHORITIES: YES NO					

WATERSHED/SUBSHE	o: GB		DATE: 6 / 4 / 08 ASSESSED BY:			
SURVEY REACH ID:	GB-04 TI	ме: <u>7:45 ам</u> /рм	PHOTO ID: (Camera-Pic #) DBCsea /# 1737, 1759			
SITE ID (Condition-#): C	T- <u>4B</u> La	TM1051 143.9" L	ONG 72 ° 25 '11. 1 '	' LMK	GPS: (Unit ID)	
BANK:	Түре:	MATERIAL:	SHAPE: Single	DIMENSIONS:	SUBMERGED:	
LT ART Head FLOW: None Trickle	Closed pipe	☐ Concrete	Circular Double Elliptical Triple Other:	Diameter: 4Z (in	$\prod N_0$	
Moderate Substantial Other:	☐ Open channel	Concrete Earthen Other:	Parabolic W	epth: (in) /idth (Top): (in) / (Bottom): (in)	NOT APPEICABLE	
CONDITION: None Chip/Cracked Peeling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: ☑None ☐Oily ☐ Flow Line	VEGGIE DENSITY: None Normal Inhibited	PIPE BENTHIC GA Brown Ora Other:	nge Green	
Corrosion Other:	Sulfide Other:	☐ Paint ☐ Other:	Excessive Other:	POOL QUALITY: Good Odors Suds Algae Other:	☐Colors ☐Oils	
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:						
POTENTIAL RESTORA	FION CANDIDATE	Discharge investigatio	n Stream daylighting [Local stream repair	r/outfall stabilization	
If yes for daylighting: Length of vegetative cover	er from outfall:		ting vegetation:	Slope:	0	
If yes for stormwater: Is stormwater currently co ☐ Yes ☐ No ☐ Not		Land Use des Area availabl	-		-	
SEVERITY: stro com stre	pared to the amount of am; discharge appears t ificant impact downstrea	discharge is significant normal flow in receiving to be having a mm.	ischarge; flow mostly clear and oc ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor	ount of discharge	es not have dry weather ; staining; or appearance g any erosion problems.	
SKETCH/NOTES:	5	4	3	2	1	
SKETCH/NOTES:	1-4B CI	3 SC 				
)			R	EPORTED TO AUTHOR	ITIES: YES NO	

\	
_	_

STRYET REACH ID: C	WATERSHED/SUBSE	IED:		DATE: 6 / 4 / 68	ASSESSED BY:	
STITE ID (Condition-sit) OT-	SURVEY REACH ID	: GB-04	TIME: 7 : 45AM/PM	Рното ID: (Camera-Pic	#) DR/2000/#	1739
BANK:	SITE ID (Condition-#):	от5	LAT 4105/ 1438"L	ONG 72 . 25 111./"		
LT RT Head Concrete Metal Circular Double Double PVCP astic Brick Didnerter 24 fin Partially Pully Mone Trickle Moderate Double Didnerter 24 fin Partially Pully Pully Moderate Substantial Open Other:						
Pr.OW:	1		MATERIAL:		DIMENSIONS:	
None Trickle Other: Other: Other: Fully		Closed			Diameter: 24 (ir	
Substantial Open Concrete Earthen Parabolic Width (Top): (in NOT ABDECABLE Concrete Substantial Other: Other: Trapezoid Orther: Width (Top): (in NOT ABDECABLE Concentration Other: Other: Glotom): (in NOT ABDECABLE Concentration Other: O		e pipe				
Other:	1 			☐ Tranezoid Der	th: (in)	
CONDITION:						NOT APPECABLE
None Gas Good G		Chamie		1 1 041		
Chip/Cracked					PIPE BENTHIC GR	OWTH: None
Peeling Paint	1 *	_		1		nge 🗌 Green
Corrosion Other:	_			T-1:1:4-1		
Other:		ı —	-	Пр		
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other:	☐ Other:	U Other:	☐Other:	☐ Other:	Suds Algae	
TURBIDITY: None Slight Cloudiness Cloudy Opaque PLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation OTHER ONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization on Storm water retrofit Other: If yes for daylighting: Length of vegetative cover from outfall: ft Type of existing vegetation: Slope: o If yes for stormwater: Is stormwater currently controlled? Land Use description: Area available: OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is seynificant compared to the amount of normal flow in receiving steam, discharge appears to be having a significant impact downstream. SKETCH/NOTES: TURBIDITY: One Slight Cloudiness Cloudy Dayne Bank Erosion Dumping (bulk) Excessive Sedimentation Other: Outfall Restoration Candling Dumping (bulk) Excessive Sedimentation Other: Outfall Stream daylighting Local stream repair/outfall stabilization Other: Slope: o Slope: o Outfall Use description: Area available: Outfall Stream daylighting Local stream repair/outfall stabilization Other: Slope: o Outfall Stream daylighting Local stream repair/outfall stabilization Other: Slope: o Outfall Outfall Outfall Stream daylighting Local stream repair/outfall stabilization Other: Slope: o Outfall Out					Other:	
TURBIDITY:	\$4.00 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A)R:	Clear Brown Grey	☐ Yellow ☐ Green ☐ (Orange Red 0	Other;
OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization If yes for daylighting: Length of vegetative cover from outfall: fit Type of existing vegetation: Slope: °	2 2000			Cloudy Dpaque		
CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization no Storm water retrofit Other: If yes for daylighting:	2.000					Other:
POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization on Storm water retrofit Other: If yes for daylighting: Length of vegetative cover from outfall: ft Type of existing vegetation: Slope: o If yes for stormwater: Is stormwater currently controlled? Land Use description: Area available: OUTFALL SEVERITY: Severity: Stormwater with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of or normal flow in receiving stream; discharge appears to be having a significant impact downstream. SKETCH/NOTES:					edimentation	
If yes for daylighting: Length of vegetative cover from outfall: ft Type of existing vegetation: Slope: o If yes for stormwater: Is stormwater currently controlled?						
If yes for daylighting: Length of vegetative cover from outfall: ft Type of existing vegetation: Slope: o If yes for stormwater: Is stormwater currently controlled?	POTENTIAL RESTOR	ATION CANDID	ATE Discharge investigatio	n Stream daylighting	Local stream repair	outfall stabilization
Length of vegetative cover from outfall:ft Type of existing vegetation:	no					
Is stormwater currently controlled? Land Use description: Yes No Not investigated Area available: Coutfall Severity: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems.						
Is stormwater currently controlled? Yes No Not investigated Area available: OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems. SKETCH/NOTES: CAB J J J J SC	Length of vegetative co	ver from outfall:	tt Type of exist	ting vegetation:	Slope:	•
OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. SKETCH/NOTES: Area available: Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems. SKETCH/NOTES: Outfall does not have dry weather discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. SKETCH/NOTES:	If yes for stormwater.	:				
OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems. SKETCH/NOTES: Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant on the amount of discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems. SKETCH/NOTES:	J			•		-
SEVERITY: (circle #) strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. SKETCH/NOTES: STAII discharge; flow mostly clear and oddriess. If the discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.				e:		
compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Circle #) Compared to the amount of normal flow in receiving stream; discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. SKETCH/NOTES: Compared to the amount of normal flow in receiving stream; discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. SKETCH/NOTES: Compared to the amount of normal flow in receiving stream; discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. Compared to the amount of normal flow in receiving stream; discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. Compared to the amount of normal flow in receiving stream; discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. Compared to the amount of normal flow in receiving stream; discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	SEVERITY: S	trong smell. The amou	unt of discharge is significant	ischarge; flow mostly clear and odor	less. If the Outfall doe	s not have dry weather
significant impact downstream. SKETCH/NOTES: SKETCH/NOTES		ompared to the amou tream; discharge appe	ears to be having a discharge	ge is very small compared to the stre	am's base discharge;	staining; or appearance
SKETCH/NOTES:	si	gnificant impact dowr	nstream. flow and	d any impact appears to be minor / lo	calized.	any erosion problems.
074 FCB / HH 125C	Cyremey (Ni omne		5 4	3	2	1
	SKETCH/NOTES:		(1)	11 1-50		
₹ ~> 075 \$		OŢ	4-6-141	1 = 3-		
~ OTS S				· Presidential Company		
			· ~ 075	S. Timer Barrer		
			The state of the s	***************************************		
			/	Service Control of th		
REPORTED TO AUTHORITIES: YES NO	. 1		ğ.	Draw	OODTED TO AUTHOR	Gring: Dyng Dyng

WATERSHED	SUBSHED: GOALS		D	ate: <u>6</u>	14108	ASSE	SSED BY;	NS .
URVEY REA	CHID: GB-04	TIME: 7 : 43	AM/PM P	ното ID	: (Camera-Pic	#) DRG	MON /#	1738
SITE ID: (Con	ndition#) SC- <u>Ol</u> LAT	4105/143	.8" LONG 72	· 25 !	/ <u>}/"</u> LN	ик	GPS	(Unit ID)
TYPE: K Ros	ad Crossing	ng Manmade)	Dam Beaver	Dam []	Geological Form	nation [Other:	
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	#BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:	ALIGI Flo	NMENT: ow-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if vo	ariable, sketch) 10 151 (ft) (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n 🔲 Downstrean 🔲 Failing emb		Fla	t ght (2° – 5°) vious (>5°)	Culvert le	ength: Width: elevation:	50 60 (ft) (ft) (ft)
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re☐ Local stream	emoval Culver	t repair/rep	placement 🔲 U	Jpstream s	torage retro	ofit
IS SC ACTING	G AS GRADE CONTROL	No □ Y	es 🔲 Unkno	wn				
If yes for fish barrier		vn int boderge bonels cop:(in)	A structure such as road culvert on a 3rd greater stream block upstream movement anadromous fish; no	a dam or I order or ling the i of fish	A total fish blocka tributary that woul significant reach o or partial blockage interfere with the I	ge on a d isolate a of stream, e that may	A temporar beaver dan the very he very little vi above it; na	y barrier such as a n or a blockage at ad of a stream with able fish habitat atural barriers such
	Flow too shallow Water D	epth: <u>6-12</u> (in)	passage device pres	ent.	anadromous fish.	-	as waterfal	IS.
NOTES/SKET	TCH: Noy: wet.	weather f	Horr wood	vy a	Tream s	Negri	lith.	
	Tool	J. Seesn						



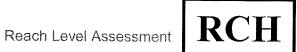
	SURVEY REACH	D: <i>Gβ-0</i> ξβ W⁻	rrshd/Subshd:	ma Bh	DATE: 6 / 4	108 AS	SSESSED BY:	
	START TIM	ie: <u>9 : (>0</u> AM/pn	и LMK:	END TIME:	<u> </u>	LMK:		GPS ID:
	LAT 410 51	43.9 " Long 7	12 . 25 111.2"	LAT 41° 51 1	144" Long 7	2025.	07.2"	
	DESCRIPTION:			DESCRIPTION:				
		ours Heavy rain		PRESENT CONDITIONS	☐ Heavy rain	Steady r	ain 🗆 Interm	nittent
-	□ None	Intermitten		☐ Clear	☐ Trace	☐ Overcas	st 🗆 Partly	cloudy
	SURROUNDING LAN		l ☐ Commercial arse ☐ Park	☐ Urban/Residential ☐ Crop		□ Forested		tional
	AVEDACI	E CONDITIONS (che			☐ Pasture	□ Other:	hed" Strick was to strick table by a convenient	
		100000000000000000000000000000000000000			SKETCH AND SI			
	BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% □ 75-100%	Simple planar sketch within the survey re	each (OT, ER, IB,SC,	UT, TR, MI) a.	is well as any a	ite impacts dditional
	DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick)	obble (2.5 –10") oulder (>10") ed rock	features	deemed appropriate.	. Indicate dire	ection of flow	
		Clear Turbinaturally colored) dyes)						
	AQUATIC PLANTS IN STREAM	/	ne □ some □ lots e □ some □ lots					
- Comment	WILDLIFE IN OR AROUND STREAM	(Evidence of) ☐ Fish ☐ Beav ☐ Snails ☐ Othe						
	STREAM SHADING (water surface)	☑ Mostly shaded ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25	%) d (≥25%)		55	\frac{\sigma}{\sigma}?		
	CHANNEL DYNAMICS Unknown	Downcutting Widening Headcutting Aggrading Sed. depositio	Bank failure Bank scour Slope failure Channelized	Story Orland PK		6 alles	tree	
	CHANNEL DIMENSIONS (FACING DOWNSTREAM)	Height: LT bank RT bank Width: Bottom Top	3.5 (ft) 3.5 (ft) 7 (ft) 15 (ft)	Maried > Grace	A			
	I	Reach Accessibili	TY		Ne ot			
	Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	Indus	00 trial East		garan	
Ţ	Notes: (biggest prob	The second secon	reach)					
1		Nonce						
					D.m.n.o.	TED TO LUTU	r	

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	(10)9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLA	N CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Encroach-	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
MENT				
1ENT	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

.

$\mathbf{\alpha}$	
U	Ί

WATERSHED/SUBSHE			DATE: 6 / 4	109 Assess	SED BY: DRIS
SURVEY REACH ID:	88-0 \$ A TI	ме: <u>4</u> : <u>15</u> ам/рм	Рното ID: (Сал	mera-Pic#) DRCY	wor/# \741
SITE ID (Condition-#): C	DT- <u>//</u> LA	T°, SK,	'LONG'	" LMK	GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete Me PVC/Plastic Bri Other:	tal 🛛 Circular 🔲		☐ No
Moderate Substantial Other:	☐ Open channel	Concrete Earth	en Trapezoid Parabolic Other:	Depth: Width (Top): " (Bottom):	
CONDITION: None	ODOR: ☑ NO ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:	DEPOSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other: ☐ SUBBLES	VEGGIE DENSIT ☐ None ☑ Normal ☐ Inhibited ☐ Excessive ☐ Other:	Brown Other: POOL QUA Good Suds	THIC GROWTH: ☑ None ☐ Orange ☐ Green ALITY: ☐ No pool ☐ Odors ☐ Colors ☐ Oils ☐ Algae ☐ Floatables SUBB ☑ S
CONCERNS: Nee	ABLES: None ABLES: None ess Trash (paper/pla ds Regular Mainten	Sewage (toilet par stic bags)	Cloudy Oper, etc.) Petroping (bulk) Exosion Others	een Orange I I Naque roleum (oil sheen) cessive Sedimentation ner: Some Sedimentation hting Local stream	Other:
If yes for daylighting: Length of vegetative covered to the covere	er from outfall:	ft Type of e	existing vegetation:		_ Slope:°
If yes for stormwater: Is stormwater currently co ☐ Yes ☐ No ☐ Not	investigated	Area avai	description:	indismid	
SEVERITY: stro con stre	avy discharge with a disti ng smell. The amount of npared to the amount of o am; discharge appears t nificant impact downstrea	discharge is significant normal flow in receiving to be having a m.	nall discharge; flow mostly cle charge has a color and/or odd charge is very small compare v and any impact appears to l	or, the amount of ed to the stream's base be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
CLARIT OXY (N. C. C. C. C. C. C. C. C. C. C. C. C. C.	5	4	3		1
SKETCH/NOTES:	Control Contro	mmor No discho	et weather	* ;	AUTHODISTISS Davis Davis
]				REPORTED TO	authorities: 🗌 yes 🔲 no 🖡



SURVEY REACH	ID: (<u>A8-10</u> 58	WTRSE	id/Subshd:	to BL	DATE: <u>614</u>	108	ASSESSE	D BY:
START TIM	ie: <u>2 :10 </u> an	M/PMD	LMK:	END TIME:) LMI		GPS ID:
LATUI OSI	Lor	NG <u>72</u>	25 06.3"	LAT COST	5/.5" Long 7	2 <u>° 25</u>	<u>'02.5</u>	•
DESCRIPTION:	210 to 1	767		DESCRIPTION:				
		2 30 4						
RAIN IN LAST 24 HO			☐ Steady rain	PRESENT CONDITIONS	B ☐ Heavy rain	☐ Stead	ly rain 🖼	Intermittent
□ None	□ Intermi	ittent [☐ Trace	☐ Clear	☐ Trace	☐ Over	cast 🗌	Partly cloudy
SURROUNDING LAN		. + +	☐ Commercial ☐ Park	☐ Urban/Residential ☐ Crop	☐ Suburban/Res ☐ Pasture	☐ Fores ☐ Other		Înstitutional
AVERAGI	E CONDITIONS	(check a	pplicable)	REACH	SKETCH AND SI	ГЕ ІМРАС	TRAC	KING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %		□ 50%-75% □ 75-100%	Simple planar sketch within the sur <u>vey re</u> features	of survey reach. Tra each (OT, ER, IB,SC, deemed appropriate.	UT, TR, M.	I) as well a.	s any additional
DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick)	⊡ Cobbl □ Bould □ Bed re	e (2.5 –10") ler (>10") ock		Sc-2 ad your		meenon o _y	,,or
WATER CLARITY ☐ Stained (clear, n ☐ Other (chemicals,	naturally colored) dyes)	□Ор	aque (milky)		EA-1			
AQUATIC PLANTS IN STREAM			some 🗆 lots		9			
INSTREAM		none L	some □ lots		Parker			
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☐ Fish ☐ E ☐ Snails ☐ C	Beaver Other:			CATCH wasin			
STREAM SHADING (water surface)	☐ Mostly sha☐ Halfway (≥☐ Partially sh☐ Unshaded (≥50%) aded (≥2						
CHANNEL	Downcutti	ing	Bed scour		and the second section of the second			
DYNAMICS	Widening	1	Bank failure	_ U-8	5.1			
Unknown	Headcuttin Aggrading Sed. depos	3	Bank scour Slope failure Channelized	A commence of)			
CHANNEL	Height: LT ba	ank	(ft)		OT-1			
DIMENSIONS	RT ba	ank _	(ft)		No.			
(FACING DOWNSTREAM)	Width: Botto	om	<u>3.5</u> (ft)	Bridge	entered to the second s			
20mminumin)	Тор	_	12 (ft)					
F	REACH ACCESSI	BILITY		h Y The Continue of the Contin				
Good: Open area in	Fair: Forested or	2	ficult. Must cross	indicate and the second				
public ownership, sufficient room to	developed area adjacent to strean		tland, steep slope, or sitive areas to get to	And in the second secon				
sufficient room to stockpile materials,	Access requires tr	ree stre	am. Few areas to					
easy stream channel	removal or impact landscaped areas		ckpile available I/or located a great	The state of the s				
access for heavy equipment using	Stockpile areas	dist	ance from stream.	7979				
existing roads or trails.	small or distant fro stream.	1 '	ecialized heavy uipment required.	A. C.				
	4 / 3	2	i	1				
NOTES: (biggest prob	olem you see in sui	rvey reac	h)					
)								
ı								
					REPOR	TED TO AL	THORITIE	s 🗆 Yes 🗀 No

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lact of habitat is obvious; substrate unstable or lacking.
habitat regime)	that are not new fall and not transient). 20 19 18 17 16	rate at high end of scale). 15 14 (13) 12 11	10 0 0 7 6	
Vacan in the second			10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambani surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
	Right Bank 10 9	8 7 6	5) 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5/4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
Vegetated Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 /4/ 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Encroach-	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
MENT	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 / 3 2 1 0

WATERSHED/SUBS	HED: GAGES T	34		DATE: 6/4/	TH ASSE	SSED BY:	DRB.
SURVEY REACH II): GB-05B T	(ME::AM/PM	1	PHOTO ID: (Camera	-Pic#)⊅ % (™	·^ /#)	768
SITE ID (Condition-#	The state of the s	ATY10 57 45,	7_"Lo	NG 72° 25'06			GPS: (Unit ID)
BANK: LT RT Heat FLOW: None Trick	Closed	MATERIAL: Concrete PVC/Plastic Other:	Metal Brick	SHAPE: Single Circular Doul Elliptical Tripl Other:	ble	SIONS: r: <u> (in)</u>	SUBMERGED: No Partially Fully
☐ Moderate ☐ Substantial ☐ Other: ☐ Very Sinh	Open channel	Concrete Ea	arthen	☐ Trapezoid ☐ Parabolic ☐ Other:	Depth: Width (Top):_ " (Bottom):_		NOT APPESCABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS ☐ None ☐ Oily ☐ Flow Line	S:	VEGGIE DENSITY: None Normal	☐ Brown☐ Other:	ı 🗌 Orang	OWTH: None
Corrosion Other:	Sulfide Other:	Paint Other: Mideu		☐ Inhibited ☐ Excessive ☐ Other:	Good		
FLOWING TURE ONLY FLOOTHER	LOR: Clean C	e Slight Clouding e Sewage (toilet astic bags)	ess	(bulk) Excessi		По	Data tom S
POTENTIAL RESTO	PRATION CANDIDAT			n ☐ Stream daylighting	Local str	eam repair/c	outfall stabilization
If yes for daylighting	·σ·	Storm water retr	OH	Other:			
1	cover from outfall:	ft Type	of existi	ing vegetation:	14444444	Slope: _	•
If yes for stormwater Is stormwater current X Yes No □	ly controlled?		Use dese	cription: <u>Conywert</u>	1/hdvs+1	ial (sofru	en (0.)
OUTFALL SEVERITY: (circle #)	Heavy discharge with a dis strong smell. The amount o compared to the amount o stream; discharge appears significant impact downstre	of discharge is significant f normal flow in receiving to be having a	discharg discharg	scharge; flow mostly clear an ge has a color and/or odor, the ge is very small compared to the any impact appears to be mi	e amount of he stream's base	discharge; s	not have dry weather taining; or appearance ny erosion problems.
	5_			3		2	<u> </u>
SKETCH/NOTES:	(5)	excessive		Pazin Hammann 224 f	Packing		
<u> </u>	<u> </u>	wed .			KEPORTED T	O AUTHORIT	TES: 🗌 YES 🎜 NO



WATERSHED/SUB	SHED: GAGES	TH		DATE: <u>6</u> / <u>4</u>	108	ASSESS	SED BY: D≥B	
SURVEY REACH:	GB-05B	Тіме: <u>Z</u> :	<u>20</u> ам/рм	РНОТО ІD (САМ	ERA-PIC#)):D5(an	m/# 1774	
SITE ID: (Condition		11021 ME.7	" Long <u>72° 2</u>	<u>5 '043''</u>] 5 '043'']	LMK		GPS: (Unit ID)	
	END LAT	1 01 ALVE	LUNG 12 C		LIVIK			
PROCESS: Downcutting Widening Headcutting	Currently unknown Bed scour Bank failure Bank scour	LOCATION: DIMENSIONS	Meander bend	RT Both (lo Straight section and/or RT and/or RT and/or RT	☐ Steep sl	ope/valle		
Aggrading Sed. deposition	Slope failure Channelized	Bank Angle	LI <u>S-7</u> 11	and/or RT	tt	Top w	1dthft 1 Width5ft	
	P: Private Public							
POTENTIAL REST	ORATION CANDIDATE	E: ⊠Grade ☐ Other		A Bank stabilization			FRIVAL PARA	-)
THREAT TO PROP	PERTY/INFRASTRUCTI	J RE: 🗵 No	Yes (Describ	e):				
EXISTING RIPARIA	AN WIDTH:	⊠ ≤25 ft	☐ 25 - 50 ft [☐ 50-75ft ☐ 75-	100ft []>100ft		
EROSION SEVERITY(circle#) Channelized= 1	Active downcutting; tall ban of the stream eroding at a fa contributing significant amo stream; obvious threat to pr infrastructure.	ast rate; erosion unt of sediment to	Pat downcutting evide widening, banks activ moderate rate; no thre infrastructure	ely eroding at a	failure/erosi	on; likely ca	e; isolated areas of bank aused by a pipe outfall, local n vegetation or adjacent use.	
<u> </u>	5 Good access: Open area in	a public	4 3	2			1	
ACCESS:	ownership, sufficient room t materials, easy stream char heavy equipment using exis trails.	o stockpile nnel access for	Fair access: Forester adjacent to stream. A removal or impact to I Stockpile areas small	ccess requires tree	other sensiti stockpile are	ive areas to eas availab m stream s	cross wetland, steep slope of access stream. Minimal le and/or located a great ection. Specialized heavy	r
	5		3	2	2		1	
NOTES/CROSS SEC	CTION SKETCH:			Valo :	A			
	(\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			W	rormers.	et vez-c	er oppours ve company. alling poler	
	of of the state of		Her	n N	mele	e en	by Over	
	GRASS		GRZ	165 - 1	projec	t po	toroilor atner (coyecti rop in sipon	ine).
					rule and rate who		valo un sodon	
	(8)	FALLER SOD CLUM						
J	ii saaaaa				REPORTED	TO AUTH	HORITIES YES NO	О

SITE ID: (Condition#) SC Lat
TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other: SHAPE: Arch Bottomless Single Concrete Flow-aligned Other: For Road Crossing Circular Other: Other: Do not know Railroad Crossing Circular Other: Other: Do not know Crossing Cracking/chipping/corrosion Downstream scour hole Sediment deposition Tailing embankment Sediment deposition Other (describe): Fish barrier removal Cobounce of Downstream scour hole Sediment deposition Other (describe): Fish barrier removal Cobounce (associated of the partial Temporary Dunknown Downstream scour hole Sediment deposition Other (describe): Fish barrier removal Cobounce (associated of the partial Temporary Dunknown Downstream scour hole Sediment deposition Other (describe): Fish barrier removal Cobounce (associated of the partial Temporary Dunknown Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Downstream scour hole Sediment deposition Sediment deposition Downstream scour hole Sediment deposition Sediment deposition Sediment
SHAPE:
SHAPE:
Arch
CROSSINGS ONLY Concing/chipping/corrosion Downstream scour hole Sediment deposition Failing embankment Slight (2° – 5°) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Culvert length: (ft) Slight (2° – 5°) Culvert repair/replacement Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) Slight (2° – 5°) Roadway elevation: (ft) (
Is SC ACTING AS GRADE CONTROL No Yes Unknown EXTENT OF PHYSICAL BLOCKAGE: Total Partial Temporary Unknown If yes for fish barrier CAUSE: Drop too high Water Drop: Flow too shallow Water Depth: Other: Other:
Is SC ACTING AS GRADE CONTROL No Yes Unknown EXTENT OF PHYSICAL BLOCKAGE: Total Partial Temporary Unknown If yes for fish barrier CAUSE: Drop too high Water Drop: Flow too shallow Water Depth: Other: O
EXTENT OF PHYSICAL BLOCKAGE: Total Partial Temporary Unknown A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. CAUSE: Drop too high Water Drop: Flow too shallow Water Depth: (in) Other: BLOCKAGE SEVERITY: (circle #) A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A temporary barrier such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. Other: 5 4 3 2 1
Total Partial A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.
Temporary Unknown If yes for fish barrier CAUSE: Drop too high Water Drop: (in) Flow too shallow Water Depth: (in) Other: A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A temporary barrier such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A temporary barrier such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. S 4 (3) 2 1
5 4 (3) 2 1
NOTES/SKETCH:

UNIVERSECUTION STEED Considerate SC 2	WATERSHED	SUBSHED: Gages			Date: <u>6</u>	14 108	ASSE	SSED BY:	
TYPE:	URVEY REA						:#) <i>(</i>	/# / 17	75
SHAPE:	SITE ID: (Con	dition-#) SC- <u>02</u> LAT	41051151	<u>5" Long 7</u>	2 <u>°25'</u>	<u> </u>	мк	GPS (Un	it ID)
SHAPE:									
Arch	TYPE: Roa	***							
ONLY CONDITION: (Evacence of) □ Cracking/chipping/corrosion □ Downstream scour hole □ Sediment deposition □ Failing embankment □ Other (describe): □ Other (describe): □ Other (describe): □ Other □ Local stream repair □ Other: IS SC ACTING AS GRADE CONTROL □ No □ Yes □ Unknown EXTENT OF PHYSICAL BLOCKAGE: □ Total □ Temporary □ Unknown If yes for fish barrier Structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish, no fish passage device present. A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish, no fish passage device present. A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish, no fish passage device present. A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish, no fish passage device present. A structure such as a dam or road culvert on a 3rd order or greater stream with the wight and book it; natural barriers such as a waterfalls. A temporary barrier such as a beaver dam or a blockage at the upstream movement of anadromous fish, no fish passage device present. Notes/Sketch: A total fish blockage on a tribulary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. A structure such as a dam or road culvert on a 3rd order or greater stream such as a dam or road culvert on a 3rd order or greater stream such as a dam or road culvert on a 3rd order or greater stream such as a dam or road culvert on a 3rd order or greater stream such as a dam or road culvert on a 3rd order or greater stream such as a dam or road culvert on a 3rd order or greater stream such as a dam or		☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical ☐ Circular	Single Double Triple	☐ Concrete ☐ Metal	☐ Flo	ow-aligned of flow-aligned	Barrel dia	meter:	<u>O, A</u> (ft) <u>O+O</u> (ft)
POTENTIAL RESTORATION CANDIDATE		☐ Cracking/chipping/corrosion☐ Sediment deposition	Failing emb		☐ Fla	☐ Flat ☐ Slight (2° – 5°)		Width:	<u>(ft)</u>
Is SC ACTING AS GRADE CONTROL No Yes Unknown Local stream repair Other: Other:									
EXTENT OF PHYSICAL BLOCKAGE: Total Partial Temporary Unknown If yes for fish barrier CAUSE: Total Total Unknown CAUSE: Total Temporary Unknown CAUSE: Torop too high Water Drop: (in) Tellow too shallow Water Depth: (in) Other: Total Temporary Unknown A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present. A temporary barrier such as a beaver dam or a blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. The work of the very head of a stream with very little viable fish habitat above it; natural barriers such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish, no fish passage device present. Total Partial A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish, no fish passage device present. Total A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. Total Temporary Unknown A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. Total Temporary Unknown		RESTORATION CANDIDATE			•	placement 🔲 U	Jpstream st	torage retrofit	
Total	Is SC ACTING	G AS GRADE CONTROL	□No □Ye	es Unkn	iown				
Temporary			CKAGE:		BLC	CKAGE SEVER	RITY: (circ	le #)	
NOTES/SKETCH:		☐ Temporary ☐ Unknow CAUSE: ☐ Drop too high Water Drop too shallow Water Drop to shallow Water Drop to shallow Water Drop to shallow Water Drop to shallow Water Drop to shallow Wate	rop: <u>Z</u> (in)	road culvert on a 3 greater stream blo upstream moveme anadromous fish; r	Brd order or cking the ent of no fish	tributary that woul significant reach o or partial blockage interfere with the	ld isolate a of stream, e that may	beaver dam or a the very head of very little viable t above it; natural	blockage at a stream with fish habitat
	r <u> </u>			5		4 (3)		2	1
	NOTES/SKET		A Robert VIII Compared to the control of the contro						

Reach Level Assessment



SURVEY REACH	ID: (25-6 WTRSHD/SUBSHD: G	in O	Date: <u>6 / 4/</u>	/ 25 ASSE	SSED BY:
START TIM	IE: 3:00 AM/RM LMK:	END TIME: 4	:35_AM/PM)	LMK:	GPS ID:
LAT 41 0 5/ 1	515" LONG 72 . 25 102.5"	LAT-11 ° 51 ' 51	" Long 7	2° 24 · 3	<u></u> "
DESCRIPTION:	Pau 177	DESCRIPTION:	`		
	* * 13333 C + 210				
RAIN IN LAST 24 HO	OURS Heavy rain Steady rain	PRESENT CONDITIONS	☐ Heavy rain	☐ Steady rain	☐ Intermittent
□ None	☑Intermittent ☐ Trace	☐ Clear	☐ Trace	☐ Overcast	☐ Partly cloudy
SURROUNDING LAN	D USE:	☐ Urban/Residential ☐		Forested	☐ Institutional
AVERAGE	E CONDITIONS (check applicable)	-	Pasture KETCH AND SIT	Other:	ACUZING
BASE FLOW AS %	□ 0-25%	Simple planar sketch of		Control of the Contro	
CHANNEL WIDTH	□25-50 % □ 75-100%	within the survey reac	ch (OT, ER, IB,SC, V	UT, TR, MI) as w	ell as any additional
DOMINANT SUBSTR		features de	eemed appropriate.	Indicate directio	n of flow
☐ Silt/clay (fine or					ON BELLET
Sand (gritty)	■ Boulder (>10")	a ·	A second	4	TE TB
☐ Gravel (0.1-2.5	5")	, considerant	Arm a		
WATER CLARITY	☑ Clear □ Turbid (suspended matter)		1564		The state of the s
☐ Stained (clear, n	aturally colored)				
☐ Other (chemicals,	dyes)	and the second s	1		
AQUATIC PLANTS	Attached: ☑ none ☐ some ☐ lots			und	ir SII
IN STREAM	Floating: ☑ none ☐ some ☐ lots	accordinately.		Cul	Ag U
WILDLIFE IN OR	(Eyidence of)	The state of the s	TO TO THE PARTY OF		To the same of the
AROUND STREAM	☐ Fish ☐ Beaver ☐ Deer ☐ Snails ☐ Other: (ronfish	Tomorphic San	The second secon		11
1	7.2	1 1			(1)
STREAM SHADING	✓ Mostly shaded (≥75% coverage) ☐ Halfway (≥50%)		30		1/11
(water surface)	☐ Partially shaded (≥25%)	F2-11 /			
	☐ Unshaded (< 25%)				1.
CHANNEL	Downcutting Bed scour	aportion of the			
DYNAMICS	Widening Bank failure	And consequences of 1971			
	Headcutting Aggrading Bank scour Slope failure	No. of the last of			
Unknown	Aggrading Slope failure Sed. deposition Channelized	January January and Market and Ma	and the state of t)57 S
		- STAN	Equilibrium THS (c)	√ 3)	
CHANNEL	Height: LT bank (ft)	- D 5	C-2		
DIMENSIONS	RT bank(ft)				7 4
(FACING DOWNSTREAM)	Width: Bottom(ft)	2,000			
NO. 17 (1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/	Top	Manage costs		Į.	1/2
P	REACH ACCESSIBILITY			1 6	- Andrew
Good: Open area in	Fair: Forested or developed area Difficult. Must cross wetland, steep slope, or	- Language	summer.	/ /	Ton Shall
public ownership, sufficient room to	adjacent to stream. sensitive areas to get to	010,000	,	-	*
stockpile materials,	Access requires tree stream. Few areas to stockpile available	0 56-	A The same of		i
easy stream channel access for heavy	landscaped areas. and/or located a great	01-29 F-7	languagement.	EK-3	
equipment using	Stockpile areas distance from stream. small or distant from Specialized heavy	MA Port Rid	and the second second	I = I	
existing roads or trails.	stream. specialized neavy stream. equipment required.	Cold Post Pud	annerson and the second	A	* A
	3 (2) 1	DAMPACE W. ST. E.	<u> </u>	4	1
NOTES: (biggest prob	olem you see in survey reach)				
<i>1</i>					
			REPORT	ED TO AUTHOR	ITIES YES NO

	Optimal	Suboptimal	Marginal	Poor		
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 /13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambanl surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetatio has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	4 3	2 1 0		
	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0		
BANK Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 (7)6	5 4 3 2 1 0		
		ALL BUFFER AND FLOODPLA	1			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	78 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0		
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN	No evidence of floodplain encroachment in the form of fill material, land development, or	Minor floodplain encroachment in the form of fill material, land development, or manmade structures,	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on		
ENCROACH- MENT	manmade structures	but not effecting floodplain function	effect on floodplain function	floodplain function		

\$78

WATERSHED/SUBSHE	D: Goges	ちん	DATE: 6/4/08 ASSESSED BY: DEIS					
SURVEY REACH ID:	58-06 TI	ME: <u>2</u> : 00 AM/PM	Рното ID: (Camera-Pic #) /# 17-16					
SITE ID (Condition-#): C	T- <u>02</u> L	AT 41.0 51 151.7 "	LONG 12° 25 '02.5'	" LMK GPS: (Unit ID)				
BANK: LT XRT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Meta ☐ PVC/Plastic ☐ Bric ☐ Other:	,	Diameter: 12-(in) Partially				
Moderate Substantial Other:	☐ Open channel	☐ Concrete ☐ Earthe	Trapezoid D	Fully				
CONDITION: None Chip/Cracked Peeling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: None Oily Flow Line	VEGGIE DENSITY: ☐ None ☑ Normal ☐ Inhibited	PIPE BENTHIC GROWTH: None Brown Orange Green Other:				
Corrosion Other:	Sulfide Other:	Paint AOther: Sovol/pedincut	Excessive Other:	POOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables Other:				
FOR COLOR	: Clea	ır 🗌 Brown 🔲 Grey	Yellow Green	WARRING STATE OF THE PROPERTY				
FLOWING TURBID	ITY: Non	e Slight Cloudiness	Cloudy Opaque	Orange Red Other:				
ONLY FLOATA		e Sewage (toilet pape		(oil sheen)				
.h.,	ess Trash (paper/pl ds Regular Mainter	~ ·	- , , , , , , , , , , , , , , , , , , ,	Sedimentation				
POTENTIAL RESTORA	TION CANDIDAT	E Discharge investiga	tion Stream daylighting	Local stream repair/outfall stabilization				
⊠ no		Storm water retrofit	Other:					
If yes for daylighting:								
Length of vegetative cove	er from outfall:	ft Type of ex	sisting vegetation:	Slope:°				
If yes for stormwater:								
Is stormwater currently co			description:					
Yes No Not		Area availa	able:					
SEVERITY: stro com stre	ny discharge with a dis ng smell. The amount of npared to the amount of am; discharge appears ificant impact downstre	of discharge is significant normal flow in receiving to be having a	Ill discharge; flow mostly clear and o narge has a color and/or odor, the an narge is very small compared to the s and any impact appears to be minor	nount of discharge; staining; or appearance				
	5	4	3	2 1				
SKETCH/NOTES:		The state of the s	and the second	***************************************				
		erren	07-01					
	enton	\S\\	(35)					
	ST.		and the second of the second o					
	0/.	- January Control	Comment of the Control of the Contro					
		1030						
<u>)</u>	1¢3		F	Reported to authorities: 🗌 yes 🔲 no				

WATERSHED/SUBSH	WATERSHED/SUBSHED: GAGES BC			DATE: 6 / 4 /06 ASSESSED BY:				
SURVEY REACH ID:	GB-06	TIME: 3:00 AM/PI	м Рното	ID: (Camera-Pic #)	/# /	776		
SITE ID (Condition-#):	от-о1	LAT 410 51 51	.7" LONG 72	0 25 102.5"	LMK_	GPS: (Unit ID)		
BANK: LT RT Head		MATERIAL:	SHAPE	: 🛛 Single]	DIMENSIONS:	SUBMERGED:		
FLOW: None Trickle Moderate	Closed pipe	☑ PVC/Plastic ☐ Other:	Oth	er:	Diameter: 15 (in)	Partially Fully		
Substantial Other:	Open channel	Concrete E	Earthen	bolic Widtl	h: (in) h (Top): (in) Bottom): (in)	NOT APPESCABLE		
CONDITION: None Chip/Cracked Peeling Paint	ODOR: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	None Oily	S: VEGGI ☐ Non ☑ Non ☐ Inhi	e E	IPE BENTHIC GRO Brown Orang Other:	ge Green		
Corrosion Other:	Sulfide Other:	Paint Other:	Exce	essive P	OOL QUALITY: [] Good	Colors Oils Floatables		
For Colo	R: 🔲	Clear 🛮 Brown 🔲 (Grey 🔲 Yello	w 🔲 Green 🔲 Or	ange 🗌 Red 🔲 O	ther:		
2. 10 Control (1972 - 1972 - 1972 - 1972 - 1972 - 1972 - 1972 - 1972 - 1972 - 1972 - 1972 - 1972 - 1972 - 1972		None ⊠ Slight Cloudin None □ Sewage (toilet			· · · · · · ·	23.2		
	cess Trash (pape		Dumping (bulk)	☐ Petroleum (oil☐ Excessive Sed		ther;		
CONCERNS: Ne	eds Regular Mai		Bank Erosion	Other:				
Porrece A Propos	1000 C 11000							
no POTENTIAL RESTOR	ATION CANDIL	DATE Discharge inve			Local stream repair/o	outfall stabilization		
If yes for daylighting.	•	Storm water ret	John Din	UI.				
Length of vegetative co	ver from outfall	:ft Type	of existing veget	ation:	Slope:	0		
If yes for stormwater.	·				Λ			
Is stormwater currently		Land	Use description:	ey ornall	ben stuped	icael		
Yes No No		Area	available: 0	ey ornall	,			
SEVERITY: St Co co co co co co co co co co co co co co	rong smell. The amo		discharge has a co discharge is very si	w mostly clear and odorle or and/or odor, the amount nall compared to the strear t appears to be minor / loca	t of discharge; s	not have dry weather staining; or appearance uny erosion problems.		
0		5	4	3	2			
SKETCH/NOTES:	enfort of-or	POAD POAD	01	Road & hore be reconst	onifolde of sees recent busto.	ppeor te		
<u>) </u>		The same of the sa		Repo	ORTED TO AUTHORIT	TIES: TYES NO		

Storm Water Outfalls f OT

WATERSHED/SUBS	SHED: Gog	es Bh	DATE: 6/	DATE: 6/4/08 ASSESSED BY: DIZB					
SURVEY REACH II	D: 6-13-06	TIME: 3:00 AM/PI	м Рното ID: (Рното ID: (Camera-Pic #) /# /776					
SITE ID (Condition-): OT- <u>02</u> A	LAT 41 ° 51 ' 51	7" LONG <u>72° 2°</u>	5 1 02.5"	LMK	GPS: (Unit ID)			
BANK: □LT □RT ☑ He FLOW: ☑ None □ Trice	Closed	MATERIAL: Concrete PVC/Plastic Other:	Metal 🔲 Circular	Double	DIMENSIONS: Diameter: (i	SUBMERGED: No Partially Fully			
Moderate Substantial Other:	Ď Open channel	□ Concrete □ E □ Other: ASPNAC	☐ Parabolic	Width	n: <u>(in)</u> n (Top): <u>/ O (in)</u> ottom): // (in)	NOT APPEICABLE			
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO NO NO NO NO NO NO NO NO NO NO NO NO		NoneNormalInhibited		IPE BENTHIC GA Brown Cora Other: OOL QUALITY:				
Corrosion Other:	Sulfide Other:	☐ Paint☐Other:	Excessive Other:		Good Odors Suds Algae Other:	☐Colors ☐Oils			
FLOWING TUI ONLY FLO OTHER	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation								
Ĺ									
POTENTIAL RESTO	DRATION CANDIDA	ATE Discharge inve		/lighting ☐ I	Local stream repai	r/outfall stabilization			
İf yes for daylightir	ıg:					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Length of vegetative	cover from outfall:	ft Type	of existing vegetation:_		Slope	;			
If yes for stormwater Is stormwater current	ly controlled?	Land	Use description:						
Yes No			available:						
OUTFALL SEVERITY: (circle #)		Int of discharge is significant of normal flow in receiving ears to be having a	Small discharge; flow mostl discharge has a color and/o discharge is very small com flow and any impact appears	r odor, the amount pared to the stream	of discharge	nes not have dry weather e; staining; or appearance g any erosion problems.			
		5	4 3		2				
SKETCH/NOTES:	A STATE OF THE STA	an annual garage and an annual garage. An Africa SAN AN AN AN AN AN AN AN AN AN AN AN AN A	nadalkan sedila di pila pila pila pila pila pila pila pil						
	07-07		101-6	21					
)		CLEAUSET EDAD		Deno	DTED TO AUGUS	RITIES: YES NO			
		,		KEPU	WIED TO WOTHOR	aries. 🗀 res 🗀 NO			

ER

WATERSHED/SUB	SHED: GLACO B	C15/4		DATE: <u>6 / 4</u>	108	ASSES	SED BY: J#W
SURVEY REACH:	66-06		AM/PM	РНОТО ID (САМ	IERA-PIC#	f): F+0	1# 17-81
SITE ID: (Condition-	#) START LAT <u></u>	051150.2	" Long 72 ° 2		LMK		GPS: (Unit ID)
ER			" Long <u> </u>		LMK		
Process.		DANK OF CO					
PROCESS:	Currently unknown	BANK OF CO LOCATION:	NCERN: LT Meander bend	RT Both (last) Both (last) Straight section	ooking dow	<i>nstream)</i> Ione/vall	ev well Other
☐ Downcutting ☐ Widening	Bed scour	DIMENSIONS		Strangilt section	☐ Steep's	Tope/van	ey wan 🔲 Other.
Headcutting	Bank failure Bank scour			and/or RT	e l	Rotto	m width / C ft
Aggrading	Slope failure	Bank Ht		and/or RT			m width <u>/ (2)</u> ft vidth <u>30</u> ft
Sed. deposition	Channelized			and/or RT 30			ed Width 8 ft
	P: Private Public	l		Forest F		Devel	
	Titon	o indiowii		· EN olost	reid/rig [opcu.
POTENTIAL REST	POTENTIAL RESTORATION CANDIDATE: Grade control Bank stabilization Other:						
THREAT TO PROP	THREAT TO PROPERTY/INFRASTRUCTURE: No Yes (Describe):						
EXISTING RIPARIA	AN WIDTH:		☐ 25 - 50 ft	∑ 50-75ft	-100ft [>100f	ì
EROSION	Active downcutting; tall ban of the stream eroding at a fa		Pat downcutting evide	ent, active stream			
SEVERITY(circle#)	contributing significant amo	unt of sediment to	widening, banks activ moderate rate; no thre	ely eroding at a	failure/eros	width stabl sion; likely d	e; isolated areas of bank aused by a pipe outfall, local
Channelized= 1	stream; obvious threat to prinfrastructure.	operty or	infrastructure	eat to property or			nn vegetation or adjacent use.
	5 Good access: Open area in		4 3		2		1
ACCESS:	ownership, sufficient room t	o stockpile	Fair access: Forester adjacent to stream. A		other sensi	c cess . Mus tive areas t	t cross wetland, steep slope or o access stream. Minimal
	materials, easy stream char heavy equipment using exis		removal or impact to landscaped areas stockpile areas available			ole and/or located a great section. Specialized heavy	
	trails.		Stockpile areas small	1			
NOTES/CROSS SEC		7.			2		. 1

				All representations of the second second second second second second second second second second second second	taka kaliminta arawa kata wa kata wa ana ana kata kata kata kata kata kata		
				The second secon		, <i>SC</i> -	3
				Company of the Compan	Service Control of th		
		3.6			_{Control} egico de Parison		
	20	Wr Je og L					
	Δ.	Contract Description		And the second s	/4.	g	
	-			and the second	19°	New	
		1/	and the state of the state of the state of the state of the state of the state of the state of the state of the	The second secon		4	3.3
	75/	A Particular of the Control of the C			110	gav en	100
	41	1000					
		A THE STATE OF THE					
	W.						
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \							
)					REPORTE	D TO AUT	HORITIES YES NO

ER

WATERSHED/SUB	SHED: Gages Bro	S.L		DATE: 6 / 4	108	ASSESSED BY: THE		
SURVEY REACH:	GB-06	TIME: 3 :	30 AM/PM	РНОТО ID (САМ	ERA-PIC#	#): Ft 4 /# 1784		
SITE ID: (Condition	#) START LAT 🛂	1 051 4914	" Long <u>12°2</u> "	150,6	LMK			
ER- <u>2</u>	END LAT	1 051 45.7	" Long <u>72°</u> 2		LMK			
PROCESS:	Currently unknown			RT Both (la				
Downcutting	Bed scour	1	I was a second	Straight section	∐ Steep s	slope/valley wall Other:		
Widening	Bank failure	DIMENSIONS	/			j.		
Headcutting	Bank scour			and/or RT				
Aggrading	Slope failure	Bank Ht	LTft	and/or RT	ft	Top width 25 ft		
Sed. deposition	Channelized	Bank Angle	LT_13_	and/or RT	°	Wetted Widthft		
LAND OWNERSHII	P: Private Publi	c Unknown	LAND COVER	Forest Fi	ield/Ag	Developed:		
POTENTIAL REST	ORATION CANDIDATE	E: Grade	e control	Bank stabilization				
□No		Other	~					
	THREAT TO PROPERTY/INFRASTRUCTURE: No							
EXISTING RIPARIA	AN WIDTH:	⊠ ≤25 ft	☐ 25 - 50 ft [☐ 50-75ft ☐ 75-	100ft	□ >100ft		
EROSION	Active downcutting; tall ban		Pat downcutting evide	ent, active stream				
SEVERITY(circle#)	of the stream eroding at a fa contributing significant amo	unt of sediment to	widening, banks active moderate rate; no three	ely eroding at a		l width stable; isolated areas of bank sion; likely caused by a pipe outfall, local		
Channelized= 1	stream; obvious threat to pr infrastructure.	operty or	infrastructure	еат to ргоретту ог		aired riparian vegetation or adjacent use.		
Chaimenzed-	5		4 3)	2	I		
ACCESS:	Good access: Open area in ownership, sufficient room t		Fair access: Forester			ccess. Must cross wetland, steep slope or itive areas to access stream. Minimal		
	materials, easy stream char	nnel access for	adjacent to stream. A removal or impact to I		stockpile a	reas available and/or located a great		
	heavy equipment using existrails.	sting roads or		or distant from stream.	distance from equipment	om stream section. Specialized heavy		
	5		1 3)	2	1		
NOTES/CROSS SEC	CTION SKETCH:							
			8 000	a company				
			are supplied to the supplied t					
				1 Total	•			
				1 1 "	1			
					1			
				Security of the security of th	2			
_					Ž			
				/ 1				
			<u> </u>	· / /	1			
				1				
			€					
				1				
)					Des			
/					KEPORTE	D TO AUTHORITIES YES NO		

Severe Bank Erosion | ER

WATERSHED/SUBS	SHED: Softer	18L		DATE: <u>6</u> / <u>4</u>	108	ASSESSED BY	K: DRB	
SURVEY REACH:	G-13-06	TIME: <u>3</u> :	ч <u>5</u> ам/рм	РНОТО ID (САМ	ERA-PIC#): DBGw/#	1765:766	
SITE ID: (Condition-	#) START LAT	11051 148.4	" Long <u>7z_</u> °2'	<u>4 '48.8"</u>]	LMK		: (Unit ID)	
ER- <u>03</u>	END LAT_	o 1	" Long°_		LMK			
PROCESS:	C 1 1	PANK OF Co	Nicopau Clar					
Downcutting	Currently unknown Bed scour			☐ RT ☐ Both (<i>lo</i> ☐ Straight section			□ Other:	
Widening	Bank failure	DIMENSIONS				oper railey main		
Headcutting	Bank scour	Length (if no	GPS) LT_O_fi	t and/or RT_30	ft l	Bottom widt	h É ft	
Aggrading	Slope failure	Bank Ht	LT <u>5</u> f	t and/or RT 5	ft	Top width _		
Sed. deposition	Channelized	Bank Angle	LT 90	° and/or RT 90		Wetted Widt	h <u>5</u> ft	
LAND OWNERSHII	P: Private Publi			, , , , , , , , , , , , , , , , , , , ,		Developed:		
POTENTIAL REST	ORATION CANDIDATI			Bank stabilization				
	ERTY/INFRASTRUCT		Yes (Describ					
EXISTING RIPARIA			☐ 25 - 50 ft [100ft [≥100ft		
EROSION	Active downcutting; tall ban		Pat downcutting evide	ent, active stream				
SEVERITY(circle#)	of the stream eroding at a fa contributing significant amo		widening, banks activ	ely eroding at a		width stable; isolate ion; likely caused b	ed areas of bank y a pipe outfall, local	
Channelized= 1	stream; obvious threat to pr infrastructure.	operty or	moderate rate; no thre infrastructure	eat to property or			ition or adjacent use.	
Ontamionzou	5		4 3)		1		
ACCESS:	Good access: Open area i ownership, sufficient room t	o stockpile	Fair access: Foreste adjacent to stream. A			cess. Must cross was to access	etland, steep slope or stream. Minimal	
	materials, easy stream chai heavy equipment using exis		removal or impact to l	to landscaped areas. stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and/or located a grid and stockpile areas available and stockpile areas available and stockpile areas available and stockpile areas available and stockpile areas available and stockpile areas available and stockpile areas available and stockpile areas available and stockpile areas available and areas available areas available areas available areas available areas available areas available areas available areas availabl				
	trails.		Stockpile areas small	or distant from stream.		and the second s		
NOTES/CROSS SEC	CTION SKETCH:	STREAM	4 1207 F	AROUND T	EODA!	- <u>'</u> ER 734,	A .A	
	ST SKING	FORMIN	16 NEW	CHANNEL	· FORM	ETZ DA ALT	16/GH17 & 5"	
	CONCRETE ABUTA	EVT			4 1 - Sacr			
way to a sympletic wife the left		V						
~~	FORMER V-Note	4						
2	SADIMENT	A_	-di					
	54.54	8/						
1		/ //						
	Commence of the Commence of th							
		//						
	1	`						
	W 120210 N							
	CE W.							
1 .								
· · · · · · · · · · · · · · · · · · ·					REPORTE	TO AUTHORIT	ies 🗌 Yes 🔲 No	

ER

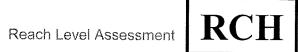
WATERSHED/SUB	SHED: GO-94		DATE: 6/	4108	ASSES	SED BY: D≥B	
SURVEY REACH:	GB-06	TIME: <u>4</u> :	<u>00</u> am/pm	Рното ID (Camera-Pic#	·):	1# 1787
SITE ID: (Condition-	#) START LAT <u>C</u>	11.051 141.8	" Long <u>72° 2</u>	41476	LMK		GPS: (Unit ID)
ER- <u>0</u> 4	9850962 D3 3 1		" Long <u>72°2</u>				
B-0		D					
PROCESS:	Currently unknown		NCERN: LT Meander bend				
Downcutting	Bed scour	DIMENSIONS		☐ Strangill Sect	ion 🗀 steeps	iope/van	ey wan Other:
Widening	Bank failure		s. GPS) LT <u> VOO</u> f	T 1/2 D.T.	7.00	D 44	' I.I. genera
	Bank scour	Bank Ht		t and/or RT_ t and/or RT_			m width <u>5</u> ft ridth <u>10</u> ft
Aggrading	Slope failure		LT 80-90				ridth <u>10</u> ft d Width <u>6</u> ft
Sed. deposition	Channelized						
LAND OWNERSHII	P: Private Public	Unknown	LAND COVER	: 🔀 Forest	∐ Field/Ag [Devel	oped:
I	ORATION CANDIDATE			☑ Bank stabiliz	ation		
☐ No THREAT TO PROP	ERTY/INFRASTRUCTI	☐ Other	Yes (Describ	ne).			
EXISTING RIPARIA			∑ 25 - 50 ft [] 75-100ft [_] >100f	t
EROSION	Active downcutting; tall ban	ks on both sides	D-1-1				
SEVERITY(circle#)	of the stream eroding at a fa contributing significant amo		Pat downcutting evid widening, banks activ				e; isolated areas of bank
	stream; obvious threat to pr		moderate rate; no thr infrastructure	eat to property or			aused by a pipe outfall, local in vegetation or adjacent use.
Channelized= 1	infrastructure.		4 3		2		1
ACCESS:	Good access: Open area i	n public	Fair access: Foreste	d or developed area	Difficult ac		t cross wetland, steep slope or
	ownership, sufficient room t materials, easy stream char		adjacent to stream. A	ccess requires tree	otner sensi		o access stream. Minimal ple and/or located a great
	heavy equipment using existrails.		removal or impact to Stockpile areas small		distance fro	om stream s	section. Specialized heavy
	trails.		1 3		equipment 2	requirea.	1
NOTES/CROSS SEC	CTION SKETCH:	and the same	The state of the s				
			Samuel .				
	e de la companya de la companya de la companya de la companya de la companya de la companya de la companya de	>	Merchanic				
)	(1	To an and the second se				
	5	4	genigra o'Cunido				
	1		2	1			
l l	-	4	SAM C.		YARD		
	Ž	Anna Anna Anna Anna Anna Anna Anna Anna	Z	<	111		
£18		\wedge	305	X .			
!	il <	3	S				
		57		i Ka			
		A W	nce point	M.			
	X		nce point	11)			
	51	et de servicio de		力			
	ne de la companya de la companya de la companya de la companya de la companya de la companya de la companya de			4			
					REPORTE	D TO AUT	HORITIES TYES NO

Impacted Buffer ${f IB}$

WATERSHED	SUBSHED: Gogles &	1000.		DATE: 😉	14 108	ASSE	SSED BY: 🔎	1215
URVEY REA	CHID: G-B-06	TIME: 3: 30	AM/PM	Рното ID	: (Camera-Pic	:#) <i>15</i> 86	ven/# 1	779
SITE ID: (Con	dition-#) SC- <u>O2</u> LAT	41°5/ '50.	<u>4" Long 7</u>	20241	<u>59.3"</u> LI	ИК	GPS (U	nit ID)
		•—						
TYPE: Roa	ad Crossing 🔲 Railroad Cross		T	r Dam 🔲	Geological Form		Other:	
	SHAPE:	#BARRELS:	MATERIAL:	1	NMENT:		ONS: (if varia	
	☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical	☐ Single☐ Double	Concrete	1	w-aligned	Barrel dia		(ft)
FOR ROAD/	Circular	Triple	☐ Metal☐ Other:		t flow-aligned not know		Height:	(ft)
RAILROAD	Other:	Other:	Ouler.		not know			
CROSSINGS ONLY	CONDITION: (Evidence of)				ERT SLOPE:	Culvert le	-	(ft)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐				☐ Fla			Width:	(ft)
	Sediment deposition	☐ Failing emb	ankment		ght (2° – 5°) vious (>5°)	D 1	1	(0)
	Other (describe):				vious (>3)	Roadway	elevation:	(ft)
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re	emoval D Culve	ert renair/rer	alacement D I	Instream et	orage retrofit	
no	RESTORATION CANDIDATE	Local stream			n Gedwer			
	G AS GRADE CONTROL	□ No 🖫 Y	***************************************		n Great	<u>wangy</u>	173(440)	5.51
15 be AcTive	EXTENT OF PHYSICAL BLO		es 🗀 Olikli		CKAGE SEVER	OITV. (circ	la #)	
	☐ Total ☐ Partial			DLO	CRAGE SEVER	di i. (circ	іе ну	
	Temporary Unkno		A structure such as road culvert on a 3		A total fish blocka tributary that would		A temporary ba beaver dam or	
If yes for	If yes for fish barrier CAUSE: Drop too high Water Drop: (in)			cking the	significant reach of	of stream,	the very head o	of a stream with
Jish barrier				nt of no fish	or partial blockage interfere with the		very little viable above it; natura	
l _{ena}	Flow too shallow Water I	Depth: (in)	passage device pre		anadromous fish.		as waterfalls.	
	Other:		5		3		2	1
NOTES/SKET	CH:							
		n / n						
	. A pe	nstock low evel ovale	1					
		revel or the						
	91 646							
	The state of the s							
		11/11/	er.					
		,		company of the control of	100 X - 1 - 100			
		<u>,</u>		The second second	* .			
		The state of the s	Θ					
		The state of the s						
		1	1	and the same of th				
	er september	and the second second		And the state of t				
	, in the second second							
	ald	wented in						
	Total and the second se	h. I sout	(1		throughturing a more or that interspectation respectively.			
	A.	wested in she/port						
, and a second			1					
Ĺ	The same of the sa	and the second s	p#		REPOR	TED TO AU	THORITIES 🔲	YES NO

WATERSHED	/SUBSHED: Cagas	***************************************		DATE:	6	<u> </u>	ASSE	SSED BY:	CM
JURVEY REA	.cн ID: <u>6</u> 8-6	Тіме: 3:13	AM/PM	Рното	ID	: (Camera-Pic	: #) /anov	/#	779
SITE ID: (Con	dition-#) SC- <u>52</u> LAT	11051 130	U Long	2024		<u> </u>	мк	GPS	(Unit ID)
TYPE: 🔽 Roa	ad Crossing 🔲 Railroad Crossi	ng 🔲 Manmade I	Dam Beave	er Dam		Geological Form	nation 🔲	Other:	
FOR ROAD/ RAILROAD CROSSINGS ONLY	SHAPE: Arch Bottomless Box Elliptical Circular Other: CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	# BARRELS: Single Double Triple Other: Downstrean Failing emb		Cu	Flor Not Do JLVI Flat Slig	w-aligned ont know ERT SLOPE: tght (2° – 5°) vious (>5°)	Barrel dia	meter: _ Height: _	riable, sketch) (ft) (ft) (ft) (ft)
POTENTIAL I	POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit ☐ Income ☐ Local stream repair ☐ Other:								
IS SC ACTING	G AS GRADE CONTROL	□No □Y	es 🔲 Unkı	nown					
	EXTENT OF PHYSICAL BLO	CKAGE:		В	LO	CKAGE SEVER	RITY: (circ	le #)	
If yes for fish barrier	Total Partial Unknow CAUSE: Drop too high Water D Flow too shallow Water D Other:	rop: <u></u> (in)	A structure such a road culvert on a 3 greater stream blo upstream moveme anadromous fish; passage device pr	3rd order o ocking the ent of no fish	or	A total fish blocka tributary that wou significant reach or partial blockag- interfere with the anadromous fish.	ld isolate a of stream, e that may migration of	beaver dam the very hea very little via above it; na as waterfalls	
NOTES/SKET		•	5		4	3		~2~	1
						Repor	TED TO AU	THORITIES	□ Yes □ No

WATERSHED	/SUBSHED:			DATI	e: <u></u>	<u>14 105</u>	ASSE	SSED BY: 😭 🕠
SURVEY REA	сн ID: <i>6В-96</i>	TIME: 3 : 25	_AM/PM	Рно	то ID	: (Camera-Pic	:#) Carros	u # 1977
SITE ID: (Condition-#) SC-Ot LAT 41 ° 51 '51.4" LONG 72 ° 25 '01.4" LMK GPS (Unit ID)							GPS (Unit ID)	
	<u> </u>							
TYPE: Roa		1						Other: Ob road leading
	SHAPE: Bottomless	#BARRELS:	MATERIAL:	- 1		NMENT:		IONS: (if variable, sketch)
FOR ROAD/ RAILROAD CROSSINGS ONLY	☐ Arch ☐ Bottomless ☐ Single ☐ Box ☐ Elliptical ☐ Double		Metal		☐ Flow-aligned ☐ Not flow-aligned		Barrel diameter: (ft)	
	Circular	Other:			Do not know		Height:(ft)	
	Other: undiana				Grave manage are com-		Culvert le	ength: (ft)
	CONDITION: (Evidence of)				CULVERT SLOPE: ☐ Flat ☐ Slight (2° – 5°) ☐ Obvious (>5°)			Width:(ft)
	☐ Cracking/chipping/corrosion ☐ Downstream scour hole ☐ Sediment deposition ☐ Failing embankment			, ,				
	Other (describe):] [Roadway	elevation:(ft)
							-	
H	RESTORATION CANDIDATE	Fish barrier re		-	oair/rep	olacement 🔲 U	Jpstream st	orage retrofit
по			repair					
IS SC ACTING	G AS GRADE CONTROL	□ No □ Ye	es Unkı	nown				
:	EXTENT OF PHYSICAL BLO	OCKAGE:			BLO	CKAGE SEVER	RITY: (circl	le #)
	Temporary Unkno	wn	A structure such as a d					A temporary barrier such as a
If yes for	CARIGE.	road culvert on a 3rd ord greater stream blocking upstream movement of anadromous fish; no fish		g the significant reach of or partial blockage		f stream, the very head of a stream with very little viable fish habitat		
fish barrier	CAUSE: Drop too high Water D							
	☐ Flow too shallow Water D	epth: (in)	passage device p			anadromous fish.		as waterfalls.
<u>) </u>	Other:		5		4	3		2 1
NOTES/SKET	CH:					474		
Sew Coak	1 9					Ner Vie	N)	
X. 265.	x-section							
						~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	- A - O - I	substitute demonstrating
		nggapulundung (n. 400 gapu) di didunung gapu, ki di dan serang kapang kapang kapang kapang kapang kapang kapan Kapang kapang et englishe with open a global filmen et stande de dat et al english synghetis samples.			014 1/2	X Ly		
			ntrophydrograe y argenn y mei a child a Martinghydrograeth captur			014 Ps	T RU	<u>A</u>
	055					OIN DO	7 21	
								Andrew of the control
			de transportante de la constitución de la constitución de la constitución de la constitución de la constitución		**************************************			
				/	<i>,</i> 7	014 00		And the second s
			onen o cum a cum a cum a cum a cum a cum a cum a cum a cum a cum a cum a cum a cum a cum a cum a cum a cum a c		フ			And the second s
			and the second s		ノフ			And the second s
	Cheen Rown	A next the	A.		7			And the second control of the second control
	Street Pours	Negetite.	al der		7			And the second s
	Street Pours Shows Pours Shows Pours	Legetite some l'é	of der		7			
	Street Pours Space & smess Space & smess	Vegetite storels	wide of		7			And the second s
	Sheen phones showsh pomons space by mes + burkers	Legetite storely	ad winder		7			
	Street founds Shows by since Space by since + bushers	Vegetite storels	and of ex		7			
	streen pourous space bythes + burkers	Legelite Storels	who of		7			



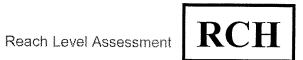
SURVEY REACH ID: <u>GB-07</u> WTRSHD/SUBSHD:		DATE: 6 14	106 Assi	ESSED BY:
START TIME: 4: SO AM/PM LMK:		: <u> </u>	LMK:	
LAT 41 ° 51 '51.9" LONG 32 ° 24 '31.0"	LAT4/ ° 51 '53	U Long	2024 21	<u>*</u> "
DESCRIPTION:	DESCRIPTION:			
RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☐ None ☐ Intermittent ☐ Trace	PRESENT CONDITIONS ☐ Clear	☐ Heavy rain		Intermittent
	☐ Urban/Residential □	Trace	☐ Overcast ☐ Forested	☐ Partly cloudy
☐ Golf course ☐ Park		Pasture	☐ Other:	☐ Institutional
AVERAGE CONDITIONS (check applicable)	REACH SI	KETCH AND SIT	E IMPACT TE	RACKING
Base Flow as % □ 0-25% □ 50%-75%	Simple planar sketch of within the survey reac	survey reach. Trac	ck locations and	IDs for all site impacts
CHANNEL WIDTH □25-50 % □75-100%	features de	eemed appropriate.	Indicate directio	on of flow
DOMINANT SUBSTRATE ☐ Silt/clay (fine or slick) ☐ Sand (gritty) ☐ Gravel (0.1-2.5") ☐ Bed rock ☐ Cobble (2.5-10") ☐ Boulder (>10") ☐ Bed rock		gyndargyna mwedd dd dd dd gaell y gael y cyf o c c		
WATER CLARITY	A 18/	SC mil	<u> </u>	
AQUATIC PLANTS Attached: ☑ none ☐ some ☐ lots IN STREAM Floating: ☑ none ☐ some ☐ lots		8		
WILDLIFE IN OR AROUND STREAM CEVIDENCE of) □ Fish □ Beaver □ Spails □ Other:	processor and the second	reserving.		
STREAM SHADING (≥75% coverage) Which is the stream of th	TB	IB		
CHANNEL Downcutting Bed scour	- Andrew Control			
DYNAMICS Widening Bank failure Headcutting Bank scour	20 American (2004)			
Unknown Aggrading Slope failure Sed. deposition Channelized	Reducing representations and security representations and security representations and security representations and security representations are security representations are security representations are security representations and security representations are security representations are security representations are security representations are security representations are security representations are security representations are security representations are security representations are security representations are security representations are security representations are security represe			
CHANNEL Height: LT bank (ft)	0,0000			
DIMENSIONS RT bank (ft)				
(FACING Width: Bottom (ft)	Supplied in the supplied of th			
Top	ida de ciclo de como de ciclo de como de ciclo de como de ciclo de como de ciclo de			
REACH ACCESSIBILITY				
Good: Open area in public ownership, Fair: Forested or developed area Fair: Forested or developed area Difficult. Must cross wetland, steep slope, or				
sufficient room to adjacent to stream. sensitive areas to get to				
stockpile materials, stockpile materials, removal or impact to stockpile available	SCOTIZATION AND A STATE OF THE			
easy stream channel access for heavy landscaped areas. stockpile available and/or located a great				
equipment using eviction roads or trails small or distant from Specialized heavy				
existing roads of trails. stream. equipment required.	National and State of Grant			
5 4 3 (2) 1 Notes: (biggest problem you see in survey reach)				
)				
		Report	ED TO AUTHOR	AITIES TYES NO

	Optimal	Suboptimal	Marginal	Poor	
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
<u> </u>	20 19 18 17 16	15 14 /13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamband surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLA	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
		15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 0	3 4 3 2 1 0	

Impacted Buffer ${\bf IB}$

July .					L_	
WATERSHED/SUBSHED:	tes BK		DATE:	77	ASSESSED BY:	
JRVEY REACH: 66-07	TIME:	5:00 AM/PM	Рното 1	D: (Camera-Pic	:#) [[] [] [] [] [] [] [] [] []	ภร
SITE ID: (Condition-#) START L	AT41 ° 51 '52.5'	LONG 32 °24	12.8"	LMK_	GPS: (U	
B-1 END L		LONG °	1 11	LMK		
		LONG		DIVIN		
LALT RT Both	ADEQUATE:	of vegetation 🔀 To	~	Widespread inv	asive plants	, , ,
	Institutional Golf (Course Park C	ther Public		7400	·
(Facing downstream) LT Bank			□:			
RT Bank			<u> </u>			
DOMINANT Paved	Bare ground Turf	lawn Tall grass	Shrub/scru		Other	
LAND COVER: LT Bank				Ø		
RT Bank	Ц				X: Pashass	nelva
INVASIVE PLANTS: None	☐ Rare	Partial coverage	Exter	nsive coverage	unknown	
STREAM SHADE PROVIDED? Non	e 🗵 Partial	Full WETI	LANDS PRES	SENT? No	Yes Unk	nown
POTENTIAL RESTORATION CANDIDA	TE Active refores	tation Greenway	design 🕅	Natural regenerati	on 🕅 Invasives r	emoval
no	Other:				on <u>E</u> m. abi veo i	ciiio vui
RESTORABLE AREA		Impacted area on a	iblic land	mnosted area as atti-		
LT BANK RT	REFORESTATION	Impacted area on pu where the riparian a		mpacted area on eithe oublic or private land th		
Length (ft): 100 BANK KI	POTENTIAL:	not appear to be use		presently used for a sp	ecific encroachmer	it or other
	(Circle #)	specific purpose; ple		ourpose; available area	Ų	
26	()	area available for pla	anting p	lanting adequate	available area	a for planting
width (ft): 25 25	(5			available area	a for planting
		5	4	3)	2	1
POTENTIAL CONFLICTS WITH REFOR	ESTATION	5 Widespread invasive	plants	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	5 Widespread invasive	plants	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR	ESTATION	5 Widespread invasive	plants	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	5 Widespread invasive	plants	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	5 Widespread invasive	plants	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	5 Widespread invasive	plants	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	5 Widespread invasive	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	ESTATION	Widespread invasive Severe animal impac	plants ts (deer, bea	Potential contam	2	1

WATERSHED	SUBSHED: Goges	Bh		ate: <u>6</u>	1408	ASSE	SSED BY: DPB
Contract Strategic to to Light Contract to	сн ID: ("В~07 ^V	Manager 1		: (Camera-Pic	c #)1913 Co	man /#	
SITE ID: (Condition-#) SC- 0/ LAT 4(° 5 1 53.0" LONG 72 ° 24 2 74)" LMK GPS (Unit ID)							GPS (Unit ID)
Tupp. 57 p	10		D. [] .	, 	0 1	,. [0.1
TYPE: Koa	d Crossing Railroad Crossi				Geological Form		
	SHAPE: Arch Bottomless	# BARRELS:	MATERIAL:		NMENT: ow-aligned	Barrel dia	IONS: (if variable, sketch) meter:
For Pour/	☐ Box ☐ Elliptical ☐ Circular	Double	☐ Metal	☐ No	t flow-aligned		Height:(ft)
FOR ROAD/ RAILROAD	Other:	☐ Triple ☐ Other:	Other:	Do	not know		
CROSSINGS	CONDITION: (Evidence of)				ERT SLOPE:	Culvert le	
ONLY	Cracking/chipping/corrosion			Fla	it ght (2° – 5 ⁰)		Width:(ft)
	Sediment deposition	☐ Failing emb	ankment	t t	gnt (2° – 5°) vious (>5°)	Roadway	elevation: 30 I (ft)
	Other (describe):					Todaway	Cicyation, (II)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	moval 🗌 Culvert	repair/rep	placement [] [Upstream st	torage retrofit
no		Local stream	repair Other:		100,000		
IS SC ACTING	G AS GRADE CONTROL	No □ Ye	es Unknov				
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVER	RITY: (circ	le #)
	☐ Total☐ Temporary☐ Unknown	wn	A structure such as a		A total fish blocka		A temporary barrier such as a
If yes for	CAUSE:		road culvert on a 3rd greater stream blocki	ng the	tributary that wou significant reach of	of stream,	beaver dam or a blockage at the very head of a stream with
fish barrier		rop: <u>24</u> (in)	upstream movement anadromous fish; no		or partial blockage interfere with the		very little viable fish habitat above it; natural barriers such
	☐ Flow too shallow Water D	epth: (in)	passage device prese		anadromous fish.	•	as waterfalls.
	Other:		5		4 3		2) 1
NOTES/SKET	Rope Rope		House	No Port	7		Meb 2.
				Jul.	REPOR	TED TO AU	THORITIES 🗌 YES 🗌 NO



	TOTAL TOTAL CO.						
SURVEY REACH ID		TRSHD/SUBSHD: Gas	45	DATE: 6 / 5	108	Assessed by:	
_	<u>6 :55 AM</u> PI		t e e e e e e e e e e e e e e e e e e e	7:25(AM/PM	LMK		GPS ID:
LAT_11 0 51 152	Long L	72 024 1187"	LAT 41 0 5/ 1	<u>55.5"</u> Long <u>7</u>	· 24	1107"	
DESCRIPTION:			DESCRIPTION:				
RAIN IN LAST 24 HOUF		. •	PRESENT CONDITIONS			∕rain □ Interm	
Suppose	☐ Intermitten		□ Clear	☐ Trace	☑ Overc		
SURROUNDING LAND L		al ☐ Commercial urse ☐ Park	☐ Urban/Residential ☐ Crop	☑ Suburban/Res ☐ Pasture	☐ Foreste	11101114	tional
AVERAGE C	ONDITIONS (cha	eck applicable)		SKETCH AND SIT			
	□ 0-25% □25-50 %	☑ 50%-75% □ 75-100%	within the survey re	of survey reach. Trac each (OT, ER, IB,SC,	UT, TR, MI)	as well as any a	ite impacts Iditional
DOMINANT SUBSTRAT			Meatures	deemed appropriate.	Indicate di	rection of flow	
☐ Silt/clay (fine or slie	_ ck) □ C	Cobble (2.5 –10")	1 / 1 / /				
Sand (gritty)		Boulder (>10")	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	1			
☑ Gravel (0.1-2.5")	<u> </u>	ed rock	_				
WATER CLARITY 🗹							
☐ Stained (clear, natu	rally colored)	Opaque (milky)	1				
☐ Other (chemicals, dye							
		ne 🗆 some 🗀 lots	0526				
		e □ some □ lots					
WILDLIFE IN OR	Evidence of) □ Fish □ Beav	ver ⊠Deer	TRIT				
ADDIND STORAM	☐ Fish ☐ Beav ☐ Snails ☐ Othe						
/ ************************************		(≥75% coverage)		0			
STREAM SHADING	⊐ Halfway (≥50%	%)	\\\\/.				
	☐ Partially shade ☐ Unshaded (< 2:						
Г		<u> </u>	L. reproduction				
CHANNEL	Downcutting Widening	Bed scour Bank failure	Topic Chieffy,				
DYNAMICS _	Headcutting	Bank scour	Contraction depth of the contraction of the contrac		-		
Unknown	Aggrading	Slope failure	refued of I				
O TAMES OF THE PROPERTY OF THE	Sed. depositio	on Channelized	1 debiis		1	, \	
CHANNEL	Height: LT bank	(ft)	tendenozoneje.		\ r	20nd	and the same of th
DIMENSIONS	RT bank	$\frac{1}{2}$ (ft)	"or Endowney		, manufacture of the second		and the second
(FACING	Vidth: Bottom	<u></u>	The second secon	OT-17		/	/
DOWNSTREAM)	Тор	(ft)	To constructions		and the state of t		
REA	CH ACCESSIBILI	The same of the sa	Newspaperson.	(IB-1	The second secon		
Good: Open area in	air: Forested or	Difficult. Must cross	1 Maria 1			Adaptamen	
public ownership,	eveloped area djacent to stream.	wetland, steep slope, or sensitive areas to get to	debris	1.		81	
stockpile materials, Ac	ccess requires tree	stream. Few areas to		Zakit Company	56-1	7	
easy stream channel lar	moval or impact to ndscaped areas.	stockpile available and/or located a great	101		A Principle of the Prin	Table Committee	
equipment using	tockpile areas	distance from stream.	001-	\$ List			
existing roads or trails.	nall or distant from ream.	Specialized heavy equipment required.	Andrew	vog	A	P	
5 4	3 (:	2 <i>)</i> i	<u> </u>	-	. :	7 .	
NOTES: (biggest problem	n you see in survey	reach)					
1							
							_
				REPORT	דווג חד משי	THORITIES TY	TO DAIG

	Optimal	Suboptimal	Marginal	Poor
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lact of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetatio has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	ALL BUFFER AND FLOODPLA	10 9 8 7 6	5 4 3 2 1 0
	Optimal	Suboptimal	T	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 /9)	8 7 6	5 4 3	2 1 0
	Right Bank 10	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetatior type is turf or crop land
	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 /13 12 11	10 9 8 7 6	5 4 3 2 1 0

		7
\		
	_	_

WATERSHED/SUBSHED: Gogle Bl			DATE: 6 /	5 106	ASSESSED BY:	DIRB
SURVEY REACH I	D: 68-08	м Рното ID : (С	Camera-Pic#)	/#	1798	
SITE ID (Condition-	#): O T- <u></u>	LAT <u>U1° 5 '57</u>	1.6" LONG 72 24	1 18.711	LMK	GPS: (Unit ID)
BANK: X LT	Closed	MATERIAL: Concrete PVC/Plastic Other:	Metal 🛛 Circular	Double	DIMENSIONS: Diameter: <u>2,5 (in)</u>	SUBMERGED: No Partially Fully
Moderate Substantial Other:	Open channel	Concrete E	Earthen Trapezoid Parabolic Other:		: (in) (Top): (in) ottom): (in)	NOT APPESCABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: N Gas Sewage Rancid/So	⊠ None □Oily	None Normal		PE BENTHIC GRO Brown	ge Green
Corrosion Other:	Sulfide Other:	Paint Other:	☐ Inhibited ☐ Excessive ☐ Other:		OOL QUALITY: [Good Odors [Suds Algae [Other:	☐Colors ☐Oils
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toiler paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization Storm water retrofit Other:					ther:	
If yes for daylighti	ng:	Storm water ret	crofit Other:			
Length of vegetative	cover from outfall:	ft Type	of existing vegetation:	VIII VIII VIII VIII VIII VIII VIII VII	Slope:	
If yes for stormwat Is stormwater curren ☐ Yes ☐ No	tly controlled?		Use description:available:			
OUTFALL SEVERITY: (circle #)	compared to the amour stream; discharge appe significant impact down	nt of discharge is significant at of normal flow in receiving ars to be having a stream.	Small discharge; flow mostly discharge has a color and/or discharge is very small comp flow and any impact appears	odor, the amount of ared to the stream	of discharge; s	not have dry weather staining; or appearance uny erosion problems.
SKETCH/NOTES:		3	4 3		2	1
SALICHINOTES.		F-1 69	asseri lo whis slavoit infoce by			
1				REPO	RTED TO AUTHORIT	TIES: 🗌 YES 🔲 NO

Impacted Buffer

IB

WATERSHED/SUBSHED: Have	s Bk		DATE: 6 /	5 108	ASSESSED BY: フルB
URVEY REACH: GB-08	TIME: 6	: 45 AM/PM	Рното ID:	(Camera-Pic	#) DB Com /#
SITE ID: (Condition-#) START LA	AT 41°51 '526" I	LONG 72 º 24		LMK	GPS: (Unit ID)
IB-OI END LA		LONG °	1 11	LMK	
LT RT Both	ADEQUATE: Lack of Recently	planted 🔀 Oth	o narrow 🔲 W er: Londs a	idęspread inva	sive plants
1	Institutional Golf Cou	rse Park Ot	her Public	1 / 4	
(Facing downstream) LT Bank			□:		
RT Bank	Bare ground Turf/lay		[]:	T	2.1
LAND COVER: LT Bank	Bare ground Turf/lav	-	Shrub/scrub	Trees (Other :
RT Bank					
Invasive Plants: 🔀 None		artial coverage	☐ Extensive	e coverage	unknown
STREAM SHADE PROVIDED? Non			ANDS PRESEN		
STREAM SHADE I KOVIDED.	C Alamai L	Jiun WEIL	ANDS FRESEN	1; NO	Yes Unknown
POTENTIAL RESTORATION CANDIDA Ino	TE Active reforestati	on Greenway d	lesign Natu	ıral regeneratio	n 🔲 Invasives removal
RESTORABLE AREA		Impacted area on put	olic land Impac	ted area on either	Impacted area on private
LT BANK RT Length (ft): <u>3の</u>	REFORESTATION POTENTIAL: (Circle #)	where the riparian are not appear to be used specific purpose; pler area available for plar	ea does public d for any present ty of purpo	or private land tha ntly used for a spe- se; available area ng adequate	at is land where road; building cific encroachment or other
Width (ft): 50-75 50-75	(5	4	3	available area for planting
POTENTIAL CONFLICTS WITH REFOR	ESTATION DW:				nation Lack of sun
Poor/unsafe access to site Existing		vere animal impact	s (deer, beaver)	Other:	nation Lack of sun
NOTES:					A CONTRACTOR OF THE CONTRACTOR
	· ·				
	The state of the s				
	Maring Control of the				
	Barry and a state of the state	Margarithe and Steel and			
V	CAD				
and the second s					
e more in the second	_				
		Laur		The state of the s	
				T House	P
L	sur ()	7		1	
	15	T.			
		,			
House		00 157			
I thought	l W	V			
	1				

WATERSHED	SUBSHED: GOOS		D)ATE: <u></u>	15168	ASSE	SSED BY:
JURVEY REA	.cн ID : <i>G в 98</i>	TIME: 7 : 25	AM/PM P	ното ID	: (Camera-Pic	:#) (pro	n 1#1906
SITE ID: (Condition-#) SC-1 LAT <u>U1051 '555</u> " LONG 72024 '10-7" LMK_ GPS (Unit ID)							
Type De	10	ZÍV 1	D 🗖 D	D [7]	Carlant IF		Other
I YPE: M Ko	ad Crossing Railroad Crossi	# BARRELS:	Dam Beaver MATERIAL:		Geological Form		Other: IONS: (if variable, sketch)
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	Single Double Triple Other:	Concrete Metal Other:	☐ No	ow-aligned t flow-aligned not know	Barrel dia	umeter: 18in (ft) Height: 18in (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	Failing emb		☐ Fla ☐ Sli	t ght (2° – 5°) vious (>5°)		ength: 130 (ft) Width: 150 (ft) elevation: 12 (ft)
POTENTIAL]	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culver	t repair/rep	olacement 🔲 🛚	Jpstream s	torage retrofit
По		Local stream	repair Other:	dayl	ghting		
Is SC ACTIN	G AS GRADE CONTROL	□No □Y	es 🔲 Unkno	own / C			
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVER	RITY: (circ	le #)
If yes for fish barrier	Flow too shallow Water D	rop:(in)	A structure such as a road culvert on a 3rd greater stream block upstream movement anadromous fish; no passage device pres	d order or king the t of o fish	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
NOTES/SKET	Other: Dam		5		4 (3))	2 1
	Cons	nd					

WATERSHED/SUB	es Brook	DATE: <u>6/</u>	5 108	ASSESSED BY:		
JURVEY REACH I	D: 05-08	TIME: 7	: <u> ()</u> AM/PM	Р ното ID : (Са	mera-Pic#) りょく	ma/# 1780/61802
SITE ID: (Condition	#) TR- <u>Ol</u>	LAT 41° 51	72024.12.	<u>6</u> " LMK_	GPS: (Unit ID)	
TYPE: Industrial Commercial Residential	MATERIAL: ☐ Plastic ☐ Tires ☐ Appliances ☐ Automotive	Paper Construction Yard Waste	Metal ☐ Medical	SOURCE: Unknown Flooding Lllegal dump Local outfall	LOCATION: Stream Riparian Are Lt bank Rt bank	A MONTH (III D) 1
POTENTIAL REST	ORATION CANDII	DATE Stream c	leanup 🗌 Strea	nm adoption segment	Removal/pr	evention of dumping
If yes for trash or debris removal	EQUIPMENT NEED WHO CAN DO IT:	DED: Heavy e		rash bags 🔲 Unkno Gov 🔲 Hazmat Te		DUMPSTER WITHIN 100 FT: ☐ Yes ☑ No ☐ Unknown
CLEAN-UP POTENTIAL: (Circle #)	A small amount of tra than two pickup truck I inside a park with easy	loads) located with ea	isy access. Trash r	or bulk items, in a small and may have been dumped or it could be cleaned up in mall backhoe.	ver A large amour area, where ac	nt of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials
NOTES:	5	<u> </u>	4	3	2	1
ROTES:	TRE, B	ATH TUB,	2 = 5	5 gallo	v dv	w 5
)					Reportei	D TO AUTHORITIES YES NO

DRUMS TIPE TO S

Reach Level Assessment



SURVEY REACH	1D:GB-04	WTRS	SHD/SUBSHD:	YUTS BK	DATE: 6 / 4	103 Assi	ESSED BY:	
	ie: <u>9</u> : <u>30 (</u> A)	1980	LMK:	1	16 : 10 AM/PM	LMK:		GPS ID:
LAT_°'	<u> </u>	NG <u>7.2</u>	<u>• 25 1072"</u>	LAT.	Long Z	0 0 0 1 1 5	<u> 4.7</u> 11	
DESCRIPTION:				DESCRIPTION:				
D						7		
RAIN IN LAST 24 HO	DURS Heavy Intermi		☐ Steady rain ☐ Trace '	PRESENT CONDITIONS Clear		Steady rair		
SURROUNDING LAN			Commercial	☐ Urban/Residential	☐ Trace	☐ Overcast ☐ Forested	☐ Partly ☐ Institu	
Dorace Cripines Bine			e □ Park	☐ Crop	☐ Pasture	☐ Other:	□ Institu	попаг
AVERAGE	E CONDITIONS	(check	applicable)	REACH	SKETCH AND SI	TE IMPACT TE	RACKING	
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %		□ 50%-75% · □ 75-100%		of survey reach. Tra each (OT, ER, IB,SC, deemed appropriate.	UT, TR, MI) as w	ell as any a	
DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick)		ble (2.5 –10") der (>10") rock		520 23 OW-110			
WATER CLARITY ☐ Stained (clear, n ☐ Other (chemicals,	aturally colored)			Ŷ.	Whites 7 5	almania and a second a second and a second and a second and a second and a second a		
AQUATIC PLANTS			□ some □ lots	•				
IN STREAM		none [□ some □ lots			i e e e e e e e e e e e e e e e e e e e		
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☑ Fish □ E □ Snails □ (☑ Deer					
STREAM SHADING (water surface)	☐ Mostly sha☐ Halfway (≥☐ Partially sh☐ Unshaded (≥50%) aded (≥	25%)					-ti-
CHANNEL	Downcutti	ing	Bed scour			- Markey-consump	-	JAN 1
DYNAMICS	Widening		Bank failure	₩ % :	sing (C)			
	Headcuttir Aggrading		Bank scour		wike		÷	
Unknown	Sed. depos	- 1	☐ Slope failure☐ Channelized			- /.		
	Height: LT ba	1						
CHANNEL DIMENSIONS	RT ba	_	(ft)		o contraction of the contraction	All I		
(FACING	Width: Botto	-	(ft)		- Grand	,		
DOWNSTREAM)	Тор	·-	(ft)					
R	LEACH ACCESSI	BILITY		,	/	144	1	
Good: Open area in	Fair: Forested or	Di	fficult. Must cross		0.	学がく	*	
public ownership,	developed area adjacent to stream		etland, steep slope, or ensitive areas to get to		V	ial oly 2 :		
sufficient room to stockpile materials,	Access requires tr	ree sti	ream. Few areas to	/	1	# 	, , , , , , , , , , , , , , , , , , ,	
easy stream channel access for heavy	removal or impact landscaped areas	. ar	ockpile available nd/or located a great	1 /	(1		
equipment using	Stockpile areas small or distant fro		stance from stream. pecialized heavy		46.000 n	regioner in professional and the second	4	
existing roads or trails.	stream.	ec	uipment required.		+128	*		
5 A NOTES: (biggest prob		2	(h)					
)	nem you see in Sui	i vey rea						
/		,		·				
					Drang	TED TO AUTHOR	urure [7] v	ree I No

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodpiain. Stream deeply entrenched.
	20 19 18 17 /16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
Vegetated Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<u> </u>	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 (11)	10 9 8, 7 6	5 4 3 2 1 0
	No evidence of floodplain	Minor floodplain encroachment in the	Moderate floodplain encroachment in the form of	Significant floodplain encroachment (i.e. fill material,
FLOODPLAIN ENCROACH- MENT	encroachment in the form of fill material, land development, or manmade structures	form of fill material, land development, or manmade structures, but not effecting floodplain function	filling, land development, or manmade structures, some effect on floodplain function	land development, or man-made structures). Significant effect on floodplain function 5 4 3 2 1 0

_	
	\mathbf{T}
V	1

WATERSHED/SUBSHEI	D: GAGE 5	EK	DATE: 6/4/0	6 ASSESSED BY	: DER		
SURVEY REACH ID:	-3-09 TH	ме:<u>\\</u>0_: Ам/РМ	РНОТО ID: (Camera-P	ic#) TR (3/0/#	1751		
SITE ID (Condition-#): O	T- <u>1)7</u> LA	T41051 1416"	LONG 72° 24 '59,7		GPS: (Unit ID)		
BANK:	TYPE:	MATERIAL:	SHAPE: Single	DIMENSIONS:	SUBMERGED:		
FLOW: None Trickle	Closed pipe	Concrete Me PVC/Plastic Brid	tal 🛛 Circular 🔲 Double		≥ No		
Moderate Substantial Other:	Open channel	Concrete Earth Other:	Parabolic v	Depth: (in Vidth (Top): 56 (in (Bottom): (in (in (In (In (In (In (In (In (In (In (In (I	NOT APPEICABLE		
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line	VEGGIE DENSITY: ☐ None ☐ Normal ☐ Inhibited	Brown Or			
Corrosion Other:	Sulfide Other:	Paint Other:	Excessive Other:	POOL QUALITY: Good Godors Suds Algae Other:			
FLOWING TURBID ONLY FLOATA OTHER	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation						
POTENTIAL RESTORA	TION CANDIDATE	☐ Discharge investig☐ Storm water retrofit	ation Stream daylighting Other:	Local stream repa	ir/outfall stabilization		
If yes for daylighting:				Я			
Length of vegetative cover	er from outfall:	ft Type of e	existing vegetation:	Slope	e:°		
If yes for stormwater: Is stormwater currently co Yes No Not	ontrolled?\&:	Land Use Area avai	description: Fudvstinal	(soltenaste	mansher?		
SEVERITY: stro com stre	pared to the amount of am; discharge appears ificant impact downstrea	f discharge is significant normal flow in receiving to be having a	nall discharge; flow mostly clear and c charge has a color and/or odor, the ar charge is very small compared to the w and any impact appears to be minor	mount of stream's base of causir	oes not have dry weather e; staining; or appearance g any erosion problems.		
	5	4	3	2	1		
SKETCH/NOTES:	OF STORY	ACKET PANEMENT					
<u> </u> 			1	Reported to autho	RITIES: YES NO		

WATERSHED/SUB	/ <u></u> Assessed	BY: S						
SURVEY REACH I	D: GB 4	TIME: : 55 AM/PM	PHOTO ID: (Came	era-Pic#) 🗽 (swh	/# <i>1749</i>			
SITE ID (Condition-	#): OT-<u>0</u>]	LAT41 º 51 142.	5" LONG 72 ° 25 '0	1.3_" LMK_	GPS: (Unit ID)			
BANK: LT RT He	Closed	MATERIAL: Concrete PVC/Plastic Other:	1	ouble	☐ No (in) ☐ Partially			
None Trice Moderate Substantial Other:	☐ Open channel	Concrete E	☐ Other: ☐ Trapezoid ☐ Parabolic ☐ Other:	Width (Top):	(in) (in) NOT APPAICABLE (in)			
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: A N	☐ None ☐Oily	S: VEGGIE DENSITY None Normal Inhibited Excessive Other:	Brown Other: POOL QUALIT Good Od				
FLOWING ONLY FLOTHER CONCERNS:	FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization							
If yes for daylighting Length of vegetative If yes for stormwat Is stormwater curren ☐ Yes ☒ No ☐	cover from outfall: er: tly controlled?	Land V	of existing vegetation:Use description:Use age 1	ope:°				
OUTFALL SEVERITY: (circle #)	compared to the amount stream; discharge appearing significant impact down	unt of discharge is significant nt of normal flow in receiving ears to be having a sstream.	Small discharge; flow mostly clear discharge has a color and/or odor, discharge is very small compared flow and any impact appears to be	the amount of to the stream's base minor / localized.	all does not have dry weather arge; staining; or appearance using any erosion problems.			
SKETCH/NOTES:		5 (4	3	2	1			
SKEICH/NOIES:	STEIRS VS		How grown!	e to color. J. Man Turi portivore for pould be in	√			
<u> </u>	-			REPORTED TO AUTH	HORITIES: YES NO			

WATERSHED		5		DAT	E: 🏒	14108	ASSE	SSED BY:	DRB
URVEY REA	CH ID: GR-09	TIME: 10 : 00				: (Camera-Pio	c#) D362	shon 1# 1	750
SITE ID: (Con	dition#) SC- O LAT	41. <u>51.147</u>	_3" Long Ţ	2° 2	<u>) 5 '</u>	<u>00.6"</u> LI	мк	GPS	(Unit ID)
TYPE: Roa	nd Crossing	ng 🖾 Manmade	Dam Beave	er Dan	n 🔲	Geological Forr	mation [Other:	
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	#BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		ALIG N☐ Flo☐ Not	NMENT: w-aligned : flow-aligned not know	DIMENS Barrel dia	IONS: (if vanneter: Height:	riable, sketch)(ft)(ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	ing/chipping/corrosion Downstream scornent deposition Failing embankm			∏ Flat ∏ Slig	ert slope: tht (2° – 5°) vious (>5°)	Culvert length:(ft) Width:(ft) Roadway elevation:(ft)		(ft)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re Local stream		_	air/rep	lacement 🔲 (Jpstream s	torage retro	fit
IS SC ACTING	G AS GRADE CONTROL	□No ☑Y	es 🔲 Unkn	nown					
	EXTENT OF PHYSICAL BLO	CKAGE:			Bro	CKAGE SEVER	RITY: (circ	le #)	
If yes for fish barrier	Total Partial Temporary Unknown for arrier CAUSE: Drop too high Water Drop: 32 (in) Flow too shallow Water Depth: (in)		A structure such as a dam road culvert on a 3rd orde greater stream blocking th upstream movement of anadromous fish; no fish passage device present.		er or tributary that would isola		Id isolate a of stream, e that may migration of	ate a beaver dam or a blockage at am, the very head of a stream with wery little viable fish habitat	
NOTES/SKET	Other:	- Lagrania de Lagrania	5		4	(3)		2	1
NOTES/SKETCH: S 4 (3) 2 1 WE ROUND CHANNEL ROUND (TREES SHROWS)									
) A-	The same of the sa		· · · · · · · · · · · · · · · · · · ·						
7			4			Repor	TED TO AU	THORITIES	☐ YES ☐ No

Reach Level Assessment



SURVEY REACH	ID: <u>GB-</u> IO WTR	SHD/SUBSHD:		DATE: 6 / U	'_/OZ Assi	ESSED BY:
	ie: 10 : 30/AM/PM	LMK:	l l	11 : 45 AM/PM	LMK: _	
LAT 51	$\frac{42.3}{}$ " Long $\frac{72}{}$	1024 156.9"	LAT 0 51 13	<u> </u>	<u> </u>	<u>=====================================</u>
DESCRIPTION:			DESCRIPTION:			
RAIN IN LAST 24 HO	OURS Heavy rain	☐ Steady rain	PRESENT CONDITIONS	U Hoorn min	[]/Ct1	
□ None	Intermittent	☐ Trace	☐ Clear	☐ Heavy rain☐ Trace	☐ Overcast	n ☐ Intermittent ☐ Partly cloudy
SURROUNDING LAN		☐ Commercial	☐ Urban/Residential		■ Forested	☐ Institutional
	☐ Golf cours	e 🗆 Park	□ Crop	☐ Pasture	☐ Other:	
AVERAGI	E CONDITIONS (check	applicable)		SKETCH AND SI		
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	∑ 50%-75% □ 75-1 00%	within the survey re	of survey reach. Tra each (OT, ER, IB,SC, deemed appropriate.	UT, TR, MI) as w	IDs for all site impacts vell as any additional on of Tow
DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5)	slick) ☐ Cob	oble (2.5 –10") ilder (>10") rock		1940 C		sec.
		paque (milky)			/ Ness	
AQUATIC PLANTS IN STREAM	Attached: ☐ none Floating: ☐ none					
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beaver □ Snails □ Other:		~			
STREAM SHADING (water surface)	☐ Mostly shaded (≥ ☐ Halfway (≥50%) ☐ Partially shaded (☐ Unshaded (< 25%)	(≥25%)	<1)		~	
CHANNEL DYNAMICS	☐ Downcutting ☐ Widening ☐ Headcutting ☐ Aggrading	Bed scour Bank failure Bank scour Slope failure			î	* .
Unknown	Sed. deposition	Channelized			The Complete Company	
CHANNEL	Height: LT bank	(ft)	, N.		* ***	:
DIMENSIONS (FACING	RT bank	(ft)			"Voneymonade	ł
DOWNSTREAM)	Width: Bottom				<i>)</i>	
r	Top REACH ACCESSIBILITY		<u> </u> 			3
Good: Open area in		Difficult. Must cross			.7	
public ownership,		vetland, steep slope, or sensitive areas to get to	meadabits -	and the second second		
sufficient room to stockpile materials,	Access requires tree s	stream. Few areas to	granditoris =			···
easy stream channel	removal or impact to salandscaped areas.	stockpile available and/or located a great		on the		
access for heavy equipment using	Stockpile areas c	listance from stream. Specialized heavy			L'	end)
existing roads or trails.	stream.	equipment required.			£, ' ,	7 et
	d 3 (2) olem you see in survey re	1 ach)				
)	you doe in our rey le	 /				
				Drnon	TED TO AUTHOR	PITIES T VES T NO

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional	20-40% mix of stable habitat; habitat availability less than	Less than 20% stable habitat; la
criteria based on appropriate	stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	substrate in the form of newfall, but not yet prepared for colonization (may	desirable; substrate frequently disturbed or removed.	of habitat is obvious; substrate unstable or lacking.
habitat regime)	20 19 (18) 17 16	rate at high end of scale). 15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE	More than 90% of the streambank	70-90% of the streambank surfaces		3 4 3 2 1 0
PROTECTION (score each bank, determine sides by facing downstream)	surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambar surfaces covered by vegetation, disruption of streambank vegetation is very high; vegetati has been removed to 5 centimeters or less in average stubble height.
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks of both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to proper or infrastructure.
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfu not able to enter floodplain. Stream deeply entrenched.
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	n Condition	
	Optimal	Suboptimal	Marginal	Poor
/egetated Buffer Vidth	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: li or no riparian vegetation due to human activities.
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
LOODPLAIN EGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetat type is turf or crop land
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
LOODPLAIN ABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 (18') 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
LOODPLAIN NCROACH- ENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-mad structures). Significant effect of floodplain function
	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

	1	П	Г
J	J		
l	J		L

WATERSHED/SUBSHE	D: CATES	TS 72004 .	DATE: 6 /	/08 ASSESSED BY:			
SURVEY REACH ID:	GB10 1	ГІМЕ: :AM/PN	Р НОТО ID : (Сат	era-Pic #)	765		
SITE ID (Condition-#): ()T- <i>O</i> I	LAT 41 0 51 132	L" LONG 72° 24'		GPS: (Unit ID)		
		The com					
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete PVC/Plastic Other:	SHAPE: Sin Metal Circular D Brick Elliptical To Other:	ouble	SUBMERGED: No Partially Fully		
Moderate Substantial Other:	Open channel	Concrete Ea	□ Parabolic	Depth: $\bigcirc \frac{1 \ge (in)}{15!(in)}$ Width (Top): $\frac{1 \ge (in)}{15!(in)}$	NOT APPEICABLE		
CONDITION:	ODOR: No	^è ☑ None □Oily			☐ Green No pool Colors ☐ Oils Floatables		
FLOWING ONLY FLOAT OTHER CONCERNS: Nee POTENTIAL RESTORA	ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation Needs Regular Maintenance Bank Erosion Other:						
If yes for daylighting:	on from outfalls	Δ	£:ti	CI.			
If yes for stormwater: Is stormwater currently c Yes No Not OUTFALL He	ontrolled? investigated avy discharge with a c	Land V Area a		r and odorless. If the	icis an		
(circle #) cor	npared to the amount eam; discharge appea nificant impact downst	tream.	discharge has a color and/or odor discharge is very small compared flow and any impact appears to be	to the stream's base a minor / localized.	ot have dry weather ining; or appearance erosion problems.		
Grander Al-	5	4	3	2	1		
SKETCH/NOTES:	RIP RIP	E & (Bradia)	A	STEEAN	A		
/		DIFFIELD OF	<u> </u>	REPORTED TO AUTHORITIE	ES: YES NO		

lm	pacted	Ruffor
* * * *	haorea	Dung

IB

WATERSHED/SUBSHED:			DATE: 4	14 108	ASSESSED BY:	
JRVEY REACH: 6/3-10	TIME: //	_: <u></u>	Рното ID:	(Camera-Pic	#) Canon 1# 1763	
SITE ID: (Condition-#) START LA	AT 411 ° 5/30. 4" I	LONG <u>12</u> ° 211		LMK	GPS: (Unit ID)	
IB- O LA	AT 41°51'31.7" I	LONG <u>72° 24</u>	142.Z"	LMK	_	
IMPACTED BANK: LT RT Both REASON INADEQUATE: Lack of vegetation Too narrow Widespread invasive plants Recently planted Other: CFacing downstream) LT Bank RT Bank RT Bank DOMINANT Paved Bare ground Turf/lawn Tall grass Shrub/scrub Trees Too narrow Widespread invasive plants Other: Too narrow Other Public Too narrow Too narrow Widespread invasive plants Other: Too narrow Too narrow Widespread invasive plants Too narrow T						
LAND COVER: LT Bank		-	Sand Park		□:	
RT Bank					<u> </u>	
INVASIVE PLANTS: None		Partial coverage	Extensiv	e coverage	unknown	
STREAM SHADE PROVIDED? Non	e Partial [Full WETL	ANDS PRESEN	IT? 🗌 No	Yes Unknown	
POTENTIAL RESTORATION CANDIDA no	TE	ion □Greenway d	esign Nat	ural regeneratio	n Invasives removal	
RESTORABLE AREA LT BANK RT Length (ft): 250 200 Width (ft): 504	REFORESTATION POTENTIAL: (Circle #)	Impacted area on put where the riparian are not appear to be used specific purpose; pler area available for plan	ea does publi I for any presently of purponting plant	cted area on either c or private land tha ently used for a spec ose; available area t ing adequate	at is land where road; building cific encroachment or other feature significantly limits available area for planting	
)		5	4	(3)	2 1	
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing		idespread invasive j vere animal impact:	olants ∐Po s (deer, beaver	otential contami: Other:	nation Lack of sun	
NOTES: Buffer from G				,		

1,1	SUBSHED: GOSES				E: <u>6</u>	<u>14108</u>		SSED BY:	
JURVEY REA	.cн ID: <u>GBGD</u>	TIME: 11: 7.5				: (Camera-Pic	:#) <i>[</i> *		1764
SITE ID: (Con	dition-#) SCLAT	41051:31	. <u>7</u> " Long <u>7:</u>	2 ° 5	<u> </u>	<u>42.4 " Lī</u>	мк	GPS	S (Unit ID)
TYPE: No	ad Crossing Railroad Crossin	ng	Dam 🔲 Beave	er Dai	m 🔲 (Geological Forr	nation [Other:	
FOR ROAD/ RAILROAD CROSSINGS ONLY	SHAPE: Arch Bottomless Box Elliptical Circular Other: CONDITION: (Evidence of) Cracking/chipping/corrosion	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		☐ Flo☐ Not☐ Do		Barrel dia	nmeter: Height: ength:	(ft)
	Sediment deposition Other (describe):					ght (2° – 5°) vious (>5°)	Roadway	elevation	:(ft)
POTENTIAL I	POTENTIAL RESTORATION CANDIDATE								
IS SC ACTING	G AS GRADE CONTROL	□ No □ Y	es 🔲 Unk	nown					
	EXTENT OF PHYSICAL BLOCKAGE: BLOCKAGE SEVERITY: (circle #)								
If yes for fish barrier	Total Partial Temporary Unknown CAUSE: Drop too high Water Drop: (in) Flow too shallow Water Depth: (in)		A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		ler or the	r or tributary that would is		isolate a beaver dam or a blockage a stream, the very head of a stream wi hat may very little viable fish habitat	
NOTES/SKET	Other:		5		4	3		2	1
		De	Cook up	222	5 5.				
						Repor	TED TO AU	THORITIE	s □ Yes □ No

WATERSHED/SUBS	HED: GAGES FX	DATE: 🙋	<u>um 108</u>		ASSESSED BY: DPB			
JURVEY REACH ID	: GB-10	TIME: 1 : 1	_AM/PM	Рно	го ID: (Са	amera-Pic	#) () x	on # 1763
SITE ID: (Condition-	#) UT- <u>O</u> Lat <u>'</u>	41.51.32	일다" Long <u>7</u> 2	·24	1427	' LMK:		GPS: (Unit ID)
TYPE:	MATERIAL:	LOCATION:	POTEN	TIAL F	ISH BARRI	ER:	PIPE DI	IMENSIONS:
Leaking sewer	Concrete	☐ Floodplain	☐ Yes	☐ No			Diameter	r:i <u>n</u>
Exposed pipe	Corrugated metal	Stream bank				·		exposed:ft
Exposed manhole		Above stream	n	····				
Other:	□PVC	☐ Stream botto			☐ Joint		•	corrosion/cracking
NEW CROSSING	Other:	Other:	Prote	ective co	overing brol	ken	☐ Manl	nole cover absent
M. M. A.	I I DNI AND N	(C2 LAST)	Othe:	<u>r: ()-</u>	000 p	1030 J	B 55 / S	And .
	Expression of Color None Clear Dark Brown Lt Brown Yellowish Greenish Other:							
EVIDENCE OF	EVIDENCE OF							
DISCHARGE:								14
	DELOSITS TO LIGHT	Tampons/To	met Paper L L	ime L	Surrace of	is 🔲 Stains	s ∐ Oth€	er:
POTENTIAL RESTO	PRATION CANDIDATE [7 Structural repa	irs Dina tasti	ina 🗆	Citiaan ha	tlines 🗆 F	\	
					Citizen no	umes 🔲 L	ry weathe	r sampning
M no		Fish barrier re	moval Other	:				
	Water Drop: (in)						
UTILITY IMPACT	Section of pipe undermined by		A moderately long	section o	of pipe is			I pipe, stream bank near the
SEVERITY:	collapse in the near future; a pi the bed or suspended above the		partially exposed b	out there i	is no			across the bottom of the portion of the top of the pipe
(Circle #)	section along the edge of the s		immediate threat the undermined and be					osed but is reinforced with
	the entire side of the pipe is ex		immediate future.			concrete and	d it is not cau	sing a blockage to upstream
	manhole stack that is located in stream channel and there is ev		is that the pipe ma	y be pun	ctured by	tish moveme	ent; a manhol	le stack that is at the edge of extend very far out into the
Leaking= 5	failure.	addition of class	large debris during	a large s	storm event.	active stream		exterio very fai out lifto the
	5		4	3		2		(1)
NOTES:								
	A	1						
		o expa		4				
		iii	2 4		Дев	APTEN TO I	OCAL ATT	THORITIES Yes No
		***************************************			KEP	OKIED IUL	OCAL AUI	HUKITIES L. Yes L. No

WOODS SHOW AND STORM

Stream Crossing

SC

	SUBSHED: LOW tonkuh			DA	TE: <u>6</u>	<u>15 108</u>	ASSE	ESSED BY:	6A 15, B	<u> </u>
URVEY REA	.cн ID: LTR-03	TIME: 4 : 92	DAM/PM)	PH	ото II	: (Camera-Pi	c#) 29,	30 /#	31	
SITE ID: (Con	ndition-#) SCO/_ LAT	<u>41 ° 49 '27.</u>	. <u>2 " Long]</u>	<u>L°</u>	29 !	<u>15%"</u> L	MK	GPS	(Unit ID)	
TYPE: Roa	ad Crossing	ng Manmade	Dam Beav	er Da	am 🔲	Geological For	mation [Other:		
FOR ROAD/ RAILROAD CROSSINGS	SHAPE: # BARRELS: Arch Bottomless Single Double Circular Triple Other: Other:		MATERIAL: Concrete Metal Other:		ALIGNMENT: Flow-aligned Not flow-aligned Do not know CULVERT SLOPE: Flat Slight (2° – 5°) Obvious (>5°)			IONS: (if va ameter: _ Height: _	riable, sketch) (f (f	ft) ft)
ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n Downstream scour hole Failing embankment						Width: _	(f	ft) (ft)
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re☐ Local stream			epair/rep	placement 🔲 I	Upstream s	torage retro	fit	
Is SC ACTING	G AS GRADE CONTROL	□ No □ Y	es Unk	nowr						
If yes for fish barrier	EXTENT OF PHYSICAL BLO Total Partial Temporary Unknow CAUSE: Drop too high Water D Flow too shallow Water D Other:	wn rop:(in)	A structure such road culvert on a greater stream bl upstream movem anadromous fish; passage device p	3rd or ocking ent of no fis	am or der or the	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	age on a Ild isolate a of stream, ee that may migration of	A temporary beaver dam the very hea very little via	barrier such as or a blockage a d of a stream w ble fish habitat tural barriers suc	at /ith
NOTES/SKET			(5	$)_{-}$		3		2	1	_
j						Repor	TED TO AU	THORITIES	□ Yes □ N	VO

Reach Level Assessment RCH

				<i>'</i>			
SURVEY REACH I	D: <u>172-03</u> Wi	rshd/Subshd: Low	Took, True	DATE: 615	108 Ass	SESSED BY:	n
1	e: <u>4 : 04 am/p</u> n	ì LMK:	END TIME	<u> </u>	LMK: _		GPS ID:
LAT 410 49 2	0,3" LONG 7	7 . 29 141.5"	LAT 41 0 49	127.2 " LONG 3	K 0 29 11	59 11	
DESCRIPTION: 10	3 4			obsinville DA			
1/2	ICOINITIE KON) triel	1	DINALIK , JA	Μ		
RAIN IN LAST 24 HO	UDS Heavy rain	☐ Steady rain	PRESENT CONDITION	10	□ C+ - 1		•
None	☐ Intermittent	•	☐ Clear	√S ☐ Heavy rain ☐ Trace	□ Steady ra ☑ Overcast		
SURROUNDING LAND							
SURROUNDING LANE		rse Park	☐ Urban/Residentia ☐ Crop	☐ Pasture	Forested Other:	□ Institu fighway	tional
	CONDITIONS (che	70.1.2		H SKETCH AND SI	36-2-3-2-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3	**************************************	
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% □ 75-100%	within the survey	rh of survey reach. Tro reach (OT, ER, IB,SC, es deemed appropriate	UT, TR, MI) as	well as any a	ite impacts dditional
DOMINANT SUBSTRA			THAM	NATEC CUI		7.5	
☐ Silt/clay (fine or s		obble (2.5 –10")	7.1	/		s	
☐ Sand (gritty)		oulder (>10")	Racky	· · · · · · · · · · · · · · · · · · ·			
☐ Gravel (0.1-2.5	⊔ B€	ed rock		5		11010 50	5700
WATER CLARITY [☐ Clear ☐Turbio	d (suspended matter)	1		WALKED TO ON C Uil	LIFE WA	LL .
Stained (clear, no	aturally colored)	Opaque (milky)	1	7.00	1 2 (1 685 A	+ TODS10
☐ Other (chemicals, a	tyes) Somewho	nt cloudy	1 1		<i>)</i>		`
AQUATIC PLANTS	Attached: non	e 🗆 some 🗀 lots	1 5/2				
IN STREAM	/	e □ some □ lots	1 228	Greet			
	(Evidence of)		TOM H	1 / C	y cx		
WILDLIFE IN OR AROUND STREAM	Fish Beav	er 🖾 Beer	Demain's all	in)	0		
AROUND STREAM	☐ Snails ☐ Other	r:	1.1	20 d			
	Mostly shaded	(≥75% coverage)	and the second s	2555			
STREAM SHADING (water surface)	☐ Halfway (≥50%	•	1	, i			
(water surface)	☐ Partially shaded ☐ Unshaded (< 25			2.54	TUS17	OF DAN	- 11
		, , , , , , , , , , , , , , , , , , ,	6 17	(TV136	WRUAT	<u> </u>
CHANNEL	Downcutting	Bed scour		20ft;	1	1 11	. / II
DYNAMICS	Widening	Bank failure	1.4.		11/00	ch culvert	
	☐ Headcutting☐ Aggrading	Bank scour Slope failure	444	/2		A CONTRACTOR OF THE PARTY OF TH	
Unknown	Sed. deposition		1	10 SPE	1 Toplo	into	
		7	ty //*	H MATERIAL	1 100	MATER	
CHANNEL	Height: LT bank	2. 5 (ft)	1 2	Popular		MOTER	/ []
DIMENSIONS	RT bank	<u>4.5</u> (ft)			FORLUS	WAZEIR-	
(FACING	Width: Bottom	<u>20</u> (ft)	1 to	4	*** Commence Commence of the C		
DOWNSTREAM)	Тор	25 (ft)	AUL V				
p	EACH ACCESSIBILI		2 504				
	Fair: Forested or	Difficult. Must cross	1215 4110	10 Parling			
Good: Open area in public ownership,	developed area	wetland, steep slope, or	4.0	PRINCENT BANK			
sufficient room to	adjacent to stream. Access requires tree	sensitive areas to get to	351-	ediene			
stockpile materials,	removal or impact to	stream. Few areas to stockpile available	Luchold's	BANK			
easy stream channel access for heavy	landscaped areas.	and/or located a great	7	••			
equipment using	Stockpile areas small or distant from	distance from stream. Specialized heavy	10 3	. 5			
existing roads or trails.	stream.	equipment required.	10 -504-	Wellow?		-	
5 4		2 1	Locality Too	T, Tel		· What a beautiful of a bit seeme	
NOTES: (biggest probl	lem you see in survey .	reach)	7-04 12/1.1.	ON TOWNOFE		-	
1 X DIOM NO	THE LANGE	BOSIN FOR	+ 0 1 /71/nn				
							į
				REPOR	TED TO AUTHO	nitire [] v	/EG []No

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0	
	OVER	ALL BUFFER AND FLOODPLAI	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0	
			Moderate floodplain	Significant floodplain	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures 20 19 18 17 16	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function 15 14 (13) 12 11	encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	

WATERSHED/SUBS	HED: LOWOZ TO	OK, TZIVES	DATE: 6/5/08 ASSESSED BY: 15. 27. 6A		
SURVEY REACH ID	: LTR-03 TI	ME: 4: 24AM/EM	Рното ID: (Camera-P	ic#) 27 /#	
SITE ID (Condition-#)	OT- <u>O</u> (LA	т <u>41°49'238"</u> L	ONG 72 · 29 · 3/5	' LMK GPS: (Unit ID)	
BANK: X LT	Closed	MATERIAL: Concrete Metal PVC/Plastic Brick Other:		Diameter: (in) Partially	
Moderate Substantial Other:	Open channel	Concrete Earthen	☐ Trapezoid ☐ Parabolic ₩	Fully Fully	
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS: ☐ None ☐Qily ☐ Flow Line	VEGGIE DENSITY: ☐ None ☐ Normal ☐ Inhibited	PIPE BENTHIC GROWTH: None Brown Orange Green Other:	
Corrosion Other:	Sulfide Other:	Paint Other: RUSTY	Excessive Other:	POOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables Other:	
FOR COL	.or: Clea	r 🔲 Brown 🔲 Grey	Yellow Green	Orange Red Other:	
FLOWING TUR	BIDITY: None	Slight Cloudiness	Cloudy Opaque	(oil sheen) Other:	
OTHER I	Excess Trash (paper/pla Needs Regular Mainten	stic bags)	g (bulk)	Sedimentation	
DOTTOWELL Drome	2.50.00	. H	process and the second		
no	RATION CANDIDATE	Storm water retrofit	on Stream daylighting Other: UNDMIN	Local stream repair/outfall stabilization	
If yes for daylightin	g:		70000	2,1,10	
Length of vegetative of	cover from outfall:	ft Type of exis	sting vegetation:	Slope:°	
If yes for stormwate	r:				
Is stormwater currentl		Land Use de	escription:		
Yes No		Area availab	ole:		
OUTFALL SEVERITY: (circle #)	Heavy discharge with a dist strong smell. The amount of compared to the amount of stream; discharge appears i significant impact downstream	f discharge is significant normal flow in receiving to be having a	discharge; flow mostly clear and o arge has a color and/or odor, the an arge is very small compared to the s and any impact appears to be minor	nount of discharge; staining; or appearance of causing any greater problems	
	5	4	3	2 1	
SKETCH/NOTES:	7-84 RU 70 7 Slung	nolly sous 70 ziver. silfy a Bottom.	Reventor Porange / Rus	1N) -7 PON) 17 -7 71+CK	
)			F	REPORTED TO AUTHORITIES: YES NO	

Reach Level Assessment RCH

SURVEY REACH	$\mathbf{D}: \mathbb{C}_{\mathbb{Z}} \times \mathbb{C} \setminus \mathbf{W}_1$	RSHD/SUBSHD:	4 Tal Rober	DATE: <u>6</u> / 4	108 ASSESSE	D BY:
START TIM		1 LMK:	END TIME:	3 : <u>40</u> AM/PM	LMK:	GPS ID:
LATH OHA!	<u> </u>	20261244"	LAT 41 ° 49 '3		2027 - 58.5	"
DESCRIPTION:	which to po		DESCRIPTION: Shr	cam Dalbo	1270 TWO	
D						
RAIN IN LAST 24 HO ☐ None	OURS Heavy rain Intermittent	⊠Steady rain ☐ Trace	PRESENT CONDITIONS Clear	☐ Heavy rain ☐ Trace	☐ Steady rain ☐	
_	D USE: Industria		☐ Urban/Residential			Partly cloudy
DAMES OF THE PARTY		rse Park		☐ Pasture		Institutional LAND
AVERAGI	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SIT	E IMPACT TRAC	
BASE FLOW AS %	□ 0-25%	□ 50%-75%	Simple planar sketch o	of survey reach. Trac	ck locations and IDs f	for all site impacts
CHANNEL WIDTH	□25-50 %	፟ጆ75-100%			UT, TR, MI) as well a Indicate direction of	
DOMINANT SUBSTR		111 (0.5 100)		Define	The state of the s	^
☐ Silt/clay (fine or ☐ Sand (gritty)		obble (2.5 –10") oulder (>10")			P	
Gravel (0.1-2.5	5") □ B∈	ed rock		WE TO	210	- The second second second second second second second second second second second second second second second
WATER CLARITY	☐ Clear ☐Turbic	(suspended matter)		S	V and continues	1024
☐ Stained (clear, n	aturally colored) 🔲				The Control of the Co	
☐ Other (chemicals,	dyes)			her her	60	
AQUATIC PLANTS	Attached: non	e □ some □ lots	1			:
IN STREAM	Floating: none	e □ some □ lots		1931.19	17 LA	1415C)
WILDLIFE IN OR	(Evidence of) □ Fish Beav	er 🛭 Deer	A A	~~\@'/	1	ion to
AROUND STREAM	☐ Snails ☐ Other			1665	I	ZNEZ BLD
	☐ Mostly shaded	(≥75% coverage)			1975 P	was a summer of the
STREAM SHADING (water surface)	☐ Partially shaded) (N. S. C.		and the company of th	- Daniel Communication
(☐ Unshaded (< 25	1 (<u>></u> 23 / 6)	O PO TO	724	Love de	
CHANNEL	☐ Downcutting	Bed scour	1 1 1 1 C. C. C.	7-41		FUTURE
DYNAMICS	Widening	Bank failure	12 M		pos	sigle New Rea
	Headcutting	Bank scour		1		-
Unknown	Aggrading Sed. deposition	Slope failure Channelized	, ,	mucha)	Massing	and the same same and
	*		1	11-31		\vec{l}_i
CHANNEL	Height: LT bank				and	8
DIMENSIONS (FACING	RT bank Width: Bottom	$\frac{2.75}{19}$ (ft)	25	1310	21-04	1
DOWNSTREAM)	Top	(ft)(ft)	January Commencer		OI STAN	ğı l
r	EACH ACCESSIBILIT		J. 200	*	(3)	
Good: Open area in	Fair: Forested or	Difficult. Must cross			1030	i.
public ownership,	developed area adjacent to stream.	wetland, steep slope, or sensitive areas to get to	1			V In 61
sufficient room to stockpile materials,	Access requires tree	stream. Few areas to	1.014	24	372	-515
easy stream channel	removal or impact to landscaped areas.	stockpile available and/or located a great	~188t->	-SIOW	1	Chart
access for heavy equipment using	Stockpile areas	distance from stream.	1 / . /	D \$ 65	1620	DT-05 0
existing roads or trails.	small or distant from stream.	Specialized heavy equipment required.	mucky /	<u>.</u>	a.	光点中间
5	(3) 2	i	POWIN		A -	acausa de la companya della companya della companya de la companya de la companya della companya
NOTES: (biggest prob	lem you see in survey .	reach)				

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 (14) 13 12 11 ALL BUFFER AND FLOODPLAI	10 9 8 7 6	5 4 3 2 1 0	
	Optimal	 			
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0	
FLOODPLAIN VEGETATION	Right Bank 10 9 Predominant floodplain vegetation type is mature forest	8 (7) 6 Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field Vegland	2 I 0 Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
Į.	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6		

_		
		Г
•	ï	
		L

WATERSHED/SUBSHED:			DATE:/_	DATE: 6 / 4 / 0% ASSESSED BY:		
SURVEY REACH ID: NO - O TIME: 2 : 30 AM/PM		Рното ID: (С	Рното ID: (Camera-Pic #) /# 24			
SITE ID (Condition-#): OT - <i>[]]</i>	LAT41 0 49 136	L"LONG TO LY	1 [] 11	LMK	GPS: (Unit ID)
BANK: LT RT Hea FLOW: None Trick	Closed nine	MATERIAL: Concrete PVC/Plastic Other:	Metal Circular [1 Double	IMENSIONS:	SUBMERGED: No Partially Fully
Moderate Substantial Other:	Open channel	Concrete E	Earthen Trapezoid Parabolic Other:		(in) (Top): (in) ttom): (in)	NOT APPAICABLE
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: ☐ 1 ☐ Gas ☐ Sewage ☐ Rancid/So ☐ Sulfide ☐ Other:	☐ None ☐Oily	VEGGIE DENS None Normal Inhibited Excessive Other:	Po	PE BENTHIC GRO Brown	ge
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING ONLY FLOATABLES: None Slight Cloudiness Cloudy Opaque OTHER CONCERNS: Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation OTHER Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization						
no	, 	Storm water retr		siming LC	cai su cam repair/	outrail stabilization
If yes for daylightin	g:					
Length of vegetative of	cover from outfall:	ft Type	of existing vegetation:	701100	Slope:	0
If yes for stormwate	r:					
Is stormwater currentl		Land	Use description:			
☐ Yes ☐ No ☐ N	Not investigated		available:	-747		
SEVERITY: (circle #)	strong smell. The amor		Small discharge; flow mostly of discharge has a color and/or or discharge is very small compar flow and any impact appears to	dor, the amount of red to the stream's	discharge; s	not have dry weather staining; or appearance iny erosion problems.
		5 4	4 3		2	1
SKETCH/NOTES:				Repor	TED TO AUTHORIS	CIES: YES NO
,				ACEI OR	TED TO AUTHURIT	IES. LI IES LI NO

		•
\ \	<i>'</i>	

	ED:	2257	DATE:/ ASSESSED BY:			
SURVEY REACH ID:	MAR-DI TI	me: <u> </u>	Рното ID: (Camera-Pic #) 30 /#			
SITE ID (Condition-#):	OT- <u>02-</u> LA	т <u>41 ° 44 '36,2 "</u> I	ONG 72 ° 26 ' 12.\ '	The state of the s	GPS: (Unit ID)	
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other:		DIMENSIONS: Diameter: (in	SUBMERGED: No Partially Fully	
Moderate Substantial Other:	Open channel	Concrete Earthen Other:	☐ Trapezoid Di	epth: (in) (idth (Top): (in) (Bottom): 5 (in)	NOT APPECABLE	
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GR Brown Ora Other: POOL QUALITY: Good Odors Suds Algae Other:	nge	
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other; FLOWING ONLY FLOATABLES: None Swage (toilet paper, etc.) Petroleum (oil sheen) OTHER CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization Storm water retrofit Other:						
If yes for daylighting: Length of vegetative cov If yes for stormwater:		ft Type of exis	sting vegetation:	Slope:	•	
Is stormwater currently o ☐ Yes ☐ No ☐ Not			escription:		_	
OUTFALL He SEVERITY: coi (circle #) str	avy discharge with a disti ong smell. The amount of mpared to the amount of eam; discharge appears t nificant impact downstrea	discharge is significant normal flow in receiving to be having a limit and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow and discharge in the flow in the flow in the flow and discharge in the flow a	discharge; flow mostly clear and od irge has a color and/or odor, the am irge is very small compared to the st nd any impact appears to be minor /	ount of discharge; of causing	es not have dry weather staining; or appearance any erosion problems.	
SKETCH/NOTES:	5	4	3	2	1	
SKETCH/NOTES;			R	EPORTED TO AUTHOR	ITIES: Tyes Tha	

OT

SITE DI Contition	WATERSHED/SUBSHED:			DATE://	DATE:/ / ASSESSED BY:		
STEED (Condition-W) OT LAT O MORE NONE Single DIMENSIONS: SUBMERCED:	SURVEY REACH ID: MO ON TIME: 3:00 AM/PM			PHOTO ID: (Camera-Pi	c#) 3 /#		
Closed	SITE ID (Condition-#):	от- <u>///</u> і	AT 49 . 369.	LONG 120 28 'B.2"		GPS: (Unit ID)	
Substantial Open	FLOW: None Trickle	Closed	Concrete Me	tal Circular Double ck Elliptical Triple		No Partially	
None Chip/Cracked Sewage Chip/Cracked Sewage Chip/Cracked Sewage Chip/Cracked Sewage Colors Corrosion Corrosion Corrosion Cother: Cother: Chip/Cracked Sewage Colors Cother: Cot	Substantial			Parabolic W	'idth (Top): (in)		
Turnibity: None Slight Cloudiness Cloudy Opaque	☐ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion	☐Gas ☐ Sewage ☐Rancid/Sour ☐ Sulfide	☐ None ☐ Oily ☐ Flow Line ☐ Paint	☐ None ☐ Normal ☐ Inhibited ☐ Excessive	Brown Ora Other: POOL QUALITY: Good Odors Suds Algae	nge	
If yes for daylighting: Length of vegetative cover from outfall:	FLOWING ONLY None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation						
Length of vegetative cover from outfall:	no				Local stream repair	r/outfall stabilization	
Is stormwater currently controlled? Yes No Not investigated Area available: OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Small discharge; flow mostly clear and odorless. If the discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	1		ft Type of e	existing vegetation:	Slope:		
SEVERITY: (circle #) strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. SKETCH/NOTES: strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. SKETCH/NOTES: SIMIL discharge; 1tow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems. SKETCH/NOTES: Outfall does not have dry weather discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.	Is stormwater currently	controlled?		•		-	
SKETCH/NOTES:	SEVERITY: ccircle #)	rong smell. The amount ompared to the amount ream; discharge appear gnificant impact downst	of discharge is significant dis of normal flow in receiving a dis	charge has a color and/or odor, the am charge is very small compared to the s	ount of discharge	; staining; or appearance	
J. b. region	SVETCH/NOTES.	5	4	3	2	1	
	T 6 1 Con						

	1	
•		ı
ľ	J	L

WATERSHED/SUB	SHED: Migole Ton	Keyhousen RIVER	DATE: 6/4/0	ASSESSED BY:	75.64	
SURVEY REACH I		ME::AM/PM	Рното ID: (Camera-P.			
SITE ID (Condition-	#): OT - <u>04</u> LA	AT <u>41 ° 49 '38. "</u> L	ONG 1/ °27. 1577	" LMK	GPS: (Unit ID)	
BANK: LT RT He FLOW: None Trice	Closed	MATERIAL: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS: Diameter: 2 (in	SUBMERGED: No Partially Fully	
Moderate Substantial Other:	Open channel	Concrete Earthen Other:	Parabolic W	Depth: (in) Vidth (Top): (in) " (Bottom): (in)	NOT APPESCABLE	
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GR Brown Orar Other: POOL QUALITY: Good Odors Suds Algae Other:	ge Green No pool Colors Oils	
FLOWING TU FLO ONLY CONCERNS:	ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other: ASS PIPE From YORD OTHER POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization					
If yes for daylighting Length of vegetative	_	ft Type of exis	ting vegetation:	Slope:		
If yes for stormwat Is stormwater current ☐ Yes ☐ No ☐	ly controlled?	Land Use de Area availabi	*			
OUTFALL SEVERITY: (circle #)	Heavy discharge with a dist strong smell. The amount of compared to the amount of stream; discharge appears significant impact downstrea	f discharge is significant normal flow in receiving to be having a	lischarge; flow mostly clear and or ge has a color and/or odor, the arr ge is very small compared to the s d any impact appears to be minor	nount of discharge;	s not have dry weather staining; or appearance any erosion problems.	
	5	4	3	2	1	
SKETCH/NOTES:			מ	REPORTED TO AUTHORI	THE TYPE THE	

Trash and Debris

TR

	MODE			,			
WATERSHED/SUI	BSHED: TANKENHOO	osen River	DATE: 6 / 6	1 108	ASSESSED BY: 15, 10, 31, 6,		
JURVEY REACH	D: MTR-01	TIME: <u>2</u> : <u>50</u> AM/PM	РНОТО ID: (С	amera-Pic #) 🛛 💯	/#		
SITE ID: (Condition	1-#) TR- <u>() </u> Lat <u> </u>	11 ° 49 ' 36.0" LON	16 72° 28 ' 22	.6" LMK_	GPS: (Unit ID)		
TYPE: Industrial Commercial Residential		onstruction	SOURCE: Unknown Flooding Ullegal dump Local outfall	LOCATION: Stream Riparian Ai	AMOUNT (# Pickup truck		
POTENTIAL REST	TORATION CANDIDATE	☐ Stream cleanup ☐ Stre ☐ Other:	eam adoption segmen	it Removal/p	revention of dumping		
If yes for trash or debris removal	EQUIPMENT NEEDED: WHO CAN DO IT: 7	Heavy equipment U			DUMPSTER WITHIN 100 FT: Yes No Unknown		
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe. A large amount of trash or debris scattered over a large amount of trash or indications of hazardous materials.						
Norma	5 /	4	3	2	1		
NOTES:	BIVE PIO LABETE	STIC 55 S	COLD PR	REL DE	EUM DROPE D TO AUTHORITIES YES NO		
	DO NUT	KNOW IF	BOZZER	is sent	LO OR OPEN		
		A A -		REPORTE	D TO AUTHORITIES TYPES X NO.		

Trash and Debris



WATERSHED/SUI	BSHED: MiDDLE TON	erhoosed TRN.	DATE: <u>6 / 4</u>	106	ASSESSED BY: 35,6AJK		
SURVEY REACH ID: MTR - O TIME: 2:36 AM/PM PHOTO ID: (Camera-Pic					# 26, 29		
SITE ID: (Condition	1#) TR- <u>02</u> LAT 4	• 44 ' 363 " LONG	372 · 24 · 15.4	_'' LMK	GPS: (Unit ID)		
TYPE: Industrial Commercial Residential	☐ Appliances ☐ Yar	estruction Medical d Waste	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION: Stream Riparian Are Lt bank Rt bank	a LAND OWNERSHIP: □ Public □ Unknown □ Private AMOUNT (# Pickup truck loads): 2 6 5		
POTENTIAL RESTORATION CANDIDATE Stream cleanup Stream adoption segment Removal/prevention of dumping no Other:							
If yes for trash or debris removal	EQUIPMENT NEEDED: Heavy equipment Trash bags Unknown WHO CAN DO IT: Volunteers Local Gov Hazmat Team Other Trash bags Unknown DUMPSTER WITHIN 100 FT: Yes No Unknown						
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., le than two pickup truck loads) locat inside a park with easy access		nay have been dumped ove it could be cleaned up in	er A large amount area, where acc	of trash or debris scattered over a large sess is very difficult. Or presence of drums hazardous materials		
NOTES: WE WERE TOWN BY NEIGHBORS OF SITE THAT VECAND DPW CAME OUT TO BEMOVE BLONGE DAWN. DEEPIS WOS PILLD							
ON EITHER SIDE OF STREAM Channel. Debits ON resident to Side was removed by Hone owners. Debits on FOR							
	Side was	Leit,	`		TO AUTHORITIES YES NO		



WATERSHED/SUB	SHED: MISSIE T	ankerhoosen RIVUT	DATE: 61 4	108	ASSESSED BY: 5 GA		
JURVEY REACH I	JURVEY REACH ID: MTL-O TIME: 3:10 AM/PM PHOTO ID: (Camera-Pic #) /#						
SITE ID: (Condition-#) TR- D'5 LAT 41 ° 49 ' 380 "LONG 72 ° 28 ' 1008 " LMK GPS: (Unit ID)							
TYPE: Industrial Commercial Residential	☐ Tires ☐ Appliances ☐ Automotive ☐	Paper Metal Construction Medical Yard Waste Five a allow Other: SUKAS, COSES	Unknown Flooding Illegal dump Local outfall	LOCATION: Stream Riparian Are Lt bank	AMOUNT (# Pickup truck loads): 2 0 5		
POTENTIAL REST	POTENTIAL RESTORATION CANDIDATE Stream cleanup Stream adoption segment Removal/prevention of dumping						
					DUMPSTER WITHIN 100 FT: Yes No Unknown		
CLEAN-UP POTENTIAL: (Circle #)	POTENTIAL: / than two pickup truck loads) located inside a park with easy access. It as if may have been dumped over a long period of time but it could be cleaned up in a lon						
	(5)	4	3	2	1		
NOTES: PRE NOT SURE WHAT THE BUCKETS CONTIAIN They ARE CNORED AND SUNK INTO THE RUCE BOTTOM							
1.	~ 16 Bucke75 70702 MAYBE MORES REPORTED TO AUTHORITIES YES \$\\\ \Delta\text{NO}						

Reach Level Assessment



SURVEY REACH I	10: M/2-01	WTRSHD/SUBSHD: Mind	Tonk, Reserviz	DATE: 6/4	108	ASSESSED BY:	<u></u>
START TIM	e: 3 : 45 AM		END TIME: 4	1: 12 AM/PM) LMF		GPS ID:
LAT41 0 49	37.4" LON	G72°27'565"	LAT 4/0 49 '3	74" LONG 7	2027	150.9"	
DESCRIPTION: 57	REAM DN	DED IN TWO	DESCRIPTION: JUN	wel ROAD CO	VUC	7	
RAIN IN LAST 24 HO			PRESENT CONDITIONS	☐ Heavy rain	☐ Stead	y rain Intern	nittent
□ None	☐ Intermit	• •	☐ Clear	☐ Trace	Over		
SURROUNDING LAN		strial Commercial course Park	,	☑ Suburban/Res □ Pasture	☐ Forest	ed Institu : Hryhway / Te	
AVERAGE	CONDITIONS	(check applicable)	REACH S	KETCH AND SIT	Е Імрас	T TRACKING	Ų.
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% ☑ 75-100%	Simple planar sketch o within the survey rea features d		UT, TR, MI) as well as any a	
DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick) [☐ Cobble (2.5 –10") ☐ Boulder (>10") ☐ Bed rock					
	aturally colored)	urbid (suspended matter) Opaque (milky)					
AQUATIC PLANTS IN STREAM	/	none □ some □ lots					
INSTREAM		none 🗆 some 🗀 lots					
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☐ Fish ☐ E ☐ Snails ☐ C	Beaver 'Deer Other:					
STREAM SHADING (water surface)	☐ Mostly shad ☑ Halfway (≥ ☐ Partially sh ☐ Unshaded (aded (≥25%)	Jonnel June	Road OT Pho	-\		
CHANNEL	Downcutti	ng Bed scour	The second secon	PAO	, •		
DYNAMICS	Widening	Bank failure	1	1			
Unknown	Headcuttir Aggrading Sed. depos	Slope failure	Low			10	
	Height: LT ba	ank <u>3</u> (ft)		M & Walley		£	
CHANNEL DIMENSIONS	RT ba	_		gjerdelle ver		8	
(FACING	Width: Botto	, ,		- Actions	\$ 1		
DOWNSTREAM)	Тор	20 (ft)	/	/ <i>i</i>	G &		
	REACH ACCESSI				S S		
Good: Open area in	Fair: Forested or	Difficult. Must cross	1 /	1 0 %			
public ownership,	developed area adjacent to stream	wetland, steep slope, or sensitive areas to get to		1		~	
sufficient room to stockpile materials,	Access requires tr	ree stream. Few areas to		7 5		1.	
easy stream channel	removal or impact landscaped areas			A			
access for heavy equipment using	Stockpile areas	distance from stream.	***************************************	*Communication of the Communication of the Communic			
existing roads or trails.	small or distant fro stream.	om Specialized heavy equipment required.	\ \	No. o street			
	4 (3)	2 1		photo			
NOTES: (biggest pro	blem you see in su	rvey reach)		4			
<u>~</u>							
							./
				REPOR	TED TO AU	THORITIES [YES X NO

	Optimal	Suboptimal	Marginal	Poor
ABITAT May modify riteria based n appropriate	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
abitat regime)	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
PROTECTION	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
-	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
,	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
		RALL BUFFER AND FLOODPLA	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 (3)	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetatio type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
		1	Moderate floodplain	Significant floodplain encroachment (i.e. fill material,
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures but not effecting floodplain function 15 14 13 12 11	encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function 10 9 8 7 6	land development, or man-made structures). Significant effect on floodplain function 5 4 3 2 1 0



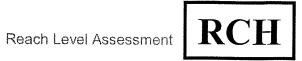
_			
	1	П	Г
•	•		l
•	•		L

WATERSHED/SUBSH	IED: Middle To	ank	DATE: 6/4/09	ASSESSED BY: Friends				
SURVEY REACH ID: MTY2 02 TIME: 4:19 AM/FM			Рното ID: (Camera-Pi	PHOTO ID: (Camera-Pic#) /#				
SITE ID (Condition-#):			LONG 72 ° 27 '50.9 '					
BANK: Head	Closed	MATERIAL: Concrete Meta PVC/Plastic Brick		DIMENSIONS: SUBMERGED: No Diameter: (in) Partially				
▼ None ☐ Trickl☐ Moderate☐ Substantial	e pipe	Other:		Fully				
Other:	channel	Other:	☐ Parabolic W	Tidth (Top): (in) NOT APDELCABLE (Bottom): (in)				
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line	VEGGIE DENSITY: ✓ None ☐ Normal ☐ Inhibited	PIPE BENTHIC GROWTH: None Brown Orange Green Other:				
Corrosion Other:	Sulfide Other:	☐ Paint ☐Other:	Excessive Other:	POOL QUALITY: ☑ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:				
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:								
POTENTIAL RESTOR	ATION CANDIDATE	Discharge investigati	on Stream daylighting [Local stream repair/outfall stabilization				
If yes for daylighting Length of vegetative co			sting vegetation:	Slope:°				
If yes for stormwater Is stormwater currently ☐ Yes ☐ No ☐ No	controlled?	Land Use d Area availal	-					
SEVERITY: S C C S	leavy discharge with a disti trong smell. The amount of ompared to the amount of i tream; discharge appears t ignificant impact downstrea	discharge is significant discharge in the common of the co	discharge; flow mostly clear and or arge has a color and/or odor, the am arge is very small compared to the s and any impact appears to be minor	ount of discharge; staining; or appearance				
	5	4	3	2 1				
SKETCH/NOTES:								
			R	EPORTED TO AUTHORITIES: YES NO				

Stream Crossing

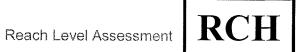


WATERSHED/SUBSHED: Middle Tank				DATE: <u>6</u>	14108	ASSE	essed by: Friunds
URVEY REACH ID: MTR Od TIME: 4:19 AM/PM PHOTO ID: (Camera-Pic #) /#							
SITE ID: (Condition-#) SC-Ol LAT 41 ° 49 '37.4" LONG 72 ° 27 '50.9" LMK GPS (Unit ID)							
TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other:							
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	#BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:	ALIG □ Flo	NMENT: ow-aligned ot flow-aligned o not know	DIMENS Barrel dia	IONS: (if variable, sketch)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n		∏ Fla ☐ Sli	/ERT SLOPE: at ight (2° – 5°) ovious (>5°)		ength: (ft) Width: $L = 13$ (ft) $R = 13$ elevation: (ft)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re		•	placement 🔲 🕻	Jpstream s	torage retrofit
IS SC ACTING	G AS GRADE CONTROL	No DY	es Unk				
EXTENT OF PHYSICAL BLOCKAGE: Total Partial Temporary Unknown If yes for fish barrier CAUSE: Drop too high Water Drop: (in) Flow too shallow Water Depth: (in) Other:		A structure such a road culvert on a greater stream blupstream movem anadromous fish; passage device p	as a dam or 3rd order or ocking the ent of no fish resent.	er or tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
NOTES/SKET			5		4 3		2 1



SURVEY REACH	10: <u>MTZ-07</u> w	trshd/Subshd: μ_0	ole Tank Riv.	DATE: <u>6</u> /5	108 Assi	ESSED BY:
START TIM	IE: 12 : 45 AM/R		END TIME:_	1:45_AM/PM)	LMK:_	GPS ID:
LAT 4 0 49 19	<u> </u>	2 · 27 · 514"	LAT 410 49 1	KGY" LONG	Z·27 ·29	(. K"
DESCRIPTION:	moel Ronz	s Culveret	DESCRIPTION:	levent of 1	enkt Cla	ork stax
D				<u> </u>		
RAIN IN LAST 24 HO None	OURS ☐ Heavy rain☐ Intermitten	•	PRESENT CONDITIONS Clear	☐ Heavy rain ☐ Trace	☐ Steady rain ☐ Overcast	n □ Intermittent
SURROUNDING LAN			☐ Urban/Residential		Forested	☐ Partly cloudy ☐ Institutional
		ırse 🗆 Park	☐ Crop	☐ Pasture	Other:	institutional
AVERAGI	E CONDITIONS (che	eck applicable)	REACH	SKETCH AND SI	TE IMPACT TI	RACKING
BASE FLOW AS %	□ 0-25% □25-50 %	□ 50%-75%	Simple planar sketch within the survey re	of survey reach. Tra	ck locations and	IDs for all site impacts vell as any additional
CHANNEL WIDTH		□ ₹75-100%	features	deemed appropriate	Indicate direction	on of flow
DOMINANT SUBSTR ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick) \square B	cobble (2.5 –10") coulder (>10") ed rock	/		•	
WATER CLARITY ☐ Stained (clear, n ☐ Other (chemicals,	aturally colored) 🔲			greater		
AQUATIC PLANTS IN STREAM	· · · · · · · · · · · · · · · · · · ·	ne □ some □ lots e □ some □ lots	tree makes	5000		
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☑ Fish ☑ Beav ☐ Snails ☑ Othe	ver Deer r: 10000 Al Son (Si (S)	(5) 15 R	2.		
STREAM SHADING (water surface)	Mostly shaded ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 2:	%) d (≥25%)			1 1/2	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
CHANNEL DYNAMICS	Downcutting Widening Headcutting	Bed scour Bank failure Bank scour	S COMM		1. Bo	JQ //pr/x
Unknown	☐ Aggrading☐ Sed. depositio	Slope failure Channelized	the county			14 st
CHANNEL	Height: LT bank	$\frac{-7.5}{2}$ (ft)	£1487	· *)	z/58	7 3.54
DIMENSIONS (FACING	RT bank	<u>3,5</u> (ft)		V.W	Total Annual Control of the Control	, 3
DOWNSTREAM)	Width: Bottom	13.5 (ft)	The second secon	8,		
10	Top	<u>/</u>		\	d	7 24
	REACH ACCESSIBILI Fair: Forested or	TY Difficult. Must cross	\ m		1	C. C. C.
Good: Open area in public ownership,	developed area	wetland, steep slope, or			The state of the s	Pr /
sufficient room to	adjacent to stream. Access requires tree	sensitive areas to get to stream. Few areas to	1.19	/	and one of the contract of the	~
stockpile materials, easy stream channel	removal or impact to	stockpile available		1	1	=19-7
access for heavy	landscaped areas. Stockpile areas	and/or located a great distance from stream.	12/10	· / })	• •
equipment using existing roads or trails.	small or distant from	Specialized heavy	(1.5	export	Ì	\
(5) 4	stream.	equipment required. 2 1	H-A-A-		A -	A
NOTES: (biggest prob	lem you see in survey	reach)	TURNEL RUAD	DINGE		
)			Tunnel RUAS CUIVER	1		
						_ \
	MARCHALL III.			Repor	FED TO AUTHOR	RITIES YES NO

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lact of habitat is obvious; substrate unstable or lacking.	
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6 .	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 (18)17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	OVER	ALL BUFFER AND FLOODPLAI	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank (10) 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	



SURVEY REACH II): MTD-06 WI	rshd/Subshd: Mio	de Tank. R.	DATE: <u>6/5</u>	ASSESSED BY:
START TIME:	:: <u>49</u> _am/pm	1 LMK:	END TIME:	2:52 AM/PM	LMK: _i GPS ID:
LAT 41 0 49 198		1.07 .38.56.	LAT 41 0 49 1		10° 26 15t 1"
DESCRIPTION: CON	erconce of Clip	CKPOOK+ TANK	DESCRIPTION:	Muerof of Tor	K/Reilrows Book
RAIN IN LAST 24 HOU	DS [] Heavy rain	☐ Steady rain	PRESENT CONDITIONS	U	Пс1 .: Пт
None	☐ Intermittent	•	☐ Clear	☐ Heavy rain 【 Trace	☐ Steady rain ☐ Intermittent ☐ Overcast ☐ Partly cloudy
SURROUNDING LAND				☐ Suburban/Res	Forested Institutional
	□ Golf cou	rse □ Park	☐ Crop	☐ Pasture	Other: OD File D
	CONDITIONS (che				TE IMPACT TRACKING
	□ 0-25% □25-50 %	□ 50%-75% ⊠ 75-100%	within the survey re	ach (OT, ER, IB,SC,	ick locations and IDs for all site impacts UT, TR, MI) as well as any additional Indicate direction of flow
DOMINANT SUBSTRAT		111 (0.5 100)		,	
☐ Silt/clay (fine or sl☐ Sand (gritty)		obble (2.5 –10") oulder (>10")		Trackerhoused	
A.Gravel (0.1-2.5")) □ B€	ed rock			
WATER CLARITY	Clear □Turbio	d (suspended matter)			1 100
☐ Stained (clear, nat	urally colored)				Colores Colores
Other (chemicals, dy	·		-		- 2018
12401110 2 20111110	. /	e □ some □ lots e □ some □ lots			Tom
***************************************	(Eyidence of)	some intois	# 		
A DOUND STDEAM	K Fish □ Beav	er Deer ::Sonlaross Raccon			
i .	Mostly shaded	· · · · · · · · · · · · · · · · · · ·			
STREAM SHADING	□ Halfway (≥50%	o)		4	119
	□ Partially shaded □ Unshaded (< 25)		C/Q/	1	
CHANNEL	Downcutting	☐ Bed scour	1 /	1 / 300°	·
DYNAMICS	Widening	Bank failure	Confluence 2		
	Headcutting Aggrading	Bank scour Slope failure	Confluence of Clark Grook much sooner &	Hoffens	
Unknown	Sed. deposition				`
_	Height: LT bank		15 reports	dow no	- 10 ft
CHANNEL DIMENSIONS	RT bank	3.0 (ft)			
(FACING DOWNSTREAM)	Width: Bottom	1687 (ft)		1	
DOWNSTREAM)	Тор	1886 (ft)		The same of the sa	
	ACH ACCESSIBILIT			J-	
	air: Forested or leveloped area	Difficult. Must cross wetland, steep slope, or			
sufficient room to	adjacent to stream. Access requires tree	sensitive areas to get to stream. Few areas to			
easy stream channel	emoval or impact to	stockpile available		. /	
access for fleavy	andscaped areas. Stockpile areas	and/or located a great distance from stream.			15 th
existing roads or trails	mall or distant from tream.	Specialized heavy equipment required.			
5 4	(3) 2	. 1		1	1
NOTES: (biggest proble	m you see in survey i	reacn)			
(
				Repor'	TED TO AUTHORITIES TYES NO

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.	
наонин тедіте)	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank (10) 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0	
- visus	Right Bank (10) 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
Vegetated Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 (19)18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

Reach Level Assessment RCH

SURVEY REACH ID: MIR-9 WTRSHD/SUBSHD: Min	TANKUMUSEN R DATE: 614/5108 ASSESSED BY: JY, IS, GA, TET
START TIME: 5:65 AM/RM LMK:	END TIME: 12 AM/PM LMK: GPS ID:
LAT410 49 374" LONG 710 27195"	LAT41 ° 49 '22.6" LONG 72 ° 27 '43.6"
DESCRIPTION: STREAM DNIDE TRIMBIONO	DESCRIPTION: TUNNEL Rd Stream Crossing
	7,410,404
RAIN IN LAST 24 HOURS Heavy rain Steady rain Trace	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent
	☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy
SURROUNDING LAND USE: Golf course Golf course Park	☐ Urban/Residential Suburban/Res ☐ Forested ☐ Institutional ☐ Crop ☐ Pasture ☐ Other: ₩₩₩₩₩
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
Base Flow as % □ 0-25% □ 50%-75%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts
CHANNEL WIDTH ☐25-50 % ☐ 75-100%	within the survey reach (OT, ER, IB,SC, UT, TR, MI) is well as any additional features deemed appropriate. Indicate affection of flow
DOMINANT SUBSTRATE ☐ Silt/clay (fine or slick) ☐ Cobble (2.5 –10")	402 MACCON AM
Sand (gritty) ☐ Boulder (>10")	07-09 07-046
Gravel (0.1-2.5") 🗆 Bed rock	DT-06 SC-04
WATER CLARITY	(Com
☐ Stained (clear, naturally colored) ☐ Opaque (milky) ☐ Other (chemicals, dyes)	CALLED SON TO
	13 8 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
AQUATIC PLANTS Attached: none some lots IN STREAM Floating: none some lots	
(Fyidence of)	Jones / Lans
WILDLIFE IN OR	I went
Shalls & Other: (C)ccoor	
☐ Mostly shaded (≥75% coverage) STREAM SHADING ☐ Halfway (≥50%)	Sough
(water surface) ☐ Partially shaded (≥25%)	55-1
☐ Unshaded (< 25%)	400
CHANNEL Downcutting Bed scour	1 OT- 7 Tr-04
DYNAMICS Widening Bank failure Headcutting Bank scour	trus @ 1275 0 2000
Unknown Aggrading Slope failure	
Sed. deposition Channelized	1 to 2-2
CHANNEL Height: LT bank (ft)	1 Fac 12-2
DIMENSIONS RT bank (ft)	203
(FACING DOWNSTREAM) Width: Bottom (ft)	evaluation of the second of th
Top(ft)	Et I Copins
REACH ACCESSIBILITY	TR-1 100 XC LOV
Good: Open area in developed area Fair: Forested or developed area Difficult. Must cross wetland, steep slope, or	Jan Jan
sufficient room to adjacent to stream. sensitive areas to get to	a 3r for our le
easy stream channel removal or impact to stockpile available	07-1 J. B. B. J. Cov. C. C.
access for heavy Iandscaped areas. and/or located a great	
equipment using existing roads or trails. Stockpile aleas small or distant from stream. Specialized heavy equipment required.	J07-10
5 (4) 3 2 1	A programme of A
NOTES: (biggest problem you see in survey reach)	A
)	
	. 1
	REPORTED TO AUTHORITIES YES NO

	Optimal	Suboptimal	Marginal	Poor	
(May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 (13)12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambant surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0	
	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0	
	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	CONTROL OF THE CONTROL OF STREET AND STREET	ALL BUFFER AND FLOODPLAI			
	Optimal	Suboptimal	Marginal	Poor	
Vegetated Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 (13)/12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16				

WATERSHED/SUBSHE	D: Misole	Tank River	I	DATE: <u>6/5/</u>	28 Asses	SSED BY:	15, Jr. GOD)
SURVEY REACH ID:	WTIZ-09 TI	me: <u>10:05</u> am/pm	I	Рното ID: (Camera-I		/#	
SITE ID (Condition-#): ()T- <u>//</u> La	т <u>41° 49 · 27</u> 2	ီ" Lon	G72.27:54.0	" LMK		GPS: (Unit ID)
BANK:	TYPE:		Metal [SHAPE: Single Circular Doubl			SUBMERGED:
FLOW: None Trickle Moderate	Closed	PVC/Plastic I		☐ Elliptical ☐ Triple☐ Other:	•••••	: <u> 1,5 (ir</u>	Partially Fully
Substantial Other:	Open channel	Concrete Ea	rthen	¬ ~	Depth: Width (Top):_ " (Bottom):_		NOT APPEICABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS None Oily Flow Line	/£	VEGGIE DENSITY: None Normal Inhibited	☐ Brown ☐ Other:	☐ Orai	OWTH: None
Corrosion Other:	Sulfide Other:	Paint Other:		Excessive Other:	☐ Good	□Odors	☐ No pool ☐ Colors ☐ Oils ☐ Floatables
700							
FOR COLOR FLOWING TURBIN ONLY FLOAT.	OITY: None	Slight Cloudine	ss 🔲	Cloudy Dpaque	Orange ()		Other:
1	ess Trash (paper/pla ds Regular Mainten	astic bags) 🔲 Du	imping (b	oulk)	e Sedimentation		
POTENTIAL RESTORA	TION CANDIDATE	Discharge inves		Stream daylighting Other:	Local stre	eam repair	outfall stabilization
If yes for daylighting:							
Length of vegetative cov	er from outfall:	ft Type o	of existing	g vegetation:		Slope:	0
If yes for stormwater:							
Is stormwater currently c		Land U	Jse descri	ption:			
Yes No Not			vailable:			· · · · · · · · · · · · · · · · · · ·	
SEVERITY: strc cor stre	avy discharge with a dist ong smell. The amount o npared to the amount of eam; discharge appears nificant impact downstre	f discharge is significant normal flow in receiving to be having a	discharge h	narge; flow mostly clear and nas a color and/or odor, the a s very small compared to the ny impact appears to be mino	mount of stream's base	discharge;	es not have dry weather staining; or appearance any erosion problems.
	5	(4)	3		2	1
SKETCH/NOTES:	ic pipe a	may from	Desig	sencé/privew pose.	y on		
Wa	then AP						
		Is this	~		1		
		Silty Di	15(4)	nge/3/0W	V		л /
)					REPORTED TO	AUTHORI	TIES: YES NO

	П
\	
	 L.

WATERSHED/SUBSH	WATERSHED/SUBSHED: Middle Tank			DATE: 614106 ASSESSED BY: FRANCES		
SURVEY REACH ID:	MTR 09 TI	ME: <u>5</u> : 15 AM/PM	РНОТО ID: (Сатега-Рі	ic#) /# 45		
SITE ID (Condition-#):	OT- <u>O</u> LA	т <u>Ч1°49 '35.7</u> "L	ONG 72°27 154.81		PS: (Unit ID)	
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS: Diameter: (in)	SUBMERGED: No □ Partially □ Fully	
Moderate Substantial Other:	Open channel	☐ Concrete ☐ Earthen ☐ Other:	Parabolic W	Pepth: (in) Vidth (Top): (in) " (Bottom): (in)	NOT APPEICABLE	
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: ☑ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GROV Brown Orange Other: POOL QUALITY: Good Odors Suds Algae Other:	Green No pool Colors Oils	
ONLY FLOAT OTHER CONCERNS: No	IDITY: None TABLES: None cess Trash (paper/pla eeds Regular Mainten	e Slight Cloudiness E Sewage (toilet paper, astic bags) Dumping ance Bank Ero	☐ Cloudy ☐ Opaque etc.) ☐ Petroleum g (bulk) ☐ Excessive esion ☐ Other:	Sedimentation	er;	
	ATION CANDIDATE	☐ Discharge investigatio☐ Storm water retrofit	Other:	L Local stream repair/ou	tfall stabilization	
If yes for daylighting	•	Storm water retroint	Other.			
		ft Type of exist	ting vegetation:	Slope:	0	
If yes for stormwater.						
Is stormwater currently		Land Use des	scription:			
☐ Yes ☐ No ☐ No		Area availabl	-			
SEVERITY: S CO S	eavy discharge with a dist trong smell. The amount o ompared to the amount of tream; discharge appears gnificant impact downstrea	f discharge is significant normal flow in receiving to be having a	ischarge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor	nount of discharge; state of causing any	ot have dry weather ning; or appearance erosion problems.	
	5	4	(3)	2	1	
SKETCH/NOTES:			r	PEROPTED TO AUTHORS		
			- R	REPORTED TO AUTHORITH	S. LIYES LINO	

	ı
U I	•

WATERSHED/SUBSHE	o: Middy -	Tank	DATE: 6/4/0	ASSESSED BY:	Friends
SURVEY REACH ID:	MTR 09 TI	me: <u>5</u> :32_am/pm)	Рното ID: (Сатега-Рі	ic #) /#	50
SITE ID (Condition-#); C	T- <u>02</u> LA	NT41 0 49 134,3 "L	ong 72°27 '2.1'	' LMK	GPS: (Unit ID)
	T				
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: Single Circular Double Elliptical Triple Other:	Dimensions:	SUBMERGED: No Partially Fully
	Open channel	Concrete Earthen Other:	☐ Parabolic W	Pepth: (in) Vidth (Top): (in) " (Bottom): (in)	NOT APPASICABLE
CONDITION: None Chip/Cracked Pecling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: None Oily Flow Line	VEGGIE DENSITY: None Normal Inhibited	PIPE BENTHIC GR Brown Orar Other: POOL QUALITY:	ge Green
Corrosion Other:	Sulfide Other:	Paint Other:	Excessive Other:	Good Odors Suds Algae Other:	☐Colors ☐Oils
FLOWING TURBID ONLY FLOATA	FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque				
	ess Trash (paper/pla ds Regular Mainten			Sedimentation	
POTENTIAL RESTORA	TION CANDIDATE	E Discharge investigation		Local stream repair	outfall stabilization
If yes for daylighting:		Storm water retrofit	Other:		
	er from outfall:	ft Type of exis	ting vegetation:	Slope:	· · · · · · · · · · · · · · · · · · ·
If yes for stormwater:					
Is stormwater currently co		Land Use des	scription:		
Yes No Not	investigated	Area availabl	e:		
SEVERITY: stro con stre	avy discharge with a dist ng smell. The amount or apared to the amount of am; discharge appears afficant impact downstrea	f discharge is significant normal flow in receiving to be having a	lischarge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor	nount of discharge;	s not have dry weather staining; or appearance any erosion problems.
	5	4	(3)	2	1
SKETCH/NOTES:					
./			K	REPORTED TO AUTHORI	TIES: LYES NO

\mathbf{O}		
U	1	

WATERSHED/SUBSHED:	1	10×1V	DATE: 6 14 108 ASSESSED BY: Friends				
SURVEY REACH ID: M	772 09 Tu	ME: 5 : 40 AM/PM)	Рното ID: (Camera-Pi	c #) /#			
SITE ID (Condition-#): OT	- <u>03</u> La	т <u>Ч) • 49 133.1 "</u> Lo	ong 72° 27 '55.9"	' LMK	GPS: (Unit ID)		
BANK: LT RT Head FLOW: None Trickle Moderate	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS: Diameter: (in	SUBMERGED: No Partially Fully		
Substantial Other:	Open channel	☐ Concrete ☐ Earthen ☐ Other:	Parabolic W	epth: (in) (in) (in) (in) (in) (in)	NOT APPECABLE		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: No Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY: ☐ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:	PIPE BENTHIC GR Brown Oran Other: POOL QUALITY: Good Odors Suds Algae Other:	nge		
ONLY FLOATAB OTHER	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER CONCERNS: Sexual Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization						
If yes for daylighting: Length of vegetative cover	from outfall:	ft Type of exist	ing vegetation:	Slope:	o		
If yes for stormwater: Is stormwater currently con ☐ Yes ☐ No ☐ Not in	vestigated	Land Use des Area available					
SEVERITY: strong compa stream	ared to the amount of r m; discharge appears to cant impact downstrea	discharge is significant discharge is significant normal flow in receiving be having a	ischarge; flow mostly clear and oc ge has a color and/or odor, the am ge is very small compared to the st d any impact appears to be minor /	ount of discharge;	es not have dry weather staining; or appearance any erosion problems.		
SKETCH/NOTES:	5	4	3	2			
SKEICHHOLES.			R	EPORTED TO AUTHORI	ITIES: TYES TNO		

\mathbf{O}	Т	٦
	_	

WATERSHED/SUBSH	ED:	Tank	DATE: 6 14 10	ASSESSED BY:	
SURVEY REACH ID:		ME::AM/PM	PHOTO ID: (Camera-Pi		· · · · · · · · · · · · · · · · · · ·
SITE ID (Condition-#):		T°_''L		' LMK	GPS: (Unit ID)
233 2 8 2 4 1 S 3 2 8 S S S S S S S S S S S S S S S S S S	Control of the Contro	4/A SC-01			()
BANK: LT RT Head FLOW: None Trickl	✓ Closed	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS: Diameter: (ir	SUBMERGED: No Partially Fully
Moderate Substantial Other:	Open channel	Concrete Earthen Other:	Parabolic W	Pepth: (in) Vidth (Top): (in) ' (Bottom): (in)	NOT APPAICABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS: None Oily Flow Line	VEGGIE DENSITY: ☐ None ☐ Normal ☐ Inhibited	PIPE BENTHIC GR Brown Oran Other:	nge 🗌 Green
Corrosion Other:	Sulfide Other:	Paint Other:	Excessive Other:	POOL QUALITY: Good Godors Suds Algae Other:	Colors Oils
ONLY FLOA OTHER	IDITY: None TABLES: None Access Trash (paper/pla eeds Regular Mainten	Slight Cloudiness Sewage (toilet paper, ustic bags) Dumping	Cloudy Opaque etc.) Petroleum g (bulk) Excessive osion Other: on Stream daylighting	Sedimentation	Other:
no		☐ Storm water retrofit	Other:		
If yes for daylighting					
Length of vegetative co	ver from outfall:	ft Type of exist	ting vegetation:	Slope:	•
If yes for stormwater.	•				
Is stormwater currently		Land Use des	scription:		
☐ Yes ☐ No ☐ No	ot investigated	Area availabl	e:		
SEVERITY: S C C S	leavy discharge with a dist trong smell. The amount of ompared to the amount of tream; discharge appears t ignificant impact downstrea	f discharge is significant normal flow in receiving to be having a	lischarge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor	nount of tream's base discharge;	s not have dry weather staining; or appearance any erosion problems.
	5	4	3	2	1
SKETCH/NOTES:					
			R	EPORTED TO AUTHORI	TIES: L YES NO

OT

WATERSHED/SUBSHED: Middle Tank			DATE: 6 / 4 /08 ASSESSED BY: Friends				
SURVEY REACH ID:	MTRO9 T	IME: <u>5</u> :53am/pm	РНОТО ID: (Сатега-Ріс #) /#				
SITE ID (Condition-#):	ОТ- <u>05</u> L	AT41 0 49 131.3 "L	ong <u>72° 27 '5540"</u>	LMK	GPS: (Unit ID)		
BANK: LT NRT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS: Diameter: (in	SUBMERGED: No Partially Fully		
Moderate Substantial Other:	Open channel	☐ Concrete ☐ Earthen ☐ Other:	Parabolic Wi	pth: (in) dth (Top): (in) (Bottom): (in)			
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPÓSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GR Brown Ora Other: POOL QUALITY: Good Odors Suds Algae Other:	nge Green Mo pool Colors Oils		
FLOWING TURB ONLY FLOAT OTHER EX CONCERNS: No	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization						
If yes for stormwater.		ft Type of exist		Slope:	0		
Is stormwater currently ☐ Yes ☐ No ☐ No		Land Use des Area availabl			-		
OUTFALL SEVERITY: (circle #)	eavy discharge with a dis	tinct color and/or a of discharge is significant formal flow in receiving to be having a	iischarge; flow mostly clear and odc ge has a color and/or odor, the amo ge is very small compared to the str d any impact appears to be minor / I	unt of discharge;	es not have dry weather staining; or appearance any erosion problems.		
	5	4	3	2	(1)		
SKETCH/NOTES:			RF	PORTED TO AUTHOR	ITIES: \(\text{ YES } \(\text{ NO} \)		
			2.52				

\mathbf{OT}	
$\mathbf{U}\mathbf{I}$	

SITE PLO (Continue 4): OT-02 LAT 040 25 LONG 20 2 2 4 1 LMK CPS: (Unit ID) BANE: Type: MATERIAL: Shape: Single Concrete Metal	WATERSHED/SUBSHE	on: Middle	Tanh	DATE: 4 / 0	ASSESSED BY:	Viends
STEE DI Conditions P. OT December Dece	SURVEY REACH ID:	MTRO9 TH	ME: 6:04 AM/PM	PHOTO ID: (Camera-Pi		
BANK: TyPE: MATERIAL: Concrete Metal Circular Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Partially Double Diameter: (in) Double Diameter: (in) Double Diameter: (in) Double Dameter: (in) Double Diameter: (in) Double Dameter: (in) Double Doub			T4/049 1295"L	ONG 72.0 27 1549	<u> </u>	
Closed Closed Prov. Prinkle		~~~ <u>~</u>				
Substantial Open	FLOW: None Trickle	☑ Closed	Concrete Metal PVC/Plastic Brick	☐ Circular ☐ Double ☐ Elliptical ☐ Triple	and the state of t	☑ No ☐ Partially
None Gas None Green Oily Other: Ot	Substantial			Parabolic W	Vidth (Top):(in)	NOT APPESCABLE
Turn Turn Turn None Slight Cloudiness Cloudy Opaque		☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☑ Other:	☐ None ☐ Oily ☐ Flow Line ☐ Paint	None Normal Inhibited Excessive	Brown Orang Other: POOL QUALITY: Good Odors Suds Algae	e Green No pool Colors Oils
Length of vegetative cover from outfall:	FLOWING ONLY FLOAT OTHER CONCERNS: Nec	ABLES: None cess Trash (paper/pla cds Regular Mainten	Slight Cloudiness Sewage (toilet paper, astic bags) Dumping ance Bank Ero	☐ Cloudy ☐ Opaque etc.) ☐ Petroleum g (bulk) ☐ Excessive osion ☐ Other:	(oil sheen) Ot Sedimentation	her:
Length of vegetative cover from outfall:			Storm water retrofit	Other:		
Is stormwater currently controlled? Yes No Not investigated Area available:		er from outfall:	ft Type of exis	ting vegetation:	Slope:	0
Is stormwater currently controlled? Yes No Not investigated Area available:	If you for at a many out and					
OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of ofischarge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. SKETCH/NOTES: Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. SMall discharge; flow mostly clear and odorless. If the discharge, staining; or appearance of causing any erosion problems. Scall discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. SKETCH/NOTES:	1	controlled?	I and I lee do			
OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems. SKETCH/NOTES: Outfall does not have dry weather discharge is very small compared to the stream's base flow and any impact appears to be minor / localized. SKETCH/NOTES:				•		
SKETCH/NOTES:	OUTFALL He SEVERITY: (circle #) He str	avy discharge with a disti ong smell. The amount of mpared to the amount of eam; discharge appears t	inct color and/or a f discharge is significant normal flow in receiving to be having a	lischarge; flow mostly clear and or ge has a color and/or odor, the arr ge is very small compared to the s	nount of discharge; st	aining; or appearance
		5	4	/3	2	1
K R POD TEN OF A TOTAL T	SKETCH/NOTES:				REPORTED TO AUTHORITE	IFS: TVES TVS

OT

WATERSHED/SUBSH			DATE: (01 5 10 8 ASSESSED BY: 35,70,3 K (A				
SURVEY REACH ID:	MR-09 TI	ме: <u>9</u> : <u>49</u> ам/рм	PHOTO ID: (Camera-P	ic#)			
SITE ID (Condition-#):	ОТ- <u>ОВ</u> LA	т 41 ° 49 '267" І	ONG 720 27 1913	" LMK_ GPS: (Unit ID)			
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other:		DIMENSIONS: Diameter: 2 (iii) Partially Fully			
Moderate Substantial Other:	Open channel	☐ Concrete ☐ Earthen ☐ Other:	☐ Parabolic y	Depth: (in) Vidth (Top): (in) " (Bottom): (in)			
CONDITION: None Chip/Cracked Peeling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: None Oily Flow Line	VEGGIE DENSITY: None Normal Inhibited	PIPE BENTHIC GROWTH: None Brown Orange Green Other:			
Corrosion Other:	Sulfide Other:	☐ Paint ☐ Other:	Excessive Other:	POOL QUALITY: No pool Good Godors Colors Oils Suds Algae Floatables Other:			
FLOWING TURBING ONLY OTHER CONCERNS: Ne	FLOWING ONLY None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation						
If yes for daylighting: Length of vegetative co		Storm water retrofit ft Type of exi	Other:	Slope:°			
If yes for stormwater: Is stormwater currently ☐ Yes ☐ No ☐ No	controlled?	Land Use do Area availab					
SEVERITY: st cc cc st	eavy discharge with a dist rong smell. The amount of impared to the amount of ream; discharge appears if gnificant impact downstrea	f discharge is significant normal flow in receiving to be having a	discharge; flow mostly clear and o arge has a color and/or odor, the an arge is very small compared to the s nd any impact appears to be minor	nount of discharge; staining; or appearance			
	5	4	3	2 1			
SKETCH/NOTES:							
J			·	REPORTED TO AUTHORITIES: YES NO			

OT	
O I	

SURVEY REACH ID:	WATERSHED/SUBSHI	ED: Missle 7	port Rour	DATE: 6/5/0	ASSESSED BY: 3 76 GAROT		
STEE ID (Condition: #): OT- OA LAT 4 0 4 1 222 "LONG 72 0 27 STS LMK GPS: (Unit ID)	SURVEY REACH ID:	MR-09 TO	ME: 9: 5 AM/PM				
Closed PVC/Plastic Brick Diliptical Triple Diameter: Fully Ful	23.0923.23.22.36.19.19.11.	The state of the s			-		
Moderate Substantial Open Concrete Earthen Parabolic Width (Top): (in) NOT APPECABLE Moderate Width (Top): (in) NOT APPECABLE Moderate Width (Top): (in) NOT APPECABLE Moderate Width (Top): (in) NOT APPECABLE Moderate Width (Top): (in) NOT APPECABLE Moderate Width (Top): (in) NOT APPECABLE Moderate Moderate Width (Top): (in) NOT APPECABLE Moderate Moderate Width (Top): (in) NOT APPECABLE Moderate Moderate Moderate Width (Top): (in) NOT APPECABLE Moderate Moder	LT RT Head FLOW:	Closed	Concrete Metal PVC/Plastic Brick	☐ Circular ☐ Double ☐ Elliptical ☐ Triple	Diameter: 2 Him Partially		
None	Moderate Substantial	☐ Open	Concrete Earthen	Trapezoid D Parabolic W	Depth: (in) Width (Top): (in) NOT APPE CABLE		
FLOWING ONLY TURBIDITY:	None Chip/Cracked Peeling Paint Corrosion	☐Gas ☐ Sewage ☐Rancid/Sour ☐ Sulfide	☐ None ☐ Oily ☐ Flow Line ☐ Paint	☐ None Normal Inhibited Excessive	Brown Orange Green Other: POOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables		
If yes for daylighting: Length of vegetative cover from outfall:ft Type of existing vegetation: Slope:o If yes for stormwater: Is stormwater currently controlled?	FLOWING TURBI PLOAT OTHER SEX CONCERNS: Ne	DITY: None CABLES: None Cess Trash (paper/pla eds Regular Mainten	Slight Cloudiness Sewage (toilet paper, on the strict bags) Dumping ance Bank Ero	☐ Cloudy ☐ Opaque etc.) ☐ Petroleum g (bulk) ☐ Excessive esion ☐ Other:	(oil sheen)		
Is stormwater currently controlled? Yes No Not investigated Area available: OUTFALL SEVERITY: (circle #) Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems.	If yes for daylighting:		Storm water retrofit	Other:			
SEVERITY: (circle #) strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream. strong smell. The amount of discharge is significant discharge; now mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge; staining; or appearance of causing any erosion problems.	Is stormwater currently of Yes No No			-			
	SEVERITY: str co (circle #) str	ong smell. The amount of mpared to the amount of eam; discharge appears t	f discharge is significant discharge is normal flow in receiving discharge to be having a	ge has a color and/or odor, the am ge is very small compared to the s	ount of discharge; staining; or appearance of causing any arrange are the stream's base		
SKETCH/NOTES:		5	4	3	2 1		
REPORTED TO AUTHORITIES: YES No.	SKETCH/NOTES:			R	REPORTED TO AUTHODITIES: The Tho		

Severe Bank Erosion



WATERSHED/SUB	shed: Middle	Tunk		DATE: 6 / 4	108	ASSESSED	BY: Prienols
SURVEY REACH:		TIME: <u>6</u> :	OC AM/RM	РНОТО ID (САМ	IERA-PIC#		
SITE ID: (Condition	#) START LAT	1 049 129.6	" Long <u>72 ° d</u>	2.549"	LMK		S: (Unit ID)
ER- <u>01</u>	END LAT_		" LONG°_		LMK		
	1						
	Currently unknown	BANK OF CO	ONCERN: LT	☐ RT ☐ Both (<i>l</i> ☐ Straight section	ooking dow	nstream)	11 -
Downcutting	Bed scour	DIMENSIONS		straight section	☐ Steep s	tope/valley wa	all [Other:
Widening	Bank failure			and/or RT	ا م	Dattama	1.1
Headcutting	Bank scour	Bank Ht	17 (0 ft	and/or RT	π	Bottom Wid	dthft
Aggrading Sed. deposition	Slope failure Channelized	Bank Angle	LT C	and/or RT	0	Wetted Wi	ft idthft
LAND OWNERSHII	P: Private Publi	c ∐ Unknown	LAND COVER	Forest F	ield/Ag [Developed:	:
POTENTIAL REST	ORATION CANDIDATE	E: Grade	_	Bank stabilization			
THREAT TO PROP	ERTY/INFRASTRUCT	URE: No	Yes (Describ	e):			
EXISTING RIPARIA	AN WIDTH:	∑ ≤25 ft	25 - 50 ft [□ 50-75ft □ 75-	-100ft [□>100ft	
EROSION	Active downcutting; tall ban of the stream eroding at a fa		Pat downcutting evide	ent, active stream	044		
SEVERITY(circle#)	contributing significant amo	unt of sediment to	widening, banks active moderate rate; no three		failure/eros	ion; likely caused	ated areas of bank I by a pipe outfall, local
Channelized= 1	stream; obvious threat to pr infrastructure.	operty or	infrastructure	acto property of	scour, impa	aired riparian vege	etation or adjacent use.
)	5 Good access: Open area i		4 (3)		2	1	
ACCESS:	ownership, sufficient room t	o stockpile	Fair access: Forested adjacent to stream. Ad				s wetland, steep slope or ess stream. Minimal
	materials, easy stream char heavy equipment using exis		removal or impact to l	andscaped areas.	stockpile ar	reas available and	d/or located a great n. Specialized heavy
	trails.	-	Stockpile areas small	or distant from stream.	equipment	required.	Opendiszed ficavy
NOTES/CROSS SEC		-	3		2	1	
V.							
					REPODTE	ን ፐብ ለሁምሀብኮ፣	TIES YES NO
				~~~	ACTORIE	TO AUTHORI	TIES LIES LINO

SC

WATERSHED		ank		DATE: 🗸	<u> 14 108</u>	ASSI	ESSED BY: Friends
URVEY REA		TIME::_	_AM/PM	Рното I	<b>D:</b> (Camera-Pic	c #)	J#
SITE ID: (Con		41049128	$\frac{17}{2}$ " Long $\frac{7}{2}$	<u>2027</u>	<u>'543</u> " L	MK	GPS (Unit ID)
	5/x						,
TYPE: Roa		ng Manmade			Geological For		
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:  Single Double Triple Other:	MATERIAL: Concrete Metal Other:	Ø FI □ N	GNMENT: low-aligned ot flow-aligned to not know	Barrel dia	Height: $\frac{1}{\ell}$ (ft)
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosion  Sediment deposition  Other (describe):	n 🔲 Downstrean 🔲 Failing emb		☑ FI	VERT SLOPE: lat light (2° – 5°) bybyious (>5°)	Culvert lo	ength:
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re			eplacement 🔲 t	Jpstream s	torage retrofit
IS SC ACTING	G AS GRADE CONTROL	□ No ☑Y	es 🔲 Unkı	nown	4" doop		
	EXTENT OF PHYSICAL BLO	CKAGE:		BL	OCKAGE SEVER	UTY: (circ	ele #)
If yes for fish barrier	Total Partial Unknow  CAUSE: Drop too high Water Dr Flow too shallow Water Dr Other:	rop:(in)	A structure such a road culvert on a 3 greater stream blo upstream moveme anadromous fish; passage device pr	3rd order or ocking the ent of no fish	A total fish blocka tributary that wou significant reach of or partial blockage interfere with the anadromous fish.	ld isolate a of stream, e that may	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
NOTES/SKET	CH:				4 3	w <u>. v</u> .	2 1
<u>ا</u>					Repor	FED TO AU	THORITIES   YES   NO

SC

WATERSHED		NC, PHYLL	L	Date: <u>6</u>	15108	ASSE	SSED BY: 35,3	K,64-72
URVEY REA	ACH ID: MTD-09	TIME: <u>7</u> : 52	AM/PM	Рното II	: (Camera-Pic	#) ろ	/#	
SITE ID: (Con	ndition-#) SC- <u>02</u> LAT	410 49.28	∄" Long <u>?</u> ?	<u>° 27 :</u>	<u>543</u> " LM	K	GPS (Unit II	D)
TYPE: Roa		ng Manmade	1		Geological Forma		Other:	
FOR ROAD/ RAILROAD	SHAPE:  Arch Bottomless  Box Elliptical Circular Other:	# BARRELS:   Single   Double   Triple   Other:	MATERIAL: Concrete Metal Other:	X Flo	i i	Barrel dia	IONS: (if variable, sameter:  Height:	sketch)(ft)(ft)
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosion Sediment deposition Other (describe):	n Downstrean Failing emb		Fla ☐ Sli	et stope: ght $(2^{\circ} - 5^{\circ})$		ength: Width: 10 elevation: 3	(ft) (ft)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re			placement UI	ostream st	torage retrofit	
IS SC ACTING	G AS GRADE CONTROL	□ No □ Yo	es 🔲 Unkn	own				
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVERI	TY: (circ	le #)	
If yes for fish barrier	Total Partial Unknow Unknow CAUSE: Drop too high Water Down too shallow Water Down Other:	rop: (in)	A structure such as road culvert on a 3 greater stream bloo upstream moveme anadromous fish; r passage device pro	rd order or cking the nt of no fish esent.	A total fish blockage tributary that would significant reach of or partial blockage interfere with the mi anadromous fish.	isolate a stream, that may	A temporary barrier s beaver dam or a blood the very head of a st very little viable fish I above it; natural barr as waterfalls.	ckage at ream with nabitat
NOTES/SKET			5		4 3		2 1	
					Reporti	ED TO AU1	rhorities 🗌 Yes	No No

	SUBSHED: MISTOL TO			<u> </u>	15108	ASSE	SSED BY:	JS, JC, 64. P
And the state of t	CHID: MT2-09	TIME: 10:17	LAM/PM P	ното П	<b>):</b> (Camera-Pic		5 /#	<i>e</i>
SITE ID: (Con	dition-#) SC- <u>05</u> LAT	41049.26	4" LONG 12	· 17 '	5).3" LM	1K	GPS	S (Unit ID)
	<u> </u>							m 22 f
TYPE: Roa	ad Crossing (Railroad Crossi		1					Perloto Trails
	SHAPE:  Arch Bottomless	#BARRELS:	MATERIAL:		NMENT: ow-aligned			ariable, sketch)
	Box Elliptical	Single Double	☐ Concrete ☐ Metal		ow-aligned of flow-aligned	Barrel dia		(ft)
FOR ROAD/	Circular	Triple	Other:		not know		Height:	5 St (ft)
RAILROAD CROSSINGS	Other:	Other:	Stone Blacks	1		Culvert le	ength:	(ft)
ONLY	CONDITION: (Evidence of)			ERT SLOPE:		-	3(+ (ft)	
	☐ Cracking/chipping/corrosion ☐ Sediment deposition	n ☐ Downstrean ☐ Failing emb		, —	ight (2° – 5°)			38+
	Other (describe): 610016			Ot	ovious (>5°)	Roadway	elevation:	: <u>60</u> (ft)
<u> </u>	RESTORATION CANDIDATE		emoval Culvert	repair/re	placement 🔲 U	pstream st	torage retr	ofit
no			repair Other:					
IS SC ACTING	G AS GRADE CONTROL	<u> </u>	es Unknov		~			
	EXTENT OF PHYSICAL BLO	CKAGE:		BLC	CKAGE SEVER	ITY: (circ	le #)	
	Temporary Unkno	wn	A structure such as a		A total fish blockag		,	ry barrier such as a
If yes for	CATOR.		road culvert on a 3rd greater stream blocki		tributary that would significant reach of			m or a blockage at ead of a stream with
fish barrier	CAUSE:  Drop too high Water D	op: (in)	upstream movement anadromous fish; no		or partial blockage interfere with the m		, ,	iable fish habitat atural barriers such
	Flow too shallow Water D		passage device pres		anadromous fish.	iigration or	as waterfa	li di
)	Other:		5		4 3	l	2	1
NOTES/SKET	CH:							
		,	\					
	Poils T	o Trails	o culum	7				
	· · Kores r							
			5 7 7 Re					
	- 1 0025	Dan (Ma)	5					
		3	land second	n.n 7	;			
		in weet	2 N W	//~\ r	Transport Company			
		1 (0 1	0	¥				
					and the second			
-	The second secon		No continue response to the second se	1				
		100 mg	3 -1-6	)	į.			
		Miles Walkerson, page	BIOCES	2.1				
	/							
		A company of the comp		1	1			
	**	The second section is the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the section of the sect						
			7					,
)								
Ĺ					REPORT	ED TO AUT	THORITIES	s □ Yes ☑∕Ño │

C	
D	

WATERSHED		ril .	DATE: 6			SSED BY:	C6A,75,2	
<ul> <li>A filtration of the control of the con</li></ul>	CH ID: MTQ-09	TIME: //: 12			<b>):</b> (Camera-Pic	c #) /O _ !	11 /# 4	12
SITE ID: (Con	dition-#) SC-64 LAT	41049.22	16" LONG 77	L° 27'	<u>43.6"</u> LI	мк	GPS (U	Init ID)
TYPE: Roa		1	T		Geological Form		Other:	
	SHAPE:	#BARRELS:	MATERIAL:		NMENT:		IONS: (if varia	
	☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical	Single Double	Concrete		ow-aligned	Barrel dia		+101d(ft)
FOR ROAD/	Circular	Triple	Metal ☐ Other:	1	ot flow-aligned on not know		Height:	(ft)
RAILROAD	Other:	Other:	Other.		Hot Khow	a	. 1	7)
CROSSINGS ONLY	CONDITION: (Evidence of)			CULV	ERT SLOPE:	Culvert le	_	(ft)
ONLI	Cracking/chipping/corrosion			<b>X</b> Fla			Width:	(ft)
	Sediment deposition	Failing emb	ankment	- 1	ght (2° – 5°) evious (>5°)	D d		7 (0)
	Other (describe):	•			vious (= 3 )	Roadway	elevation:	(ft)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	moval X Culve	ert repair/re	nlacement $\square$ 1	Instream st	torage retrofit	
□ no		Local stream i	,		priacomont	spatieum s	iorage remoni	
	G AS GRADE CONTROL	No Y					***************************************	
	EXTENT OF PHYSICAL BLO				CKAGE SEVER	RITY: (circ	le #)	
	☐ Total ☐ Partial		A -4					. ,
1C C	Temporary Unknow	wn	A structure such a road culvert on a 3		A total fish blocka tributary that woul		A temporary babeaver dam or	
If yes for fish barrier	CAUSE:		greater stream blo upstream moveme		significant reach of or partial blockage		the very head o	of a stream with
1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		rop: (in)	anadromous fish; i	no fish	interfere with the		above it; natura	
<b>L</b> .	Flow too shallow Water D	_	passage device pr	esent.	anadromous fish.		as waterfalls.	
,	Other: Doby Slock	ox or	5		4 3		(2)	1
NOTES/SKET	CH: PALLNO	~						
1								
۷					Repor	TED TO AU	THORITIES [	YES □ NO



WATERSHED/SUB	SSHED: Middle Jan	nh	DATE: 4/	100	ASSESSED BY: Friends						
JURVEY REACH I	D: MTRO9 TI	ме: <u>5 :30</u> ам/бм	Рното ID: (Сал	mera-Pic #)	14 49						
SITE ID: (Condition	14) TR-01 LAT 410°	49 · 34.5 " LONG	72.27 .55.	<u>9</u> LMK_	GPS: (Unit ID)						
TYPE:  Industrial Commercial Residential	MATERIAL:  ☐ Plastic ☐ Paper ☐ Tires ☐ Constr ☐ Appliances ☐ Yard V ☐ Automotive ☐ Other:	☐ Metal uction ☐ Medical	SOURCE:  Unknown  Flooding  Illegal dump  Local outfall	LOCATION:  Stream  Riparian Are  Lt bank  Rt bank	A A CONTAIN A CONTAIN A						
POTENTIAL REST	POTENTIAL RESTORATION CANDIDATE Stream cleanup Stream adoption segment Removal/prevention of dumping										
If yes for trash or debris removal		Heavy equipment  Trace  Volunteers  Local Go			DUMPSTER WITHIN 100 FT: Yes No Unknown						
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, or with easy access. Trash made a long period of time but it few days, possibly with a sm	ay have been dumped ov t could be cleaned up in	er area, where ac	at of trash or debris scattered over a large coss is very difficult. Or presence of drums of hazardous materials						
	5_/	4	3	2	1						
NOTES:											
				Reportei	TO AUTHORITIES YES NO						



WATERSHED/SUE	BSHED: Middu	Tanh	DATE: 6/4	108	ASSESSED BY: 下メシン						
SURVEY REACH I	D: MTR 09	TIME: 5:32 AM/PM)	Рното ID: (Car	nera-Pic #)	/# <u>5</u> ]						
SITE ID: (Condition	4) TR- <u>02</u> LAT <u>4</u>	1 · 49 ·34.3 "LONG	372·27·56.	LMK_	GPS: (Unit ID)						
TYPE:  Industrial Commercial Residential		nstruction  Medical rd Waste	SOURCE:  Unknown  Flooding  Illegal dump  Local outfall	LOCATION:  Stream Riparian Are Lt bank Rt bank	A = = = = = = = = = = = = = = = = = =						
POTENTIAL REST	POTENTIAL RESTORATION CANDIDATE Stream cleanup Stream adoption segment Removal/prevention of dumping no Other:										
If yes for trash or debris removal		☐ Heavy equipment ☐ T  Volunteers ☐ Local (	DOMESTER WITHIN TO								
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., lethan two pickup truck loads) loca inside a park with easy access	with easy access. Trash r	or bulk items, in a small are may have been dumped ov it could be cleaned up in small backhoe.	er area, where ac	nt of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials						
NOTES:	5	4	3	2	1						
NOTES:											
)				Reportei	TO AUTHORITIES YES NO						

Š.



WATERSHED/SUB	SHED: MUZBE T	and River	DATE: <u>6/5</u>	1 <u>0-6</u> A	ASSESSED BY: TRIENDS						
JURVEY REACH I	D: MR-09	TIME: 10: 13 AM/PM	PHOTO ID: (Cam	nera-Pic#) 5	/#						
SITE ID: (Condition	14) TR- <u>03</u> Lat 41	<u>• 49 ' 267 " LONG</u>	72.27.124	_" LMK	GPS: (Unit ID)						
TYPE:    Industrial   Commercial   Residential	— — —	er	Unknown	LOCATION:  ☑ Stream ☑ Riparian Area ☐ Lt bank ☐ Rt bank	LAND OWNERSHIP:  Public Unknown Private  AMOUNT (# Pickup truck loads): / 07 7						
POTÉNTIAL REST	POTENTIAL RESTORATION CANDIDATE  Stream cleanup  Stream adoption segment  Removal/prevention of dumping										
If yes for trash or debris removal		Heavy equipment Tr	ash bags Unknow		DUMPSTER WITHIN 100 FT:						
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., le than two pickup truck loads) locat inside a park with easy access		ay have been dumped ove t could be cleaned up in	area, where acce	of trash or debris scattered over a large ess is very difficult. Or presence of drums nazardous materials						
NOTES:	5	4	3	2	1						
North.											
)	.,			REPORTED 1	TO AUTHORITIES YES NO						

WATERSHED/SUB	SHED: Misole Tonk, R.	iver	DATE: 6/6	ASSESSED BY: JS PLOAJK							
JURVEY REACH I	D: MTR-09 TIME:/0	:_55AM/PM	Рното ID: (Сан	mera-Pic#) K, G	/#						
SITE ID: (Condition#) TR-04 LAT 41° 49'24.5" LONG 72°27'48.3" LMK GPS: (Unit ID)											
TYPE:  Industrial Commercial Residential	MATERIAL:  Plastic Paper  Tires Construction  Appliances Yard Waste  Automotive Other:	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION:  Stream Riparian Area Lt bank Rt bank	LAND OWNERSHIP:  Public Unknown Private  AMOUNT (# Pickup truck loads): 2 07 3							
POTENTIAL REST	POTENTIAL RESTORATION CANDIDATE Stream cleanup Stream adoption segment Removal/prevention of dumping										
If yes for trash or debris removal	EQUIPMENT NEEDED: Heavy eq WHO CAN DO IT: Volunteer		ush bags Unkno		DUMPSTER WITHIN 100 FT:  ☐ Yes No ☐ Unknown						
CLEAN-UP POTENTIAL: (Circle #)	than two pickup truck loads) located inside a park with easy access	y access. Trash ma	bulk items, in a small ar by have been dumped ov could be cleaned up in all backhoe.	ver area, where acc	of trash or debris scattered over a large ess is very difficult. Or presence of drums hazardous materials						
	5 4	)	3	2	1						
NOTES:	LOS OF DE	BRID / L STUMPS	earcs/Lo	255							
}				REPORTED	TO AUTHORITIES YES NO						



WATERSHED/SUBSHED:							DATE:/ ASSESSED BY:						
SURVEY REAC	CH ID:		TIN	<b>ЛЕ:</b> :_	AM/PM	Л	<b>РНОТО ID:</b> (Сатега-Ріс #) /#						
SITE ID (Condit	tion-#): <b>O</b> '	Т	La	т°_		_"L(	ONG°	''	LMK		GPS: (Unit ID)		
FLOW:	LT RT Head  FLOW: None Trickle			MATERI Conci	rete Plastic	Metal Brick	SHAPE:  Circula Elliptic Other:	al Triple		r: <u>(i</u>	SUBMERGED:  ☐ No  ☐ Partially ☐ Fully		
Moderate Substantial Other:	Substantial Open chann				arthen	☐ Trapezo	oid Delic W	epth: idth (Top):_ (Bottom):_	(in)	NOT APPEACABLE			
CONDITION:  None Gas Chip/Cracked Peeling Paint Corrosion Other: Other:		e Sour	☐ None ☐ Oily		VEGGIE I  None Normal Inhibite Excessi Other:	ed	Brown Other:  POOL Qu Good	UALITY: Odors Algae	ROWTH: None Inge Green  No pool Oils Floatables				
FOR FLOWING ONLY OTHER CONCERNS:	FLOWING ONLY       TURBIDITY:       □ None       □ Slight Cloudiness         OTHER       □ Excess Trash (paper/plastic bags)       □ Dumpi						g (bulk)	Green Opaque Petroleum Excessive Other:	(oil sheen)		Other:		
POTENTIAL R  no  If yes for dayli		TION CAND	IDATE		harge inve	_	on Stream Other:	daylighting	Local str	ream repai	r/outfall stabilization		
Length of vegeta  If yes for storm	ative cove		ıll:	·						Slope	:°		
Is stormwater cu ☐ Yes ☐ No	-					Use des availabl	-				_		
OUTFALL SEVERITY:  (circle #)  Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving discharge appears to be basing a					dischar dischar flow an	Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.  Outfall does not have dry discharge; staining; or all of causing any erosion p							
SKETCH/NOTI	EG.		5			4		3		2	1		
JETCH/11011	ш.							I	Reported 1	O AUTHO	RITIES: □ YES □ NO		

Severe Bank Erosion

ER

WATERSHED/SUBS	HED:				DATE:		ASSES	SED BY:
SURVEY REACH:			TIME::	AM/PM		(CAMERA-PIC	#):	<b>/</b> #
SITE ID: (Condition-	#)	START LAT	<u> </u>	' Long°_	' ''	LMK_		GPS: (Unit ID)
ER		END LAT_	<u> </u>	' Long°_	' ''	LMK_		
PROCESS:  Downcutting Widening		tly unknown Bed scour Bank failure	LOCATION: [ DIMENSIONS	:	☐ Straight s	ection		ey wall  Other:
Headcutting	☐ E	Bank scour	-	GPS) LTf				m widthft
Aggrading		Slope failure	Bank Ht			Tft	_	vidthft
Sed. deposition		Channelized	Bank Angle	LT	° and/or R	T°	Wette	ed Widthft
LAND OWNERSHIP	: 🗌 Pr	rivate Public	Unknown	LAND COVER	:  Forest	☐ Field/Ag	☐ Deve	loped:
POTENTIAL RESTO	ORATIC	ON CANDIDATE	: Grade	-	Bank stab	ilization		
THREAT TO PROP	ERTY/I	NFRASTRUCTU	JRE: No	Yes (Descri	be):			
EXISTING RIPARIA	N WID	тн:	□ <u>&lt;</u> 25 ft	☐ 25 - 50 ft	□ 50-75ft	☐ 75-100ft	□ >100	ft
EROSION SEVERITY(circle#) Channelized= 1	of the s	downcutting; tall ban tream eroding at a fa ting significant amo obvious threat to pr acture.	ast rate; erosion unt of sediment to	Pat downcutting evid widening, banks activ moderate rate; no the infrastructure	vely eroding at a	failure/erd	sion; likely	ole; isolated areas of bank caused by a pipe outfall, local an vegetation or adjacent use.
	0 1	5		4 3		2		1
ACCESS:	owners materia	ccess: Open area in hip, sufficient room t ls, easy stream char equipment using exis	o stockpile nnel access for	Fair access: Foreste adjacent to stream. A removal or impact to Stockpile areas smal	Access requires t landscaped area	other sen stockpile distance f	sitive areas areas availa	st cross wetland, steep slope or to access stream. Minimal able and/or located a great section. Specialized heavy
		5		1 3		2		1
NOTES/CROSS SEC	TION S	БКЕТСН:				Report	ED TO AU	THORITIES □ YES □ NO

Impacted Buffer IB

WATERSHED/SUBSHED:						DATE:	/_	/	Ass	SESSED BY:
SURVEY REACH:			TIME:	_:AN	M/PM	Рното	<b>ID:</b> (0	Camera-Pic	: #)	/#
SITE ID: (Condition-#)	START L	ΔAT°	_'" I	LONG	<u> </u>	<u>'</u> ''	]	LMK		GPS: (Unit ID)
IB	END L	ωAT°	<u>'" I</u>	ONG	<u> </u>	<u>' ''</u>	]	LMK		
IMPACTED BANK:  LT RT Both	REASON IN	NADEQUATE:	Lack of Recently	-			☐ Wie	despread inv	asive p	plants
LAND USE: (Facing downstream) LT Bar RT Bar		Institutional	Golf Cou		Ot	her Publi	:			
DOMINANT LAND COVER: LT Bar RT Bar		Bare ground	d Turf/lav		l grass	Shrub/sc	erub 7	Γrees □ □	Other ::	
INVASIVE PLANTS:	☐ None	Rare	☐ P	artial cove	rage	☐ Ext	tensive	coverage	unk	known
STREAM SHADE PROVID	DED? No	one	ial [	] Full	WETL	ANDS PR	ESENT	? 🗌 No		es Unknown
POTENTIAL RESTORATI	ON CANDID	ATE Activ		on Gre	enway d	lesign [	Natur	al regenerati	on 🗌	Invasives removal
RESTORABLE AREA				Impacted a				ed area on eithe		Impacted area on private
Length (ft):		REFOREST POTENTIAL (Circle #)		where the not appear specific pu area availa	to be use rpose; plei	d for any nty of	present purpose	or private land th ly used for a sp e; available area g adequate	ecific	land where road; building encroachment or other feature significantly limits available area for planting
Width (ft):				5		4		3	2	2 1
POTENTIAL CONFLICTS  Poor/unsafe access to si			□ Wi	despread i	nvasive Il impact	plants s (deer, b	☐ Pote eaver)	ential contam	inatio	n Lack of sun
NOTES:										

SC

WATERSHED	/SUBSHED:				DA	TE:	<u>/</u>	ASSE	SSED BY:	
SURVEY REA	CH ID:		TIME::	_AM/PM	PH	ото ID	: (Camera-Pi	c #)	/#	
SITE ID: (Con	dition-#) SC	LAT	<u> </u>	" Long_	<u> </u>	'	" L	MK	GPS (Unit ID)	
TYPE: Roa	ad Crossing    Railroad	d Crossi	ng Manmade			am 🗌	Geological For	mation 🗌	Other:	
	SHAPE:	,	#BARRELS:	MATERIAL:			NMENT:		IONS: (if variable, sketch)	
	Arch Botton Box Ellipt		☐ Single ☐ Double	Concrete			w-aligned	Barrel diameter: (f		
FOR ROAD/	Circular	icai	☐ Triple	☐ Metal☐ Other:			t flow-aligned not know	Height:(ft)		
RAILROAD	Other:		Other:	U Other.			HOLKHOW			
CROSSINGS	CONDITION: (Evidence	e of)					ERT SLOPE:	Culvert le		
ONLY	Cracking/chipping/c		n Downstream	n scour hole		Fla			Width:(ft)	
	Sediment deposition	☐ Failing emb	ankment		-	ght (2° – 5°) vious (>5°)	D 1	1 2 (6)		
	Other (describe):						vious (>3 )	Roadway	elevation:(ft)	
POTENTIAL I	RESTORATION CANDI	DATE	Fich harriar ra	emoval	zert r	engir/res	alacement $\square$	Unstraam	torage retrofit	
no	XESTORATION CANDI	DAIL	Local stream			ерап/тер	nacement	opsiream s	torage retrofft	
-	G A G CD A DE CONTROL	,								
185C ACTING	G AS GRADE CONTROL		□ No □ Y	es Unk	cnow		CKAGE SEVEI	DEFENTA ( :	1 41)	
	EXTENT OF PHYSICATION Total	<b>AL BLO</b> Partial	CKAGE:			DLO	CKAGE SEVEI	KIIY; (circ	te #)	
		Unknov	vn	A structure such			A total fish block		A temporary barrier such as a	
If yes for	G			road culvert on a greater stream b			tributary that wou significant reach		beaver dam or a blockage at the very head of a stream with	
fish barrier	CAUSE:  ☐ Drop too high V	Vater Dr	rop:(in)	upstream moven anadromous fish			or partial blockage interfere with the		very little viable fish habitat above it; natural barriers such	
	☐ Flow too shallow \		-	passage device			anadromous fish		as waterfalls.	
	Other:			5			3		2 1	
NOTES/SKET	CH:									
							Rерог	RTED TO AU	THORITIES YES NO	





WATERSHED/SUBSHED:									/	ASSESSED BY:	
SURVEY REAC	н ID:		TIME:	<u>:</u>	AM/PM		<b>PHOTO ID:</b> ( <i>Camera-Pic #</i> ) /#				
SITE ID: (Cond.	ition-#)	START LAT		•••	Long	<u> </u>		•••	LMK	<b>GPS:</b> (Unit ID)	
CM		END LAT°		•••	Long_	0	•	"	LMK	_	
	<u>.</u>										
TYPE:  Channelization Bank armoring concrete channel Floodplain encroachment Other:											
MATERIAL:		Does channel hav	e pereni	nial flo	ow?		Yes [	No	<b>DIMENSIONS:</b>		
	Gabion	Is there evidence	of sedin	nent de	eposition?		Yes [	No	Height Bottom Width	(ft)	
☐ Rip Rap ☐ ☐ Metal	] Earthen	Is vegetation grov	ving in o	channe	el?		Yes [	No	Top Width:	(ft) (ft)	
Other:		Is channel connect				П	Yes [	No	Length:	(ft)	
				F							
BASE FLOW C						AD	JACE	NT STE	REAM CORRIDO	R	
Depth of flow						Av	ailabl	e widtl	h LT	(ft) RT(ft)	
Defined low flo	ow channe	l? ☐ Yes ☐ No				Uti	lities	Presen	ıt?	Fill in floodplain?	
% of channel b	ottom	%						□ No		□Yes □ No	
POTENTIAL RI	ESTORATIO	ON CANDIDATE [	Structi	ıral rej	pair 🔲 Ba	se flo	w chai	nnel cre	eation   Natural	channel design	
□ no		[	De-cha	anneliz	zation 🔲 Fi	sh barı	rier rei	moval	Bioeng	ineering	
CHANNEL-		n of concrete stream (>500		ndorato	length ( > 200')	but ch	annal st	ahilizad a		nannel less than 100 ft with good water	
IZATION		e water is very shallow (<´ natural sediments presen	begi	nning to	function as a	natural s	stream c	channel.	depin, a natu	ral sediment bottom, and size and to the unchannelized stream reaches	
SEVERITY: the channel.						ormed ir	n channe	el.	above and be	elow impacted area.	
(Circle #)		5	4		3				2	1	
Notes:											



WATERSHED/SUBSHED:				<b>D</b> ATE:/_	/	ASSESSED BY:	
SURVEY REACH ID: TIME::AM/PM			<b>ME:</b> :AM/PM	PHOTO ID: (Camera-Pic #) /#			
SITE ID: (Condition	-#) <b>TR</b> ]	Lat°_	'"Lond	<u> </u>	_" LMK_	GPS: (Unit ID)	
TYPE:  Industrial Commercial Residential	MATERIAL:  Plastic Tires Appliances Automotive	Paper Constru		SOURCE:  Unknown  Flooding  Illegal dump  Local outfall	LOCATION:  Stream Riparian Are Lt bank Rt bank	AMOUNTE (// D: 1	
POTENTIAL RESTORATION CANDIDATE							
If yes for trash or debris removal	EQUIPMENT NEEDS WHO CAN DO IT:		Heavy equipment T			DUMPSTER WITHIN 100 FT:  ☐ Yes ☐ No ☐ Unknown	
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access  A large amount of trash, owith easy access. Trash of a long period of time but few days, possibly with a significant			nay have been dumped ov it could be cleaned up ir	ver area, where ac	nt of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials	
,	5		4	3	2	1	
NOTES:							
					Reporte	D TO AUTHORITIES YES NO	

Utility Impacts

|--|

WATERSHED/SUBS		DATE:	<u></u>	_	ASSESS	ED BY:			
SURVEY REACH ID:			Гіме::_	AM/PM	Рн	ото <b>ID:</b> (	Camera-Pic	#)	/#
SITE ID: (Condition-	#) <b>UT</b>	LAT_	o '	"Long	٥	'	_'' LMK	:	GPS: (Unit ID)
TYPE: MATERIAL:  Leaking sewer Concrete Exposed pipe Corrugated metal Exposed manhole Smooth metal		metal [	☐ Floodplain ☐ Yes☐ Stream bank☐ Above stream ☐ Country		POTENTIAL FISH BARRIER:  Yes No  CONDITION: Joint failure		Diamete Length	IMENSIONS: er: in exposed: ft corrosion/cracking	
Other:	PVC Other:		Other:	Siteani bottom				_	shole cover absent
		<u></u>							
EVIDENCE OF	COLOR	None [	☐ Clear ☐ D	ark Brown [	Lt Bro	own 🗌 Ye	llowish 🗌 G	reenish [	Other:
DISCHARGE:	ODOR				•				
	DEPOSITS	None [	Tampons/T	oilet Paper	<b>_</b> Lime		oils   Stain	s 🗌 Oth	ner:
Domestic December			G 1	· 🗆 ъ:	•	n a	🗆		1.
POTENTIAL RESTORATION CANDIDATE ☐ Structural repairs ☐ Pipe testing ☐ Citizen hotlines ☐ Dry weather sampling ☐ no ☐ Fish barrier removal ☐ Other:				er sampling					
If yes to fish barrier,	Water Drop:	(in)							
UTILITY IMPACT SEVERITY: (Circle #)	collapse in the near future; a pipe running across the bed or suspended above the stream; a long section along the edge of the stream where nearly the entire side of the pipe is exposed; or a manhole stack that is located in the center of the stream channel and there is evidence of stack failure			rly  A moderately long section of pipe is partially exposed but there is no immediate threat that the pipe will be undermined and break in the immediate fiture. The primary accounts the pipe is across the bottometry stream but only a small portion of the top exposed; the pipe is exposed but is reinforced and it is not causing a blockage.			s across the bottom of the portion of the top of the pipe cosed but is reinforced with susing a blockage to upstream ole stack that is at the edge of		
Leaking= 5		5		4	3		2		1
NOTES:  REPORTED TO LOCAL AUTHORITIES Yes No									



WATERSHED/SUBSHED:	DATE:	<u></u>	ASSESSED BY:	<u> </u>	
SURVEY REACH ID:	Тіме:	:AM/PM	<b>Р</b> ното <b>ID:</b> (Camera-Pic #)	/#	
SITE ID: (Condition-#) MI LAT	0 1	"LONG°	' '' LMK:	GPS: (Unit ID)	
` '		<u> </u>	<u> </u>		
POTENTIAL RESTORATION CANDIDATE	Storm water ret	rofit Stream	restoration	ent	
no	Discharge Prev	rention  Other:			
DESCRIBE:					
			REPORTED TO LOCAL AU	THORITIES Yes No	
WATERSHED/SUBSHED:	DATE:	1 /	ASSESSED BY:		
SURVEY REACH ID:	TIME:	: AM/PM	<b>РНОТО ID:</b> ( <i>Camera-Pic #</i> )	/#	
SITE ID: (Condition-#) MI- LAT	0 1	"LONG °	' '' LMK:	GPS: (Unit ID)	
SHEID. (Condition-#) WII LAI		LONG		GIB. (Omi ID)	
POTENTIAL RESTORATION CANDIDATE	Storm water ret	rofit  Stream:	restoration Riparian Manageme	ent	
		rention  Other:	_ 1		
DESCRIBE:					
			REPORTED TO LOCAL AU	THORITIES  Yes  No	
WATERSHED/SUBSHED:	DATE:	<i>l</i> /	ASSESSED BY:		
SURVEY REACH ID:	TIME:	: AM/PM	PHOTO ID: (Camera-Pic #)	/#	
	0 1	· <u></u>	, , , , , , , , , , , , , , , , , , , ,	GPS: (Unit ID)	
SITE ID: (Condition-#) MI LAT		"LONG°_	'' LMK:	GIS. (Unit ID)	
POTENTIAL RESTORATION CANDIDATE  Storm water retrofit  Stream restoration  Riparian Management					
□ no □ Discharge Prevention □ Other:					
DESCRIBE:		<del></del>			
			REPORTED TO LOCAL AU	THORITIES  Yes  No	

SURVEY REACH ID:		WTRSHD/SUBSHD:		DATE:/	ASSESSED BY:
START TIME:	: AM	1/PM <b>LMK</b> :	END TIME:	:AM/PM <b>I</b>	MK: GPS ID:
LAT	 " Lon	NG ° ' ''	LAT	" Long °	, ,,
DESCRIPTION:			DESCRIPTION:	<del></del>	
Diponii Horr					
RAIN IN LAST 24 HOURS	S £ Heavy i	rain £ Steady rain	PRESENT CONDITIONS	£ Heavy rain £ S	teady rain £ Intermittent
£ None	£ Intermi		£ Clear		Overcast £ Partly cloudy
SURROUNDING LAND US	SE: £ Indu	strial £ Commercial	£ Urban/Residential	£ Suburban/Res   £ Fe	orested £ Institutional
	£ Golf	Course £ Park	£ Crop	£ Pasture £ C	ther:
AVERAGE CO	ONDITIONS	(check applicable)	REACH S	SKETCH AND SITE IM	PACT TRACKING
	0-25%	£ 50%-75%			tions and IDs for all site impacts P, MI) as well as any additional
CHANNEL WIDTH E	25-50 %	£ 75-100%		leemed appropriate. Indic	
DOMINANT SUBSTRATE		C C 111 (2.5 1011)			
£ Silt/clay (fine or slice) £ Sand (gritty)	*	£ Cobble (2.5 –10") £ Boulder (>10")			
£ Gravel (0.1-2.5")		E Bed rock			
` '	GI 6.T				
WATER CLARITY £ 0 £ Stained (clear, natur		_			
£ Other (chemicals, dyes	•	□ Opaque (muky)			
	<u>*                                    </u>	none £ some £ lots			
AQUATIC I LANIS					
11		none £ some £ lots			
WILDLIFE IN OR	Evidence of) Fish £ F	Beaver £ Deer			
A DOUND STDEAM	Snails £ C				
£	Mostly sha	ded (≥75% coverage)			
	Halfway (≥				
(water surface)					
CHANNEL	<ul><li>Downcutti</li><li>Widening</li></ul>	·   —			
DYNAMICS	Headcuttin				
l [	Aggrading				
Unknown	Sed. depos	sition Channelized			
_ н	eight: LT ba	ank (ft)			
CHANNEL DIMENSIONS	RT b				
(F) cnyc	/idth: Botto	. ,			
DOWNSTREAM)		(ft)			
Dry	Top		_		
Fa	CH ACCESSI ir: Forested or	Difficult. Must cross	-		
nublic ownership de	veloped area	wetland, steep slope, or			
sufficient room to	jacent to strean cess requires to				
Stockpile materials,	moval or impact	t to stockpile available			
access for heavy	ndscaped areas ockpile areas	<ul> <li>and/or located a great distance from stream.</li> </ul>			
equipment using sm	nall or distant fro	om Specialized heavy			
5 4	eam.	equipment required. 2 1			
NOTES: (biggest problem			1		
				REPORTED T	o authorities  Yes  No

OVERALL STREAM CONDITION						
	Optimal	Suboptimal	Marginal	Poor		
IN-STREAM HABITAT  (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
-	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
<u></u>	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
OVERALL BUFFER AND FLOODPLAIN CONDITION						
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Sub Total In-stream:/80 + Buffer/Floodplain:/80 = Total Survey Reach/160						

# Photo Inventory (By Camera)

<b>Project:</b>	This field sheet is to be completed AS photos are taken in the field. The intent is to
Group:	force us to organize pictures taken on a camera basis. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a
Camera:	new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description
	Keacii	TD .	π	

Date	Stream/ Reach	Location ID	Photo #	Description

**Comments:** 

Reach Level Assessment RCH

START   TIME: 2 O AMEN   LANK:   END   TIME: W. AMEN   LANK:   LANGE   CANONIC   CAN	SURVEY REACH ID: TB-O/ WTRSHD/SUBSHD;	WER BY DATE: 7/1 108 ASSESSED BY:
DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESCRIPTION:   DESC		
RAIN IN LAST 24 HOURS #Heury rain   Steady rain   Once   Intermittent   Trace   Clear   Trace   Overeast   Partly cloudy   SURROUNDING LAND USE:   Industrial   Commercial   Other: Trace   Other:   Other / O		
None	DESCRIPTION: CONF. W/ LTR	DESCRIPTION: SC-04
None	RAIN IN LAST 24 HOURS Heavy rain  Steady rain	PRESENT CONDITIONS
AVERAGE CONDITIONS (check applicable)  BASE FLOW AS %   0-25%   0-25%   0-75%   CHANNEL DIMENSIONS (The control of the problem		
BASE FLOW AS %   0-25%   50%-75%   75-100%    DOMINANT SUBSTRATE   Sili/clay (fine or slick)   Cobble (2.5 - 10")   Sand (gritty)   Boulder (>10")    Gravel (0-12-5")   Bed frock    WyTER CLARITY   Clear   Turbid (suspended matter)    Stained (clear, naturally colored)   Opaque (milky)    Other (chemicals, dyes)   Bed soour   Dome   Some   lots    WiLDLIFE IN OR   Shails   Other:   Shails   Other:    WiLDLIFE IN OR   Shails   Other:   Shails   Other:    Wyten Surface   Downwutting   Bank failure   Bank soour   Bank failure   Headcutting   Bank failure   Bank soour   Aggrading   Sed. deposition   Channelized    CHANNEL   DIMENSIONS   Top   T		
DOMINANT SUBSTATE   Silv(clay (fine or slick)   SCObble (2.5 -10")   Sand (gritty)   Bed tock   Bed tock   Water CLARITY   Sclear   Turbid (suspended matter)   Stained (clear, naturally colored)   Opaque (milty)	AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
Dominant Substrate   Slit/clay (fine or slick)   Cobble (2.5 - 10")   Ed rock   Boulder (>10")   Ed rock		within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional
Stained (clear, naturally colored)	☐ Silt/clay (fine or slick) ☐ Cobble (2.5 –10") ☐ Sand (gritty) ☐ Boulder (>10")	
NSTREAM	☐ Stained (clear, naturally colored) ☐ Opaque (milky) ☐ Other (chemicals, dyes)	SC-04
WILDLIFE IN OR AROUND STREAM  AROUND STREAM    Fish	112	
STREAM SHADING (water surface)	WILDLIFE IN OR	55-03
DYNAMICS   Widening   Bank failure   Bank scour   Slope failure   Channelized   Channe	STREAM SHADING ☐ Halfway (≥50%) (water surface) ☐ Partially shaded (≥25%)	A 05-1
CHANNEL DIMENSIONS (FACING DOWNSTREAM)  REACH ACCESSIBILITY  Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.  Fair Forested or developed area adjacent to stream. Access requires tree removal or impact to landscapet almost of stream. Specialized heavy equipment required.  Septimized (ft)  (ft) (ft) (ft) (ft) (ft) (ft) (ft)	DYNAMICS  Widening Headcutting  Bank failure  Bank scour  Aggrading  Slope failure	50°2
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.  Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.  Second: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.  Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	CHANNEL DIMENSIONS (FACING DOWNSTREAM) Height: LT bank RT bank RT bank G(ft)  (ft)  (ft)  (ft)	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
developed area an public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.  developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.  5	Fair Forested or Difficult Must cross	tend 1/1
Toiling in dustrial-eve in festiveture	developed area adjacent to stream.  Stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.  developed area adjacent to stream.  Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.  Specialized heavy equipment required.	
	Toiling in dustrial -eva	infrestructure

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT  (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	Il colonization potential; abitat for maintenance of presence of additional the form of newfall, but ared for colonization (may)  20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.  Less than 20% stab of habitat is obvious unstable or lacking.		
	20 19 18 17 16	15 4 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
- Y	20 19 18 17 (16,)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
Buffer	activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.  Left Bank 10 9	human activities have impacted zone only minimally.	human activities have impacted zone a great deal.	or no riparian vegetation due to	
Buffer	activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	human activities have impacted zone only minimally.	human activities have impacted zone a great deal.  5 4 3 5 4 3	or no riparian vegetation due to human activities.	
Buffer Width Floodplain	activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.  Left Bank 10 9	human activities have impacted zone only minimally.	human activities have impacted zone a great deal.	or no riparian vegetation due to human activities.	
Buffer Width Floodplain	activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.  Left Bank 10 9  Right Bank 10 9  Predominant floodplain vegetation type	human activities have impacted zone only minimally.   8 7 6  8 7 6  Predominant floodplain vegetation	human activities have impacted zone a great deal.  5 4 3 5 4 3  Predominant floodplain vegetation type is shrub or old	or no riparian vegetation due to human activities.  2 1 0 2 1 0 Predominant floodplain vegetation	
BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN	activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.  Left Bank 10 9  Right Bank 10 9  Predominant floodplain vegetation type is mature forest	human activities have impacted zone only minimally.    8 7 6  8 7 6  Predominant floodplain vegetation type is young forest	human activities have impacted zone a great deal.  5 4 3 5 4 3  Predominant floodplain vegetation type is shrub or old field	or no riparian vegetation due to human activities.  2 1 0 2 1 0  Predominant floodplain vegetation type is turf or crop land	
BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN	activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.  Left Bank 10 9  Right Bank 10 9  Predominant floodplain vegetation type is mature forest  20 19 18 17 16  Even mix of wetland and non-wetland habitats, evidence of standing/ponded	human activities have impacted zone only minimally.   8 7 6  8 7 6  Predominant floodplain vegetation type is young forest  15 14 13 12 11  Even mix of wetland and non-wetland habitats, no evidence of	human activities have impacted zone a great deal.  5 4 3 5 4 3  Predominant floodplain vegetation type is shrub or old field  10 9 8 7 6  Either all wetland or all nonwetland habitat, evidence of	or no riparian vegetation due to human activities.  2 1 0 2 1 0 Predominant floodplain vegetation type is turf or crop land  5 4 3 2 1 0  Either all wetland or all nonwetland habitat, no evidence of	
Buffer	activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.  Left Bank 10 9  Right Bank 10 9  Predominant floodplain vegetation type is mature forest  20 19 18 17 16  Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	human activities have impacted zone only minimally.    8 7 6  8 7 6  Predominant floodplain vegetation type is young forest  15 14 13 12 11  Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	human activities have impacted zone a great deal.  5 4 3 5 4 3  Predominant floodplain vegetation type is shrub or old field  10 9 8 7 6  Either all wetland or all nonwetland habitat, evidence of standing/ponded water	human activities.  2 1 0 2 1 0  Predominant floodplain vegetation type is turf or crop land  5 4 3 2 1 0  Either all wetland or all nonwetland habitat, no evidence of standing/ponded water	

# Severe Bank Erosion

ER

		0 1			1	
WATERSHED/SUBS	· Jawa	Brk		DATE://		ASSESSED BY:
SURVEY REACH:	TBOI.		15 AM/PM	<b>РНОТО ID</b> (САМ	ERA-PIC#)	: /#
SITE ID: (Condition-	#) START LAT L	11.49.26	" Long <u>72 ° 2</u>	9:15"	LMK	GPS: (Unit ID)
ER-OL	END LAT_	<u> </u>	" LONG°_	1 11	LMK	
PROCESS:	Currently unknown	BANK OF CO	ONCERN. TIT	RT Both (la	ooking down	Istraam)
Downcutting	Bed scour	LOCATION:	Meander bend	Straight section	Steep slo	ope/valley wall  Other:
Widening	Bank failure	DIMENSIONS			-	
Headcutting	Bank scour	Length (if no	GPS) LTft	and/or RT_5	<u>O</u> ft	Bottom width 15 ft
Aggrading	Slope failure	Bank Ht	LTft	and/or RT	<u>O_ft</u>	Top width 20 ft
Sed. deposition	Channelized	Bank Angle	LT	° and/or RT <u>9</u> 0	2 .	Wetted Widthft
LAND OWNERSHII	Private Public	Unknown	LAND COVER	Forest Fi	ield/Ag [	Developed:
		7		7-2		
	ORATION CANDIDATE		, ç	🕻 Bank stabilization		
□ No		Other				
THREAT TO PROP	ERTY/INFRASTRUCTI	JRE: No	Yes (Describ	pe):		,
EXISTING RIPARIA	AN WIDTH:	<b>⊠</b> ≤25 ft	25 - 50 ft [	☐ 50-75ft ☐ 75-	100ft [	]>100ft
EROSION	Active downcutting; tall ban of the stream eroding at a fa		Pat downcutting evide	ent, active stream		
SEVERITY(circle#)	contributing significant amo	unt of sediment to	widening, banks activ moderate rate; no thre	ely eroding at a		vidth stable; isolated areas of bank on; likely caused by a pipe outfall, local
Channelized= 1	stream; obvious threat to pr infrastructure.	operty or	infrastructure	eat to property or		red riparian vegetation or adjacent use.
	5		4 3	>	2	1
Access:	Good access: Open area in ownership, sufficient room to		Fair access: Forested		Difficult acc	cess. Must cross wetland, steep slope or ve areas to access stream. Minimal
	materials, easy stream char heavy equipment using exis	nnel access for	adjacent to stream. An removal or impact to I	andscaped areas.	stockpile are	as available and/or located a great
	trails.		<u> </u>	or distant from stream.	equipment re	n stream section. Specialized heavy equired.
Normal Change Cha	5		1) 3		2	1
NOTES/CROSS SEC	CTION SKETCH:					
	\	, )				
		1 16	Sank being			
	\	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	01:1-1	\(		
	\	1	stabilized trees, roi are ha out of	. 69		
	1 8		trees mi	itc'		
	Siran					
	1 2		are na	nging		
	S	1 Saly	out of	blank		:
	1	/ /				
	i					
1					REPORTED	TO AUTHORITIES YES NO

WATERSHED	SUBSHED: JANTUV	lucker		DATE:(	11108	ASSE	SSED BY: KB		
URVEY REA	CHID: TB'01	TIME: 4:60			<b>):</b> (Camera-Pic	: #)	/#		
SITE ID: (Con	dition-#) SC-QU LAT	41.49.18	" Long <u>7</u>	2.29	12" LI	МК	GPS (Unit ID)		
TYPE: X Roa	TYPE: X Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other:								
FOR ROAD/ RAILROAD	SHAPE:  Arch Bottomless  Box Elliptical  Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL:  ☐ Concrete ☐ Metal ☐ Other:	Ď Flo	NMENT:  ow-aligned  ot flow-aligned  o not know	Barrel dia	Height: (ft)		
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosion Sediment deposition Other (describe):	n		IXI Fla	VERT SLOPE: at light (2° – 5°) ovious (>5°)	Culvert le	ength:(ft) Width:(ft) elevation:(ft)		
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re			placement 🔲 (	Jpstream s	torage retrofit		
Is SC ACTING	G AS GRADE CONTROL	No □Y	es 🔲 Unkr	nown					
	EXTENT OF PHYSICAL BLO	CKAGE:		BLC	OCKAGE SEVER	RITY: (circ	ele #)		
If yes for fish barrier	☐ Flow too shallow Water D	rop: (in) epth: (in)	A structure such a road culvert on a 3 greater stream blo upstream moveme anadromous fish; passage device pr	Brd order or ocking the ent of no fish resent.	A total fish blocka tributary that wou significant reach of or partial blockage interfere with the anadromous fish.	Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.		
NOTES/SKET									
NOTES/SKETCH:  NOTES/SKETCH:  Pooling  Sworing									
 			Cenut		Repor	TED TO AU	THORITIES ☐ YES ☐ NO		

~~ t	Crossing
STraam	Traccina
JUVUIII	

Stream Crossing	SC
-----------------	----

			Λ.				Strea	am Cros	ssing	
WATERSHEL	o/subshed: "	Tanter	Lucker	-	Da	ге:	11 108	ASSE	SSED BY	: LB
URVEY REA		801	TIME: 3:57	AM/M			: (Camera-Pic		/#	
SITE ID: (Cor	ıdition-#) SC-	03 LAT	41.29.2	_" Long ]	20	19.	14" LI	ик	GP	S (Unit ID)
		1								
TYPE: X Ro	ad Crossing	Railroad Crossi	ng Manmade I	Dam Beav	er Da	ım 🔲	Geological Forn	nation 🔲	Other:	
FOR ROAD/ RAILROAD	SHAPE: Arch Box Circular Other:	⊠Bottomless ☐ Elliptical	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		☐ Flo	NMENT: w-aligned t flow-aligned not know	Barrel dia	meter: Height:	variable, sketch) (ft) (ft)
CROSSINGS ONLY		=	n 💆 Downstrean ☐ Failing emb			CULVERT SLOPE:  ☐ Flat  ☐ Slight (2° – 5°)  ☐ Obvious (>5°)			Width:	
POTENTIAL :	RESTORATIO	N CANDIDATE	Fish barrier re Local stream	,		epair/rep	olacement 🔲 U	Jpstream st	torage ret	rofit
IS SC ACTIN	G AS GRADE	CONTROL	No □ Y	es 🔲 Unl	cnowr					
		PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVER	HTY: (circ	le #)	
☐ Flow too shallow Water Depth:(i		rop:(in)	A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		der or the h t.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.		
				5			4 3		2	1
Drop too high Water Drop:(in) anadromous fish; no fish passage device present. Or pattern blockage that may interfere with the migration of anadromous fish. Very little viable his relation of anadromous fish.										
Ĺ							Repor	TED TO AU	THORITII	es 🗌 Yes 🔲 No

WATERSHED/SUBSHED: Twhen The			DATE: 7/ 1/09 ASSESSED BY: DB				
SURVEY REACH ID: TR-0 TIME: 3:15 AMAPM			Рното ID: (Camera-		/#	D.D	
SITE ID (Condition#): (				DNG-12° 29 1 14			GPS: (Unit ID)
						<u> </u>	G15. (Chil 1D)
BANK:  LT RT Head  FLOW:  None Trickle  Moderate	TYPE: Closed pipe	MATERIAL: Concrete PVC/Plastic Other:		SHAPE: Single Circular Doub Triple Other:	le	VSIONS: er:_\	SUBMERGED: No Partially Fully
Substantial Other:	Open channel	☐ Concrete ☐ E ☐ Other:	arthen		Depth: Width (Top): " (Bottom):		NOT APPEICABLE
CONDITION:  ☐ None  ☐ Chip/Cracked  ☐ Peeling Paint	ODOR: No Gas Sewage Rancid/Sour	DEPOSITS/STAINS  None  Oily  Flow Line	s:	VEGGIE DENSITY:  None  Normal Inhibited	PIPE BE Brown Other	NTHIC GRO	WTH: None  Green
☐ Corrosion ☐ Other:	Sulfide Other:	Paint		Excessive Other:	☐ Good	UALITY: Z Odors [ Algae [	Colors Oils
	orry: None	Slight Clouding Sewage (toilet astic bags)	ess [	☐ Cloudy ☐ Opaque tc.) ☐ Petroleun (bulk) ☐ Excessiv	Orange [1]  1 (oil sheen)  1 Sedimentat		
POTENTIAL RESTORA	TION CANDIDATE	Discharge inves	stigatior	Stream daylighting	Local str	ream repair/ou	ıtfall ştabilization
If yes for daylighting:		Storm water retr	ofit	Other: Remarl	. Doesn	1 seem	to have use
Length of vegetative cover	er from outfall:	ft Type	of existi	ng vegetation:			
Thurse for atomics		· · · · · · · ·				вторе	
If yes for stormwater:  Is stormwater currently co	ontrolled?	I and I	Ina dass	cription:			
Yes No Not			vailable		-		
SEVERITY: stroic com stres	ny discharge with a disti ng smell. The amount of npared to the amount of n am; discharge appears to ificant impact downstrea	discharge is significant normal flow in receiving to be having a	discharg discharg	scharge; flow mostly clear and e has a color and/or odor, the a e is very small compared to the any impact appears to be mino	mount of stream's base	discharge; sta	ot have dry weather ining; or appearance recosion problems.
Crypton cyy/NI om-	5	4		3		2	(1)
SKETCH/NOTES:			-01				
					REPORTED TO	O AUTHORITIE	ES: YES NO

_	
1 )	

WATERSHED/SUBSHED:	Tucker		DATE: 7/1/0	ASSESSED BY:	ICB
SURVEY REACH ID: 7	TIM	E: 3:45 AM/PM	<b>РНОТО ID:</b> (Camera-Pi	ic #) /#	
SITE ID (Condition-#): OT-	02_ LAT	41.49.22 "L	ONG 720 29 13		GPS: (Unit ID)
FLOW:  None Trickle	YPE:  Closed pipe	MATERIAL:  Concrete Metal  PVC/Plastic Brick  Other:	SHAPE: Single Double Deliptical Triple Other:	DIMENSIONS: Diameter: (i	SUBMERGED:  No  Partially  Fully
Moderate Substantial Other:		☐ Concrete ☐ Earthen☐ Other:	Parabolic W	repth: 36(in)  /idth (Top): 544(in)  ' (Bottom): (in)	NOT APPEICABLE
Chip/Cracked Peeling Paint	Gas V Sewage Rancid/Sour I Sulfide	DEPOSITS/STAINS:  None Oily Flow Line Paint Other:	VEGGIE DENSITY:  None  Normal Inhibited Excessive Other:	PIPE BENTHIC GH Brown Ora Other:  POOL QUALITY: Good Odors Suds Algae Other:	nge
	ES: None  Frash (paper/plast.  egular Maintenan	☐ Slight Cloudiness ☐ Sewage (toilet paper, of the bags) ☐ Dumping Ice ☐ Bank Ero	Cloudy Opaque etc.) Petroleum ( (bulk) Excessive sion Other:	Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red Orange Red	Other:
If yes for daylighting:	1	Storm water retrofit	Other:		/outrail stabilization
Length of vegetative cover from	om outfall:	ft Type of exist	ing vegetation:	Slope;	. 0
If yes for stormwater:  Is stormwater currently contro  Yes No No Not invest		Land Use des Area available	•		-
SEVERITY: strong sm compared stream; di	scharge with a distinct nell. The amount of die d to the amount of nor lischarge appears to b t impact downstream.	scharge is significant discharge is significant discharge mal flow in receiving be having a	scharge; flow mostly clear and od ge has a color and/or odor, the am ge is very small compared to the st I any impact appears to be minor /	ount of discharge;	es not have dry weather staining; or appearance any erosion problems.
SKETCH/NOTES:	5	4	3	2	1
	iwaler ot	- from highwa	y - entrance i	nould be > 7	200ft lam
			R	EPORTED TO AUTHORI	TIES: YES   NO

WATERSHED	subshed: tucher l	3K		TE:	1) 104	•	SSED BY: DE	
URVEY REA	CONTROL OF SAN THE CONTROL OF SANSAN AND A CONTROL OF THE CONTROL	TIME: 3 : 70			: (Camera-Pic	c #)	# 39	
SITE ID: (Con	dition-#) SC- <u>()</u> LA	r 110 4012	5" LONG 72°	29.	15 " L	MK	GPS (Unit ID)	
TYPE: Roa	ad Crossing	ssing	Dam 🔲 Beaver D	am 🔲	Geological Forr	nation [	Other:	
FOR ROAD/ RAILROAD CROSSINGS	SHAPE: Arch Bottomless Box Elliptical Circular Other: Awarded	# BARRELS:   Single   Double   Triple   Other:	MATERIAL: Concrete Metal Other:	Flo No Do	NMENT: ow-aligned t flow-aligned not know	DIMENS Barrel dia	Height: NA (ft)	
ONLY	CONDITION: (Evidence of)  Cracking/chipping/corros  Sediment deposition  Other (describe):			☐ Fla ☐ Sli	t tght $(2^{\circ} - 5^{\circ})$ vious $(>5^{\circ})$		Width:(ft) elevation:(ft)	
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re ☐ Local stream	emoval	epair/rep	olacement 🔲 t	Jpstream s	torage retrofit	
Is SC ACTING	G AS GRADE CONTROL	Y ONK	es Unknow					
If yes for fish barrier				A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.  A total fish blockag tributary that wou significant reach or partial blockag interfere with the anadromous fish.			A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
) 		ENCROACHO	MILT 5		1 3		2 1	
V Other * Lough Ald * 100 acts								
7					REPOR	TED TO AU	THORITIES TYES TNO	

Stream Crossing

SC

WATERSHED	SUBSHED: Janteir	lucker		DATE: <u>7</u>	1 1 08	ASSE	ESSED BY: KB	
URVEY REACH ID: TBO TIME: 3:20 AMPM PHOTO ID: (Camera-Pic #) /#								
SITE ID: (Con	dition-#) SC-1992 07 LA	т 41049.2	4" LONG 77	- 29	<u> 14"</u> L	MK	GPS (Unit ID)	
TYPE: Ros	nd Crossing Railroad Cro	ssing  Manmade	Dam Beaver	r Dam	Geological For	nation	Other:	
FOR ROAD/ RAILROAD	SHAPE:  Arch Bottomless Box Elliptical Circular Other:	#BARRELS:	MATERIAL:  ☐ Concrete ☐ Metal ☐ Other:	ALIGI	NMENT: ow-aligned t flow-aligned not know		IONS: (if variable, sketch)	
CROSSINGS ONLY	CONDITION: (Evidence of  Cracking/chipping/corros  Sediment deposition  Other (describe):	* -	m scour hole	CULV ☐ Fla ☑ Sli	ERT SLOPE: tt ght (2° – 5°) vious (>5°)	Culvert le	width: (ft) Well (ft) Well (ft) Well (ft)	
POTENTIAL I	RESTORATION CANDIDATI	Fish barrier r  Local stream	emoval		olacement 🔲 I	Jpstream s	torage retrofit	
IS SC ACTING	G AS GRADE CONTROL	□No □Y	es 🔲 Unkno	own				
If yes for fish barrier	EXTENT OF PHYSICAL BLOCKAGE:  Total Partial Temporary Unknown  A structure such as a dam or road culvert on a 3rd order or greater stream blocking the greater stream blocking the greater stream blocking the greater stream with						A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
NOTES/SKET		,	5		4) 3		2 1	
		ALWAY						
REPORTED TO AUTHORITIES YES PINO								
<u> </u>					Repor	TED TO AU	THORITIES TYES NO	

Impacted Buffer

IB

Tucker						Impac	ted Bu	ifter	ID
WATERSHED/SUBSHED: Fanker BR	K				DATE:	7/1/0	8 Ass	ESSED I	BY: KB
JRVEY REACH: TBOI	TIM	ме: <u> З</u>	: <u>04</u> AM/	M)	Рното	ID: (Camera-l	Pic #)	/	# 35,36
SITE ID: (Condition-#) START LAT	1049.2	1 <u>7"</u> L	ONG 72	29	116"	LMK			(Unit ID)
IB-OL END LAT_	o •	" L	ONG	·	1 11	LMK			
IMPACTED BANK: REASON INADE	QUATE: □ I □ R	Lack of Recently	vegetation 🔏 planted 🛭 🖸	【】Too 【] Oth	narrow   er: Brid	] Widespread i ge abutv	nvasive p	lants	المصمدما
LAND USE: Private Instit	utional Go	olf Cour	rse Park	Ot	her Public	JE STEELS	<u> </u>	10000	0-200
(Facing downstream) LT Bank				]	<u> </u>				
RT Bank		T. 67			<u> </u>				
DOMINANT Paved Ba  LAND COVER: LT Bank	are ground	Turf/law ⊠	n Tall g	rass T		ub Trees	Other		
RT Bank			<u> </u>	] ]			□:   <b>X</b> 1-	Pas.	>WAY
	Rare	☐ Pa	artial coverag	ge	Exte	ensive coverage	Unk		5 60 / 7
STREAM SHADE PROVIDED? None	☐ Partial		Full V	VETLA	ands Pre	ESENT? No	ΠY	es 🔲 U	Jnknown
POTENTIAL PERMONENTAN CANADA TO	F7L				. 4-				
POTENTIAL RESTORATION CANDIDATE  no	☐ Other:	torestation	on []Green	way d	esign [X]	Natural regener	ation [_]	Invasive	es removal
RESTORABLE AREA			Impacted area	on pub	olic land	Impacted area on ei	ther	Impacted	area on private
B1 5/14 51	FORESTATIO	ON	where the ripa not appear to l			public or private land presently used for a	<b>I</b>		re road; building ment or other
Zengin (10)	TENTIAL: rcle #)		specific purpos	se; plen	ity of	purpose; available a	• 1	feature si	gnificantly limits
"(idth (ft): 20 3	icie #)	-	area available	for plar		planting adequate			area for planting
POTENTIAL CONFLICTS WITH REFORESTA	TION			•	4	3			<u>(1)</u>
Poor/unsafe access to site DExisting imp		☐ Sev	despread inva ere animal in	asive p npacts	plants L s (deer, be	☐ Potential conta aver) ☐ Other		ı [_] La	ack of sun
NOTES:							-	300 5.	
left bank could by 40 ft ups	9 100cl	co d	0	1	,	a 1			
40 ft nost	Jean h	recx Vac	acre is	€~t	- hy	grass/5	crub	-01	1
Maht bank has	bridge	aby	Alven.	L ca	outvu	ent app	104 1	15 +t	long
\	f		or vo co	i	no	)0551blQ	1627	ovati	ν <b>ν</b> '
					1				
	•								
1									
		10							
	Concr	en							
*// {									
Contract of the second of the									
Sept of the sept o	11 0,00	145	\ \						
	11 1	,							
1 2 2 1	qra	W		,					
	1)		1/						
Land 1									

### Reach Level Assessment



SURVEY REACH ID	: <u>13-02</u>	WTRSHD/SUBSHD:	TUCKED GK	DATE: 7/ 1/08	ASSESSED BY:
START TIME:		PM LMK:	END TIME:_	:AM/PM	1K: GPS ID:
LATMI O MO 1	<u>5</u> " Lond	3720291111	LAT°'	" Long°	1 11
DESCRIPTION:			DESCRIPTION:		
RAIN IN LAST 24 HOUR	RS Heavy ra	in	PRESENT CONDITIONS	☐ Heavy rain ☐ Stea	ady rain   Intermittent
□ None	☐ Intermitt		☐ Clear	☐ Trace ☐ Ov	-
SURROUNDING LAND U	use: 🗆 Indust	rial   Commercial	☐ Urban/Residential [		
	$\Box$ Golf $\circ$	course		☐ Pasture ☐ Oth	
AVERAGE C	CONDITIONS (	check applicable)	REACH S	KETCH AND SITE IMPA	ACT TRACKING
	∆ 0-25%	□ 50%-75%	Simple planar sketch of	f survey reach. Track location	ons and IDs for all site impacts
CHANNEL WIDTH	□25-50 %	□ 75-100%	features d	cn (O1, ER, 1B,SC, U1, 1R, 1 eemed appropriate.  Indicate	MI) as well as any additional edirection of flow
DOMINANT SUBSTRAT	_	G 111 (0 f 10)		**	
☐ Silt/clay (fine or sli ☐ Sand (gritty)		Cobble (2.5 –10") Boulder (>10")			
Gravel (0.1-2.5")		Bed rock			
Witness Co.	(Class Floor	1.11.2	+		:
WATER CLARITY D					
☐ Other (chemicals, dye		□ Opaquo (milky)			
A OVERNO DE LA MOS	Attached: An	one □ some □ lots	_	To a find a special section of the s	
1	96 4	one $\square$ some $\square$ lots		The state of the s	
1	Evidence of)	one 🗆 some 🗀 iots			
	∃ Fish □ Be	aver 🛮 Deer			
AROUND STREAM	☐ Snails ☐ Ot				
		ed (≥75% coverage)			
	☐ Halfway (≥5)☐ ☐ Partially shad			**************************************	
_	☐ Unshaded (<			holds water sec	
[ C	Downcuttin	g Bed scour		AA	
CHANNEL DYNAMICS	Widening	Bank failure			
DYNAMICS	Headcutting				
Unknown	Aggrading	Slope failure	and the second		
	Sed. deposit			A-64.	
CHANNE H	Height: LT ban	k <u>2</u> (ft)		weeklaba	
CHANNEL DIMENSIONS	RT ban	~~	SE SECTION CONTRACTOR	**Ontabil for	
(FACING V	Width: Bottom	100	15/345452E	Volume	
DOWNSTREAM)	Тор	20 (ft)	chasevases	bassahan Marka	
REA	ACH ACCESSIBI		CARROLL SALES	vedician	
Good: Open area in	air: Forested or	Difficult. Must cross	5. Orași	est particularly.	
public ownership,	eveloped area djacent to stream.	wetland, steep slope, or	Eggithative	position of the state of the st	
	ujacent to stream. ccess requires tree	sensitive areas to get to stream. Few areas to	, the second of	Associate of posts	
easy stream channel re	emoval or impact to	stockpile available	a de la constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della constantina della cons	#Boat (Announce)	
access for neavy St	ndscaped areas. tockpile areas	and/or located a great distance from stream.	1	A STATE OF THE PROPERTY OF THE	
existing roads or trails.	mall or distant from	Specialized heavy	Managing of the State of the St		
5 4	ream.	equipment required.			
NOTES: (biggest problem		ey reach)		TV 61	AAVA A
	1001	1. 12/11/ T	7-10-11	TB-01	IMITED
NW	NU	WAN	4/CH -	- IRHU	March
		and the same of th	gr	REPORTED TO A	AUTHORITIES YES NO
	V5X	/			- Lund 170

	Optimal	Suboptimal	Marginal	Poor		
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamban surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)  Banks stable; evidence of erosion or bank failure absent or minimal little potential for future problems <5% of bank affected.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20/ 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	OVER	ALL BUFFER AND FLOODPLA	IN CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN Encroach-	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on		
MENT	20 19 18 17 16	15 14 13 12 11	effect on floodplain function	floodplain function		

### Reach Level Assessment

RCH

SURVEY REACH ID: 18-63 WTRSHD/SUBSHD: 100	DATE: 7/1 /OF ASSESSED BY:
START TIME: 900 AM/PM LMK:	END TIME: 1/2: 1770 AM/PM LMK: GPS ID:
LAT 10 44 15 " LONG 72 29 1 14 "	LATU . 46 . 44" LONG 70. 79 " PARK
DESCRIPTION: IND OF 785. LU	DESCRIPTION: PLANNER RD
RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent
□ None □ Intermittent □ Trace	Clear
SURROUNDING LAND USE:   Industrial   Commercial   Golf course   Park	☐ Urban/Residential   Suburban/Res ☐ Forested ☐ Institutional
AVERAGE CONDITIONS (check applicable)	☐ Crop ☐ Pasture ☐ Other:  REACH SKETCH AND SITE IMPACT TRACKING
Base Flow as % □ 0-25% □ 50%-75%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts
Channel Width □25-50 % □ 75-100%	within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE  Silt/clay (fine or slick)  Sand (gritty)  Gravel (0.1-2.5")  □ Boulder (>10")  □ Bed rock	Tous-65th PIRFLINE Weared (ALC-INGLEN)
WATER CLARITY ☐ Clear ☐ Turbid (suspended matter) ☐ Stained (clear, naturally colored) ☐ Opaque (milky) ☐ Other (chemicals, dyes)	Weared
AQUATIC PLANTS Attached: ☐ none ☐ some ☐ lots IN STREAM Floating: ☐ none ☐ some ☐ lots	
WILDLIFE IN OR AROUND STREAM  (Evidence of)  (E) Fish  Beaver  Deer  (B) Snails  Other:	1300
Mostly shaded (≥75% coverage)  STREAM SHADING ☐ Halfway (≥50%)  (water surface) ☐ Partially shaded (≥25%)  ☐ Unshaded (<25%)	13-0
CHANNEL Downcutting Bed scour	L/V
DYNAMICS Widening Bank failure Headcutting Bank scour	( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )
Unknown  Aggrading Sed. deposition  Channelized	18-10 ON 35-100
CHANNEL Height: LT bank (ft)	
DIMENSIONS RT bank (ft)	
(FACING DOWNSTREAM) Width: Bottom (ft)	The second of th
Top	
REACH ACCESSIBILITY  Good: Open gree in Fair: Forested or Difficult. Must cross	(heard)
bublic ownership developed area wetland, steep slope, or	( beard)
sufficient room to adjacent to stream. sensitive areas to get to	
easy stream channel landscaped areas stockpile available and/or located a great	The state of the s
equipment using Stockpile areas distance from stream.	138.57
existing roads or trails. small or distant from stream. Specialized heavy equipment required.	A Company of the Comp
5 4 3 2 1	
NOTES: (biggest problem you see in survey reach)	
LINA COLOR	
NOTES: (biggest problem you see in survey reach)	Reported to authorities 🗌 Yes 🖟 No

	Optimal	Suboptimal	Marginal	Poor		
IN-STREAM HABITAT Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).		40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamban surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	3 4 3	2 1 0		
	Right Bank 10 9	8 7	3 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to propert or infrastructure.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: littl or no riparian vegetation due to human activities.		
			1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1			
	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0		
	Left Bank 10 9 Right Bank 10 9	8 7 6 8 7 6	5 (4) 3	2 1 0 2 1 0		
		8 7 6  Predominant floodplain vegetation type is young forest		2 1 0		
	Right Bank 10 9  Predominant floodplain vegetation type	8 7 6 Predominant floodplain vegetation	5 4 3 Predominant floodplain vegetation type is shrub or old	2 I 0  Predominant floodplain vegetatio		
VEGETATION  FLOODPLAIN	Right Bank 10 9  Predominant floodplain vegetation type is mature forest	8 7 6  Predominant floodplain vegetation type is young forest	5 4 3  Predominant floodplain vegetation type is shrub or old field	2 1 0  Predominant floodplain vegetation type is turf or crop land		
VEGETATION  FLOODPLAIN	Right Bank 10 9  Predominant floodplain vegetation type is mature forest  20 19 18 17 16  Even mix of wetland and non-wetland habitats, evidence of standing/ponded	Predominant floodplain vegetation type is young forest  15 14 13 12 11  Even mix of wetland and non-wetland habitats, no evidence of	5 4 3  Predominant floodplain vegetation type is shrub or old field  10 9 8 7 6  Either all wetland or all nonwetland habitat, evidence of	Predominant floodplain vegetation type is turf or crop land  5 4 3 2 1 0  Either all wetland or all nonwetland habitat, no evidence of		
FLOODPLAIN VEGETATION FLOODPLAIN HABITAT FLOODPLAIN ENCROACH- MENT	Right Bank 10 9  Predominant floodplain vegetation type is mature forest  20 19 18 17 16  Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Predominant floodplain vegetation type is young forest  15 14 13 12 11  Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	5 4 3  Predominant floodplain vegetation type is shrub or old field  10 9 8 7 6  Either all wetland or all nonwetland habitat, evidence of standing/ponded water	Predominant floodplain vegetation type is turf or crop land  5 4 3 2 1 0  Either all wetland or all nonwetland habitat, no evidence of standing/ponded water		

$\mathbf{O}$	T
	_

WATERSHED/SUBSHED: TUCKEY				DATE: 7/1 /08 ASSESSED BY: KMB				
SURVEY REACH ID:		ME: 0: 00 AGA/PM		Рното ID: (Camera-Pi		/#		
SITE ID (Condition-#): O	T- <u>01</u> L	AT 410 48, 46	t"Lo	NG 72° 29' 7"	LMK_		GPS: (Unit ID)	
	1							
BANK:  LT TRT Head  FLOW:  None Trickle	TYPE: Closed pipe	MATERIAL:  Concrete  PVC/Plastic  Other:	Metal Brick	SHAPE: Single Double Dilpitical Triple Other:	DIMENSI Diameter:	ions:	SUBMERGED:  No Partially Fully	
Moderate Substantial Other:	Open channel	Concrete Ea	arthen	☐ Trapezoid Di	epth: idth (Top): (Bottom):		NOT APPENCABLE	
CONDITION:  None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS  None  Oily  Flow Line  Paint  Other:	S:	VEGGIE DENSITY:  ✓ None  ☐ Normal  ☐ Inhibited  ☐ Excessive  ☐ Other:	Brown Other:  POOL QU. Good [	☐ Orang  ALITY: [€ ☐ Odors ☐	_	
CONCERNS: Need	ITY: Non BLES: Non ess Trash (paper/pl. ls Regular Mainter	e Slight Clouding e Sewage (toilet) astic bags) Do nance Ba	paper, e umping nnk Eros	(bulk) Excessive	oil sheen) Sedimentatio	□ Øt on	her:	
If yes for daylighting:		Storm water retr	OIII	☐ Other:				
	r from outfall:	ft Type	of existi	ng vegetation:	***************************************	Slope: _	0	
If yes for stormwater:  Is stormwater currently co  ☐ Yes ☐ No ☐ Not			Use desc vailable	cription: ::				
SEVERITY: stroit communication street	vy discharge with a dis ng smell. The amount of pared to the amount of am; discharge appears ificant impact downstre	of discharge is significant normal flow in receiving to be having a	discharg discharg	scharge; flow mostly clear and oc e has a color and/or odor, the am e is very small compared to the st any impact appears to be minor /	ount of tream's base	discharge; st	not have dry weather aining; or appearance ny erosion problems.	
	5	4		3	2	2	<u> </u>	
SKETCH/NOTES:								
)				R	EPORTED TO	AUTHORIT	IES: YES NO	

Impacted Buffer IB

WATERSHED/SUBSHED: TUCKER DATE: 7/1/08 ASSESSED BY: KMB
URVEY REACH: TBOS TIME: 9: 45 AMPM PHOTO ID: (Camera-Pic #) /#
SITE ID: (Condition-#) START LAT 4 048 46" LONG 72 029 10" LMK GPS: (Unit ID)
IB-03 END LAT 41 ° 45' 44" LONG 72 ° 29' 7" LMK
IMPACTED BANK:  LT TRT Both  REASON INADEQUATE: Lack of vegetation Too narrow Widespread invasive plants  Recently planted Other:
LAND USE: Private Institutional Golf Course Park Other Public
(Facing downstream) LT Bank \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
RT Bank D
DOMINANT Paved Bare ground Turf/lawn Tall grass Shrub/scrub Trees Other  LAND COVER: LT Bank □ □ □ ☒ □ □: ATV tvai\
RT Bank
INVASIVE PLANTS: None Rare Partial coverage Extensive coverage unknown
STREAM SHADE PROVIDED? None Partial Full WETLANDS PRESENT? No Yes Unknown
POTENTIAL RESTORATION CANDIDATE Active reforestation Greenway design Natural regeneration Invasives removal  Other:
Program in the Annual Control of the Annual
impacted area on private impacted area on enter impacted area on private
Length (%):  POTENTIAL: not appear to be used for any presently used for a specific encroachment or other
Specific purpose; plenty of area available area for planting adequate available area for planting available area f
5 4 3 2 1
POTENTIAL CONFLICTS WITH REFORESTATION
Notes:

Impacted Buffer IB

WATERSHED/SUBSHED: TUCK	1		DATE: 7/1 /08	1 M P
URVEY REACH: 1803		9:29 AM/PM		ASSESSED BY: KMB
	AT 41 ° 48 ,49 "		<b>Р</b> ното <b>ID</b> : (Camera-Pic ‡	#) /#6,7 GPS: (Unit ID)
			THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE P	- GIS. (Onti 1D)
<b>IB-</b> 02, END L	AT''	Long°	<u>'" LMK</u>	-
IMPACTED BANK: REASON IN LT RT Both		of vegetation 🔯 To	o narrow  Widespread invas	sive plants
LAND USE: Private (Facing downstream) LT Bank □	Institutional Golf C	ourse Park O	ther Public  M: AtV trail?	
RT Bank 💢				
DOMINANT Paved  LAND COVER: LT Bank				ther ☑: [20€ □:
INVASIVE PLANTS: None	Rare	Partial coverage	Extensive coverage	unknown
STREAM SHADE PROVIDED? No.	ne Partial	Full WETL	ANDS PRESENT? █ No [	Yes Unknown
POTENTIAL RESTORATION CANDIDA no	ATE Active reforest	ation ZGreenway o	design 🔲 Natural regeneration	n Invasives removal
RESTORABLE AREA  Length (ft): 30  Vidth (ft): 20	REFORESTATION POTENTIAL: (Circle #)	Impacted area on pu where the riparian ar not appear to be use specific purpose; ple area available for pla	rea does public or private land that presently used for a specianting purpose; available area for planting adequate	ific encroachment or other feature significantly limits available area for planting
<u> </u>		5	4 (3)	2 1
POTENTIAL CONFLICTS WITH REFORM Poor/unsafe access to site Existin		Widespread invasive Severe animal impact	plants Potential contamin ts (deer, beaver) Other:	nation    Lack of sun
NOTES:	Stream Stream PATH (abundaned 1262)	150 ft ferns		
) )	Lect bank			

### Impacted Buffer

IB

WATERSHED/SUBSHED: Tucke	x		DATE: 7 / (	/ 08 Ass	SESSED BY: KMB
JRVEY REACH: 1303	Тіме: 9	: 27 MYPM	Рното ID: (Сате		/# 5
SITE ID: (Condition-#) START LA	17 41 °48 '50" I	LONG 17 29	'12' LMI	ζ	GPS: (Unit ID)
IB- <i>O(</i> END LA		LONG°	''' LMI	ζ	
IMPACTED BANK: REASON IN A	ADEQUATE: Lack of Recently			ead invasive p	plants
LAND USE: Private I (Facing downstream) LT Bank	nstitutional Golf Cou	rse Park Ot	her Public		A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PARTICLE AND A PART
RT Bank			<u>:</u>	···	
DOMINANT Paved  LAND COVER: LT Bank	Bare ground Turf/lav		Shrub/scrub Trees	Other ::	
INVASIVE PLANTS: None	Rare P	artial coverage	Extensive cover	age 🛣 unk	cnown
STREAM SHADE PROVIDED? Non	e 💹 Partial 🗌	Full WETL	ands Present? 🏹	No 🔲 Y	es Unknown
POTENTIAL RESTORATION CANDIDA no	TE	on Greenway d	esign 🗌 Natural reg	eneration	Invasives removal
LT BANK RT   Length (ft):   20	REFORESTATION POTENTIAL: (Circle #)	Impacted area on put where the riparian are not appear to be used specific purpose; pler area available for plan	ea does differ any presently used purpose; avail planting adequal	te land that is I for a specific able area for late	Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting
POTENTY I CONTINUE VOTE VICTOR IN THE POPULATION		5	4 (	3) 2	
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing	impervious cover Sev	despread invasive propertion of the design o	plants Potential s (deer, beaver) 💢	contamination Other: いんこん	Lack of sun
Notes:	The supprison of the second of	vere animai impacti	s (ueer, beaver)	Juner. Vasi	tential

# Severe Bank Erosion

ER

WATERSHED/SUB	shed: Tucker			DATE: 7 / 1	108	ASSES	SED BY: KMB
SURVEY REACH:		TIME: 9_:	05 MYPM	<b>РНОТО ID</b> (САМ	ERA-PIC#	<i>‡</i> ):	/#
SITE ID: (Condition-	+) START LAT _	11.48.51	" LONG 12° 2	9.13"	LMK		GPS: (Unit ID)
ER- <u>()  </u>	END LAT 4	1 . 48.50	" Long <u>72° 3</u>	9.12"	LMK		
Pro cress.	la ı	D		57 []			
PROCESS:	Currently unknown	BANK OF CO	NCERN: ∐ LT		ooking dow 	<i>'nstream)</i> :lone/vall	ev wall Cother
Downcutting Widening	☐ Bed scour ☐ Bank failure	DIMENSIONS			□ висер з	Tope/ van	cy wan Onici.
Headcutting	Bank scour			t and/or RT	5 ft	Botto	m width 5 ft
Aggrading	Slope failure	Bank Ht		t and/or RT	- 1		vidthff
Sed. deposition	Channelized	Bank Angle		° and/or RT			ed Width 5 ft
	P: Private Publi					☐ Devel	oped:
<b>D</b>							
POTENTIAL REST	ORATION CANDIDATE	E: Grade	/7	Bank stabilization			
THREAT TO PROP	ERTY/INFRASTRUCT	URE: No	Yes (Describ	oe): Shed			
EXISTING RIPARIA	AN WIDTH:	≤25 ft	<b>⊠</b> 25 - 50 ft [	☐ 50-75ft ☐ 75-	100ft [	>100f	t
EROSION	Active downcutting; tall ban of the stream eroding at a fa		Pat downcutting evide				
SEVERITY(circle#)	contributing significant amo	unt of sediment to	widening, banks activ moderate rate; no thr				le; isolated areas of bank caused by a pipe outfall, local
Channelized= 1	stream; obvious threat to pr infrastructure.	operty or	infrastructure	out to property of	scour, impa	aired riparia	an vegetation or adjacent use.
)	5 Good access: Open area i	n public	3		2	Mus	1
ACCESS:	ownership, sufficient room t	o stockpile	Fair access: Foreste adjacent to stream. A		other sensi	itive areas t	t cross wetland, steep slope or to access stream. Minimal
	materials, easy stream chai heavy equipment using exis		removal or impact to		stockpile au distance fro	reas availat om stream :	ble and/or located a great section. Specialized heavy
777	trails.		4 /3	<b></b>	equipment	required.	1
NOTES/CROSS SEC	CTION SKETCH:						
125 €	7 in 2 s	ech.		or X			
		ל מטווי ביי		March	/		
	$\int$		TAND O	. 57	1//		
	1			4 /	tool		
			/ *	584			
	$\wedge$	,	/	1 /	/		
/	$\sim$		\				
A	$\times$ /			1 7	/		
	$/$ $\wedge$ $\wedge$		/	// 5	(		
			<u> </u>	) Seen			
			Carion Region				
	$\wedge$	Var	3 Kg/	120			
( \			7				
1	· \	/		\			
. )	\		/ /	\			
Ĺ					REPORTE	D TO AUT	HORITIES YES NO

Stream Crossing SC

WATERSHED	SUBSHED: TUCKLY	Brk	D	ате: <u>7</u>	1108	ASSE	SSED BY: L	ins .	
URVEY REACH ID: 15 03 TIME::AM/PM					: (Camera-Pic	: #)	/# \	0	
SITE ID: (Con	SITE ID: (Condition-#) SC-01 LAT 41°48' 45" LONG 22°29'8" LMK_ GPS (Unit ID)								
TYPE: TRO	TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other:								
FOR ROAD/ RAILROAD	SHAPE:  Arch Bottomless Box Elliptical Circular Other:	# BARRELS: MATERIAL:  Single Concrete Double Metal Triple Other:		ete ☐ Flow-aligned ☐ Not flow-aligned ☐ Do not know  CULVERT SLOPE: ☐ Flat ☐ Slight (2° - 5°)		DIMENSIONS: (if variable, sketch)  Barrel diameter:(ft)  Height:(ft)  Culvert length:(ft)  Width:(ft)  Roadway elevation:(ft)		(ft)	
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosio  Sediment deposition  Other (describe):	n scour hole ankment	(ft)						
no	RESTORATION CANDIDATE	Local stream			placement 🔲 (	Jpstream s	torage retrofit		
IS SC ACTING	G AS GRADE CONTROL	□ No 🗓 Ye	es Unknov		CVACE SEVER	YTY (sing	1.4		
If yes for fish barrier	ish barrier CAUSE:			A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of A total fish tributary trib		ockage on a would isolate a ach of stream, chage that may the migration of fish.  A temporary bar beaver dam or a the very head of very little viable above it; natural as waterfalls.		a blockage at of a stream with e fish habitat	
NOTES/SKET	Other:		5		4 3		2	(1,)	
)		000 000 - 854	Cascade Son →	lder E Bi	s blocks				
					Repor	TED TO AU	THORITIES [	] Yes □ No	

Stream Crossing

SC

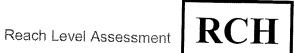
WATERSHED	/subshed: tucker f	brk	DA	те: <u></u> 7	1 108	> ASSE	SSED BY: KMB	
	URVEY REACH ID: TBO3 TIME: 9:54 60/PM					: #)	/# <b>[</b> [	
SITE ID: (Con	SITE ID: (Condition#) SC-02 LAT 4104 "LONG 72029 14" LMK GPS (Unit 1D)							
- A-								
TYPE: K Roa	nd Crossing Railroad Crossi						Other:	
For Road/	SHAPE:  Arch Bottomless Box Elliptical Circular	# BARRELS: Single Double	MATERIAL:	<b>⊠</b> Flo □ No	NMENT: ow-aligned t flow-aligned	Barrel dia		(ft) (ft)
RAILROAD	Other:	☐ Triple ☐ Other:	Other:	Do	not know			
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosion	n 🔲 Downstream	n scour hole	Fla		Culvert le		(ft)
	Sediment deposition Other (describe):	Failing emb			ght (2° – 5°) vious (>5°)	Roadway	elevation:	_(ft)
Domestor - T	DECEMBER AND AND AND AND AND AND AND AND AND AND				.1	T		
no	RESTORATION CANDIDATE	Local stream r			olacement [] (	Jpstream st	torage retrofit	
Is SC ACTING	G AS GRADE CONTROL	No ☐ Ye	es Unknow					
	EXTENT OF PHYSICAL BLO	CKAGE:	<u> </u>	BLO	CKAGE SEVEI	RITY: (circ	le #)	
If yes for fish barrier	Total Partial Unkno		A structure such as a croad culvert on a 3rd croad culvert on a 3rd croad culvert and block of the structure	rder or g the f	A total fish blocka tributary that wou significant reach or partial blockag	Id isolate a of stream, e that may	A temporary barrier such beaver dam or a blockage the very head of a stream very little viable is sheaking	e at n with at
	Flow too shallow Water D		anadromous fish; no fi passage device preser	nt.	interfere with the anadromous fish.	migration of	above it; natural barriers s as waterfalls.	such
NOTES/SKET			5		4 3		2 1	
NOTES/SKET	Cn.		triam	Ρ	HOEVIXS	<i>t</i> .		
<u> </u>					Repor	TED TO AU	THORITIES TYES	] No

### Reach Level Assessment



SURVEY REACH	m: K-off A	WTRSHD/SUBSHD:		DATE: 7/1	/OG ASSE	ESSED BY:
	ie: <u>10</u> :30 am/	PM <b>LMK:</b>	END TIME:	6:46 AM/PM	LMK:	GPS ID:
LATY O UG.	<u>44"</u> Lond	:42° 20'07"	LATU OUG	45" Long 1	0 1	<i>[</i> -
DESCRIPTION:	Muny Ed		DESCRIPTION:	7. No. 19. 19. 19. 19. 19. 19. 19. 19. 19. 19	- 12cm	F. T.
	VIUM NE NOIS				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	₹7 <b>A/</b> A
RAIN IN LAST 24 HO	ours 🗆 Heavy ra	•	PRESENT CONDITIONS	☐ Heavy rain	☐ Steady rain	n □ Intermittent
□ None	☐ Intermitte		Clear	☐ Trace	☐ Overcast	Partly cloudy
SURROUNDING LAN			☐ Urban/Residential		☐ Forested	☐ Institutional
	☐ Golf c		☐ Crop	Pasture	☐ Other:	
	E CONDITIONS (	check applicable)		SKETCH AND SI	66 St. 1982 P. C. S. S. S. S. S. S. S. S. S. S. S. S. S.	
BASE FLOW AS %	□ 0-25%	□ 50%-75%	Simple planar sketch	of survey reach. Tra	ck locations and	IDs for all site impacts vell as any additional
CHANNEL WIDTH	□25-50 %	₹ 75-100%	features	deemed appropriate.	Indicate direction	reu as any aaautonat On of flow
DOMINANT SUBSTR		C-1-1- (2.5 10H)				
Silt/clay (fine or Sand (gritty)		Cobble (2.5 –10") Boulder (>10")				
Gravel (0.1-2.5		Bed rock				
WATER CLARITY	O Clear O Tur	bid (suspended matter)				
☐ Stained (clear, n						
☐ Other (chemicals,	dyes)	— - Fudue (9)				
AQUATIC PLANTS	Attached: 🗆 n	one □ some ☒ lots				
IN STREAM		one 🗆 some 🗆 lots		Pond		
WILDLIFE IN OR	(Evidence of)		1			
AROUND STREAM	☐ Fish   Be					
	☐ Snails ☐ Ot		-	72		
STREAM SHADING	☐ Halfway (≥50	ed (≥75% coverage) 0%)		Beauty	(aux	
(water surface)	☐ Partially shad	ded (≥25%)				
	☐ Unshaded (<	25%)			, and the second	
CHANNEL	Downcutting	·   ===			range and a second	
DYNAMICS	☐ Widening ☐ Headcutting	Bank failure				
<b>₩</b>	Aggrading	Bank scour Slope failure				
Unknown	Sed. deposit				IN VASIV	ę
	Height: LT ban	l ₂ 7 (A)	-	Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Compan	specie	1
CHANNEL DIMENSIONS	RT ban	- Company		American Services	Incre	stream
(FACING	Width: Bottom				(N)	2 Lange Carlon
DOWNSTREAM)	Top	\(\frac{1}{5}\) (ft)				
	REACH ACCESSIBI	70-		Selection of the select		
Good: Open area in	Fair: Forested or	Difficult. Must cross	_		7	
public ownership,	developed area	wetland, steep slope, or		A Company of the Comp	The same of the sa	
sufficient room to stockpile materials,	adjacent to stream. Access requires tree	sensitive areas to get to stream. Few areas to			V /	
easy stream channel	removal or impact to landscaped areas.	stockpile available and/or located a great	All aurope and Confession Statement	comments.	1-564	A the company of the contract
access for heavy equipment using	Stockpile areas	distance from stream.	Brown 5)	a reconstruction of the state o	TOO	>
existing roads or trails.	small or distant from stream.	Specialized heavy equipment required.	Name and the second		A CONTRACTOR OF THE CONTRACTOR	
5 4	1 (3)	2 1			Me the second se	the entire the second displacement
NOTES: (biggest prob		•	è			
J Bea	ver dam	@ UPARCAIN	evd.			
		1				
				REPORT	TED TO AUTHOR	RITIES YES NO

·	Optimal	Suboptimal	Marginal	Poor	
N-STREAM HABITAT  (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lact of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 ③	2 1 0	
	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
		15 14 13 12 11  ALL BUFFER AND FLOODPLAI	10 9 8 7 6 N CONDITION	5 4 3 2 1 0	
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 /13 / 12 11	10 9 8 7 6	5 4 3 2 1 0	



SURVEY REACH ID: TBOYB WTRSHD/SUBSHD: TW	cker Brk	DATE: 1/1	A	SSESSED BY:	DRB
START TIME: 0:52 M/PM LMK:	END TIME:	1 : 28 AM/PM	LMK:		GPS ID:
LATU 048 43 " LONG 72°29 5 "	LAT41048,		7. 29.		0.010.
DESCRIPTION: ENTRALL TO BEAVER DAM	DESCRIPTION: (16	. 1 . 1	,		
	UC-	sipenifal be	gins		
RAIN IN LAST 24 HOURS  Heavy rain  Steady rain	PRESENT CONDITIONS	☐ Heavy rain	☐ Steady r	rain  Interm	nittent
None	☐ Clear	☐ Trace	☐ Overcas		
SURROUNDING LAND USE:   Industrial   Commercial   Golf course   Park		X)Suburban/Res □ Pasture	☐ Forested☐ Other:		
AVERAGE CONDITIONS (check applicable)	S Province and the second	SKETCH AND SIT		TRACKING	
BASE FLOW AS %       □ 0-25%       □ 50%-75%         CHANNEL WIDTH       ☑ 25-50 %       □ 75-100%	Simple planar sketch o within the survey rea	of survey reach. Trac sch (OT, ER, IB,SC,	ck locations ar UT, TR, MI) a	nd IDs for all si s well as any a	te impacts Iditional
DOMINANT SUBSTRATE  Silt/clay (fine or slick)	Jeatures a	leemed appropriate.	Indicate direc	ction of flow	
Stained (clear, naturally colored)    Opaque (milky)  Other (chemicals, dyes)					
AQUATIC PLANTS Attached: ☐ none ☐ some ☒ lots IN STREAM Floating: ☐ none ☒ some ☐ lots					į
WILDLIFE IN OR AROUND STREAM  (Evidence of)    Fish					
STREAM SHADING (water surface)		1 Hovse			
CHANNEL Downcutting Bed scour  DYNAMICS Widening Bank failure					
☐ Headcutting ☐ Bank scour ☐ Aggrading ☐ Slope failure ☐ Sed. deposition ☐ Channelized		continued			
CHANNEL Height: LT bank 2 (ft)	W14+	invasion			
DIMENSIONS RT bank (ft)  (FACING Width: Bottom (ft)	CM HARREY		Hand/		
DOWNSTREAM)	7.1	OT OF SE	tland		
Top (ft)  REACH ACCESSIBILITY	1 0/2/	01 36	wat		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy  Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas.  Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great	The stream stream stream	Some of			
equipment using Stockpile areas distance from stream.		beared of			
existing roads or trails.  small or distant from stream.  Specialized heavy equipment required.		1			
5 4 (3) 2 1					
NOTES: (biggest problem you see in survey reach)					
Invasive species covering st.	RAM				
		Reporte	D TO AUTHO	RITIES 🗌 YE	s 🗌 No

\	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT  (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION  (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	7 0	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 (3/12 11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
].	20 19 18 17 16	15 14 13 (2) 11	10 9 8 7 6	

$\mathbf{O}$	7	٦
V	J	

WATERSHED/SUBSHE	<del></del>			DATE://	ASSESSED	DBY: KMB, DRB		
SURVEY REACH ID:		<b>ime:</b> <u>                                    </u>		Рното ID: (Camera-F	Pic #)	# 7 12		
SITE ID (Condition#): (	DT- <u>OL</u> L	AT41048,42	<u> </u>	0NG72029 · 2	" LMK	GPS: (Unit ID)		
BANK:  LT RT Head  FLOW:  None Trickle	TYPE:	MATERIAL:  Concrete   1   PVC/Plastic   1   Other:	Metal Brick	SHAPE: Single Circular Double Elliptical Triple Other:		т П No		
	Open channel	Concrete Ea	ırthen	Parabolic V	Depth: Width (Top): " (Bottom):	(in) (in) NOT APPENCABLE (in)		
CONDITION:  None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS None Oily Flow Line Paint Other:	:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	Brown Other:  POOL QUALT Good	C GROWTH: None Orange Green  TY: No-pool dors Colors Oils Algae Floatables		
FLOWING ONLY FLOAT OTHER CONCERNS: Nee  POTENTIAL RESTORA	ONLY FLOATABLES: Solve Sewage (toilet paper, etc.) Petroleum (oil sheen) Other:  OTHER							
If yes for daylighting: Length of vegetative cov If yes for stormwater:		ft Type o	of existi	ing vegetation:	S	lope:°		
Is stormwater currently c  ☐ Yes ☐ No ☐ Not				cription:				
OUTFALL He stro	avy discharge with a dis ong smell. The amount of onpared to the amount of am; discharge appears officant impact downstre	of discharge is significant f normal flow in receiving s to be having a earn.	Small di discharg discharg flow and	scharge; flow mostly clear and c ge has a color and/or odor, the ar ge is very small compared to the I any impact appears to be minor	mount of stream's base disc	fall does not have dry weather sharge; staining; or appearance ausing any erosion problems.		
SKETCH/NOTES:	5	4		3	(2)	1		
	dy weather flow from snall netland for Storm nater drainage of residential area. Streets wethord pipe sheam							
			Herr			THORITIES: YES NO		



WATERSHED/SUBSHED: Tacker			DATE: <u>7</u> /	1 108	ASSESSED BY: KMB DRB		
URVEY REACH I	D: TB 04B TI	ME: 1 : 02 AD/PM	<b>РНОТО ID:</b> (Са.	mera-Pic #)	/# <b>2</b> 0		
SITE ID: (Condition	#) TR- <u>01</u> LAT <u>41</u> °	46,44 "LONG	72.29.3	_" LMK_	GPS: (Unit ID)		
TYPE:  Industrial Commercial Residential	MATERIAL:  ☐ Plastic ☐ Tires ☐ Constr ☐ Appliances ☐ Automotive ☐ Other:	☐ Metal uction ☐ Medical  Waste	SOURCE:  Unknown  Flooding  Illegal dump  Local outfall	LOCATION:  Stream  Riparian Ard  Lt bank			
POTENTIAL REST	ORATION CANDIDATE S	tream cleanup 🔲 Strear Other:	n adoption segment	Removal/pr	evention of dumping		
If yes for trash or	EQUIPMENT NEEDED:	Heavy equipment 💢 Tra	ash bags 🔲 Unkno	wn	DUMPSTER WITHIN 100 FT:		
debris removal	WHO CAN DO IT:	olunteers    Local Gov    Hazmat Team   Other			Yes No Unknown		
CLEAN-UP POTENTIAL: (Circle #)	POTENTIAL: than two pickup truck loads) located inside a park with easy access a long period of time but it co				at of trash or debris scattered over a large access is very difficult. Or presence of drums of hazardous materials		
	(5)	4	3	2	1		
Notes: grass and brush dispings							
<u>)</u>				Reportei	TO AUTHORITIES YES NO		

### Reach Level Assessment



SURVEY REACH	113-04C	WTRSHD/SUBSHD: NO	WER BU	DATE: 7 / 1	05 A	SSESSED BY:	0B
	1E: 11:30 AN	7 -	END TIME:_	:AM/PM	LMK:		GPS ID:
LAT 410 46.	43" LON	ig 72° 79 '00"	LAT'	" Long _	<u> </u>	**	
DESCRIPTION:	Backward	^ ~	DESCRIPTION:				
	9	·					
RAIN IN LAST 24 HO	•	•	PRESENT CONDITIONS	☐ Heavy rain	•	ain 🖵 Intern	1
None	☐ Intermit		Clear	☐ Trace	□ Overcas		y cloudy
SURROUNDING LAN		strial $\square$ Commercial course $\square$ Park	Urban/Residential	☐ Suburban/Res ☐ Pasture	☐ Forested ☐ Other:	☐ Institu	ıtional
AVERAGI	SCINEROS PARESTA A CONTRACTOR AND	(check applicable)	•	SKETCH AND SI	A 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TRACKING	
BASE FLOW AS %	□ 0-25%	□ 50%-75%	Simple planar sketch	200 (1886) 86 (1986)	7.000		
CHANNEL WIDTH	□25-50 %	□ 75-100%	within the survey re	ach (OT, ER, IB,SC,	UT, TR, MI) a	s well as any a	idditional
DOMINANT SUBSTR	ATE		features	deemed appropriate	Indicate dire	ction of flow	
☐ Silt/clay (fine or	slick)	☐ Cobble (2.5 –10")					
☐ Sand (gritty)		☐ Boulder (>10")	Q1-1	77.			
☐ Gravel (0.1-2.5	)") L	Bed rock		7 4			
		arbid (suspended matter)		41			
☐ Stained (clear, n	aturally colored)	☐ Opaque (milky)		<b>V</b>			
☐ Other (chemicals,		7250-2	SM+CC				
AQUATIC PLANTS		none □ some □ lots	115/12				
IN STREAM		none  some  lots		J)			
WILDLIFE IN OR	(Evidence of)  ☐ Fish ☐ B	Seaver 🗆 Deer	J. Com	OTPI			
AROUND STREAM	☐ Snails ☐ C		OF-05//		1		
	☐ Mostly shad	led (≥75% coverage)	1	47/	1		
STREAM SHADING (water surface)	☐ Halfway (≥:			7	1		
(water surface)	☐ Partially sha☐ Unshaded (		<i>( )</i>	White country	and the second s		
Cranning	Downcutti				The second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second secon		
CHANNEL DYNAMICS	Widening	Bank failure		M		_	18
Dinames	Headcuttin	- I ==				f	100
Unknown	Aggrading	1 === *		**************************************	4)	/	
	Sed. depos	ition	(sc-0)	18-01			r < 1
CHANNEL	Height: LT ba	nk(ft)			//	1	
DIMENSIONS	RT ba	nnk(ft)			14	1 //	' Z K/1
(Facing downstream)	Width: Botton	m(ft)	3	4-11		1 //	
	Тор	(ft)	and a providence	+			4.
J	REACH ACCESSIE	A S. M. C. M. C. M. C. M. C. C. C. C. C. C. C. C. C. C. C. C. C.	assignass well)		d /	( ) / l	15-02
Good: Open area in	Fair: Forested or developed area	Difficult. Must cross wetland, steep slope, or	Millernolatigues	FY-11	The state of the s	-1/1	5721/2
public ownership, sufficient room to	adjacent to stream	sensitive areas to get to	Samulation	Total 1	-	- // /:	W/
stockpile materials,	Access requires tre removal or impact		ag ed ann is		/ 1	11.1	
easy stream channel access for heavy	landscaped areas.	and/or located a great	A		13-07	4///	***************************************
equipment using	Stockpile areas small or distant fro	distance from stream.  m Specialized heavy	100001/	1477/		H/I	1
existing roads or trails.	stream.	equipment required.	<u> </u>	1 -/	キン	FRE	7
NOTES: (biggest prob		2 1 vev reach)					704
)	you see in our			7			,
, d							
				REPOR	<u>የ</u> ጀክ ፕ <u>ስ አ</u> ሀታሀ	ORITIES 🔲	VEC DNO
				ALDI OIL	LUNUIL		LEST LING L

· · · · · · · · · · · · · · · · · · ·	Optimal	Suboptimal	Marginal	Poor		
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambanl surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfuil) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	Over	ALL BUFFER AND FLOODPLA				
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		

$\mathbf{O}'$	T
U	1

WATERSHED/SUBSHE	D: Tucker	2	DATE: 7/1/08 ASSESSED BY: (CMB)				
SURVEY REACH ID:	1804C TO	ME: <u>[2: 08</u> AM/PM)	Рното ID: (Camera-Pi	c#) /#			
SITE ID (Condition-#): (	рт- <u>04</u>   La	741048,43"L	ong 72° 28 :51 ·	LMK	GPS: (Unit ID)		
BANK:  LT RT Head  FLOW:  None Trickle	TYPE: Closed pipe	MATERIAL:  Concrete Metal PVC/Plastic Brick Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS:  20  Diameter: 4 (in	SUBMERGED:  No  Partially  Fully		
Moderate Substantial Other:	Open channel	☐ Concrete ☐ Earthen ☐ Other:	Parabolic W	epth:(in) idth (Top):(in) (Bottom):(in)	NOT APPESCABLE		
CONDITION:  None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: No Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS:  None Oily Flow Line Paint Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GR Brown Cran Other:  POOL QUALITY: Good Godors Suds Algae Other:	nge		
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other:  OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:  POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization Storm water retrofit Other:							
If yes for stormwater:	Is stormwater currently controlled?  Land Use description:						
OUTFALL He stro	avy discharge with a disti ong smell. The amount of npared to the amount of am; discharge appears t nificant impact downstrea	f discharge is significant normal flow in receiving to be having a am.	lischarge; flow mostly clear and od ge has a color and/or odor, the am ge is very small compared to the si d any impact appears to be minor /	ount of ream's base localized.	es not have dry weather staining; or appearance any erosion problems.		
SKETCH/NOTES:	pp+	(4')	3	2	1		
<u>)</u>			R	EPORTED TO AUTHORI	TIES: YES NO		

WATERSHED/SUBSHED: TUCKER		DATE: 71 1 108 ASSESSED BY: KMB					
SURVEY REACH ID: 13 04 ( TIME: 12: 46AM/PM		PHOTO ID: (Camera-Pic #) /#					
SITE ID (Condition-#): C	T- <u>05</u> LA	л 49 ° 48 1 12 12 11 11 11 11 11 11 11 11 11 11 1	ong 72° 28 ,46 "	LMK GPS: (Unit ID)			
	2.5 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	37					
BANK:   LT RT Head   FLOW:   None Trickle	TYPE:  Closed pipe	MATERIAL:  ☐ Concrete ☐ Metal  ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: N. Single Circular Double Elliptical Triple Other:	DIMENSIONS:  Diameter: (in)  Fully			
Moderate Substantial Other:	☐ Open channel	Concrete Earthen Other:	Parabolic W	epth: (in) idth (Top): (in) NOT APPESCABLE (Bottom): (in)			
CONDITION: None Chip/Cracked Peeling Paint	ODOR! ☑ No ☐ Gas ☐ Sewage ☐ Rancid/Sour	DEPOSITS/STAINS:  None □Oily □ Flow Line	VEGGIE DENSITY: None Normal Inhibited	PIPE BENTHIC GROWTH: ☐ None ☐ Brown ☐ Orange ☐ Green ☐ Other:			
Corrosion Other:	Sulfide Other:	☐ Paint ☐Other:	Excessive Other:	POOL QUALITY: ☑ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:			
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:  POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization							
⊠no		Storm water retrofit	Other:				
If yes for daylighting:  Length of vegetative cover.	er from outfall:	ft Type of exis	sting vegetation:	Slope: °			
If yes for stormwater:  Is stormwater currently co  ☐ Yes ☐ No ☐ Not	ontrolled?	Land Use de Area availab	escription:	otope.			
SEVERITY: stro (circle #) stro	ny discharge with a dist ng smell. The amount of pared to the amount of am; discharge appears t ificant impact downstrea	f discharge is significant normal flow in receiving to be having a	discharge; flow mostly clear and od- rge has a color and/or odor, the amo- rge is very small compared to the str and any impact appears to be minor /	ount of discharge; staining; or appearance			
	5	4	3	2 (1)			
SKETCH/NOTES:							
A state of the sta			Ri	EPORTED TO AUTHORITIES: YES NO			

OT

WATERSHED/SUBSHED: TUCKEY Brook			DATE: 7 / 109	ASSE	SSED BY:	DB		
SURVEY REACH ID: 713-04 TIME: 11:45 AM)PM			1	<b>Р</b> ното <b>ID</b> : (Camera-P	ic #)	/#		
SITE ID (Condition-#): O	NG 120 28.55	" LMK		GPS: (Unit ID)				
BANK:  LT RT Head  FLOW:  None Trickle	TYPE:  Closed pipe	MATERIAL:  Concrete  PVC/Plastic  Other:	Metal Brick	SHAPE: Single Circular Double Elliptical Triple Other:			SUBMERGED:  No Partially Fully	
☐ Moderate ☐ Substantial ☐ Other:	☐ Open channel	Concrete Ea	ırthen	Parabolic v	Depth: Vidth (Top):_ " (Bottom):_		NOT APPECABLE	
CONDITION:  None Chip/Cracked Peeling Paint	ODOR: ☑ No ☐ Gas ☐ Sewage ☐ Rancid/Sour	<b>DEPOSITS/STAINS</b> ☐ None ☐ Oily ☐ Flow Line	3:	VEGGIE DENSITY: None Normal Inhibited	☐ Brown ☐ Other:	☐ Orai	OWTH: None	
Corrosion Other:	Sulfide Other:	☐ Paint ☐ Other:		Excessive Other:	Good	Odors	No pool     □Colors □Oils     □ Floatables	
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other:  FLOWING ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen)  OTHER CONCERNS: Needs Regular Maintenance Bank Erosion Other:								
<u></u>								
POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization								
If yes for daylighting:		Storm water retro	otit	Other: Rupisco &	act heade	45 W	Va Haavden	
Length of vegetative cover	from outfall:	ft Type o	of existi	ing vegetation:		Slope:	. 0	
If yes for stormwater:								
Is stormwater currently co	ntrolled?	Land U	Jse desc	cription:				
Yes No Not in		Area av	vailable					
SEVERITY: stron (circle #) strea	ry discharge with a disti g smell. The amount of pared to the amount of m; discharge appears t ficant impact downstrea	normal flow in receiving o be having a	discharge discharge	scharge; flow mostly clear and o se has a color and/or odor, the an se is very small compared to the s any impact appears to be minor	nount of stream's base	discharge;	es not have dry weather staining; or appearance any erosion problems.	
	5	4	2	3		2	(1)	
SKETCH/NOTES:	05-27							
		SC-01		F	Reported to	) AUTHORI	TIES: YES NO	

<b>(</b> )	•
	_

WATERSHED/SUBSHED: Tucker		DATE: 7/1/08 ASSESSED BY: Cub				
SURVEY REACH ID: TBOY C TIME: 11:55 AD/PM		Рното ID: (Сатега-Ріс#) /# 7 7				
SITE ID (Condition-#):	OT-03 LA	T41048, 43"L			PS: (Unit ID)	
3 T Annual 1992						
BANK:  LT RT Head  FLOW:  None Trickle	TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: Single Circular Double Elliptical Triple Other:		SUBMERGED:  No Partially Sully	
Moderate Substantial Other:	Open channel	☐ Concrete ☐ Earthen ☐ Other:	Parabolic W	Depth:        (in)           Vidth (Top):        (in)           " (Bottom):        (in)	NOT APPESICABLE	
CONDITION:  None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: No Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS:  □None □Oily □ Flow Line □ Paint □Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GROW  Brown Orange Other:  POOL QUALITY:  Good Odors O Suds Algae Other:	☐ Green  No pool Colors ☐ Oils	
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other:  POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization						
no		Storm water retrofit	Other:			
If yes for daylighting:						
Length of vegetative cov	er from outfall:	ft Type of exist	ting vegetation:	Slope:	· · · · · ·	
If yes for stormwater: Is stormwater currently o  Yes No Not  OUTFALL He		Land Use des Area availabl	le:			
SEVERITY: str (circle #) str	ong smell. The amount of npared to the amount of eam; discharge appears t nificant impact downstrea	dischar dischar be having a	discharge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor	nount of discharge; stain	have dry weather ing; or appearance crosion problems.	
	5	4	3	2		
SKETCH/NOTES:						
)			R	REPORTED TO AUTHORITIES	S: NES NO	

Impacted Buffer IB

WATERSHED/SUBSHED: Thekek			DATE: 7/ 1/08	ASSESSED BY:
URVEY REACH: TBOY C	TIME: 12	<u> </u>	Рното ID: (Camera-Pic	
SITE ID: (Condition-#) START LA	r41 ° 48 '43 " 1			GPS: (Unit ID)
	T 41 ° 48, 44" I			
IND EA		DONG 1 12 CO	<u> </u>	MATERIAL PROPERTY AND ADMINISTRATION OF THE PROPERT
LT RT Both		vegetation  Too	narrow Widespread inva	sive plants
1	nstitutional Golf Cou	rse Park Otl	ner Public	
(Facing downstream) LT Bank			□:	
RT Bank				
DOMINANT Paved	Bare ground Turf/lav	. ~		Other —
LAND COVER: LT Bank				<u>_</u> :
RT Bank				<u></u> :
INVASIVE PLANTS: None	☐ Rare         P	artial coverage	Extensive coverage	unknown
STREAM SHADE PROVIDED? None	Partial	Full WETLA	ands Present? ☑ No	Yes Unknown
POTENTIAL PROTOR ATION CANDY AT				<b>}_</b>
POTENTIAL RESTORATION CANDIDAT	7~	on ∐Greenway de	esign Natural regeneratio	n 🔀 Invasives removal
no	Other:			
RESTORABLE AREA	_	Impacted area on pub		Impacted area on private
DI BRUK KI	REFORESTATION	where the riparian are not appear to be used		
	POTENTIAL: (Circle #)	specific purpose; plen	ty of purpose; available area f	or feature significantly limits
Width (ft): (5	(Circle #)	area available for plan		available area for planting
		5	4 3)	2 1
POTENTIAL CONFLICTS WITH REFORE Poor/unsafe access to site Existing	STATION Windows Cover Sev	despread invasive p	plants Potential contamination (deer beaver)	nation   Lack of sun
Notes:			(deci, seaver) La siner.	Esidential /pnvale
1.0125.				
	•			
		,		
/				

Impacted Buffer IB

WATERSHED/SUBSHED: 13			DATE: 7/ 1 /09	5 Ass	SESSED BY: DIZIS
URVEY REACH: TB-04 (	TIME:	2: 15 AM/PM	Рното ID: (Camera-	Pic #)	/#
SITE ID: (Condition-#) START LA	AT 4/048,4/ "I	LONG <u>72°28</u>	'D" LMK		GPS: (Unit ID)
IB-09 END LA	17 41 048 14 [" I				_
200000000000000000000000000000000000000					,
LT RT Both		vegetation  Too planted  Oth		invasive p	plants
	Institutional Golf Cou	_	her Public		
(Facing downstream) LT Bank			□: -		
RT Bank			<u> </u>		
DOMINANT Paved	Bare ground Turf/lav	vn Tall grass	Shrub/scrub Trees	Other	
LAND COVER: LT Bank		] <u> </u>	<b>X</b> -		
		<u> </u>			
		artial coverage	Extensive coverage	unk	nown
STREAM SHADE PROVIDED? Non	e Partial	Full WETLA	ANDS PRESENT? No	☐ Y	es Unknown
			~		
POTENTIAL RESTORATION CANDIDA	TE Active reforestati	on □Greenway d	esign Natural regener	ation 🗌	Invasives removal
RESTORABLE AREA		Impacted area on pub			Impacted area on private
Length (ft): LT BANK RT CO	REFORESTATION POTENTIAL: (Circle #)	where the riparian are not appear to be used specific purpose; plen area available for plar	for any presently used for a purpose; available a	specific	land where road; building encroachment or other feature significantly limits available area for planting
Width (ft): 20 906		5	4 3		
POTENTIAL CONIELICITE WITH DEFOR	EGELTHON: DW			2	
POTENTIAL CONFLICTS WITH REFOR Poor/unsafe access to site Existing		despread invasive p vere animal impacts			1 Lack of sun
NOTES:	No.				
		SCRUE	S S		

C	T

WATERSHED/SUBSHED: TUCKER BYK			DATE: 7 / 1 / 08 ASSESSED BY: KMB DRB			
SURVEY REACH ID: TBOYC TIME: 1 : 38AM/PM			PHOTO ID: (Camera-Pic#) /#			
SITE ID (Condition-#): OT-D( LAT 41 ° 48 ' 43 "LONG 72 ° 28 '57 " LMK GPS: (Unit ID)						
BANK:  LT RT Head  FLOW:  None Trickle	TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS:  Diameter: (in)	SUBMERGED:  No Partially Fully	
☐ Moderate ☐ Substantial ☐ Other:	Open channel	☐ Concrete ☐ Earthen ☐ Other:	Parabolic W	epth:(in) /idth (Top):(in) / (Bottom):(in)	NOT APPESCABLE	
CONDITION:  None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY:  None  Normal Inhibited Excessive Other:	PIPE BENTHIC GRO Brown Orang Other:  POOL QUALITY:  Good Odors Suds Algae Other:	e 🗹 Green  No pool Colors 🔲 Oils	
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other:  OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation ONCERNS: Needs Regular Maintenance Bank Erosion Other:  POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization Storm water retrofit Other:						
If yes for daylighting: Length of vegetative cove	er from outfall:	ft Type of exis	ting vegetation:	Slope: _	O ~~,	
If yes for stormwater:		•				
Is stormwater currently co		Land Use de	scription:			
Yes No Not		Area availab	e:			
SEVERITY: stro com stre	ny discharge with a disting smell. The amount of pared to the amount of am; discharge appears to ificant impact downstreating.	f discharge is significant normal flow in receiving dischargo be having a	lischarge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor	iount of discharge; st	not have dry weather aining; or appearance ny erosion problems.	
	5	4	3	2		
SKETCH/NOTES:						
<u> </u>			R	EPORTED TO AUTHORIT	IES: 🗌 YES 🗌 NO	

WATERSHED	/subshed: Incher			DATE:	1/1 /08	ASSE	SSED BY: K	MB. DRB	
URVEY REA	CHID: TBO4C	<u> Тіме: Ц: Ч</u>			: (Camera-Pi	c #)	/#		
SITE ID: (Con	idition-#) SC- <u>Ol</u> LAT <u>U</u>	flo 48.41	4" LONG 7	2º <u>28'</u>	<u>55"</u> L	МК	GPS (	Jnit ID)	
Trunn. $\square$ D	10 · Dn: 10 ·	kzí v		ъ П	C 1 : 1F	. ভো	0.1 0 5	1	
FOR ROAD/ RAILROAD		Manmade	MATERIAL:  Concrete  Metal  Other:	ALIGN	Geological Forn NMENT: ow-aligned t flow-aligned not know	DIMENSI Barrel dia	IONS: (if vari meter: Height:		
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosion Sediment deposition Other (describe):	☐ Downstrean ☐ Failing emb		☐ Fla ☐ Slig	t ght (2° – 5°) vious (>5°)		ength: Width: elevation:	(ft)(ft)(ft)	
POTENTIAL I	POTENTIAL RESTORATION CANDIDATE  Fish barrier removal Culvert repair/replacement Upstream storage retrofit  Local stream repair Other:								
IS SC ACTING	G AS GRADE CONTROL	] No     X Y (	es 🔲 Unkn	ıown					
	EXTENT OF PHYSICAL BLOC	KAGE:		BLO	CKAGE SEVEI	RITY: (circ	le #)		
If yes for fish barrier	Total Partial Temporary Unknown  es for barrier  CAUSE: Drop too high Water Drop: 5-4 (in) Flow too shallow Water Depth: (in)		road culvert on a 3rd order or greater stream blocking the sig upstream movement of anadromous fish; no fish trib		tributary that wou significant reach or partial blockag interfere with the	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
1 - 10	Other:		5		4 3		2	1	
NOTES/SKET	Some Stands of the stands of t	who had	C'ement Wad	- & roc	x 1 Idam				
					REPOR	TED TO ALL	тновітівѕГ	TYES □NO	

C	

WATERSHED	SUBSHED: TUCKER			DATI	E: 🔼	11 /08	ASSE	ESSED BY: /	KMB
URVEY REA		TIME::	_AM/PM	Рно	то ID	: (Camera-Pic	c #)	/#	
SITE ID: (Con	idition-#) SC- <u>O7</u> LA	T <u>41. 48.4</u>	<u> て" Long</u>	72° 1	<b>US</b> '.	<u>50 " Li</u>	МК	GPS (	Unit ID)
TYPE: Ros	ad Crossing	ssing Manmade	Dam Beav	er Dan	n 🗆	Geological Form	nation [	Other:	
FOR ROAD/ RAILROAD	SHAPE:  Arch Bottomless Box Elliptical Circular Other:	#BARRELS:	MATERIAL:  Concrete Metal Other:	[	<b>ALIG</b> N☐ Flo☐ Not	NMENT: w-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if var. ameter: Height:	(ft) (ft)
CROSSINGS ONLY	CONDITION: (Evidence of  Cracking/chipping/corros  Sediment deposition  Other (describe):			]	CULVERT SLOPE:    Flat   Slight (2° – 5°)   Obvious (>5°)		Width:(fi		(ft)(ft)(ft)
POTENTIAL RESTORATION CANDIDATE									
IS SC ACTING	G AS GRADE CONTROL	□ No TY	es Unk	nown					
	EXTENT OF PHYSICAL B		<u> </u>		BLO	CKAGE SEVER	UTY: (circ	:le #)	
If yes for fish barrier	Total Parti Temporary Unka  CAUSE: Drop too high Water Flow too shallow Water Other:	nown  Drop: 36 (in)	A structure such road culvert on a greater stream bl upstream moven anadromous fish, passage device p	3rd orde ocking the ent of no fish	er or ne	A total fish blocka tributary that woul significant reach o or partial blockage interfere with the r anadromous fish.	d isolate a of stream, e that may	beaver dam of the very head very little viab above it; natu as waterfalls.	parrier such as a or a blockage at of a stream with le fish habitat ral barriers such
NOTES/SKET			5		4	$\frac{3}{3}$		2	
	Stone	pool ) de	im/ raterfall re ined	H	υ√ς₹			THORITIES [	

~	$\sim$
S	C
D	

WATERSHED	/subshed: Tucker			DAT	E: <u>1</u>	11 1 68	ASSE	SSED BY:	KMB
URVEY REA	CHID: 115090	TIME: 12: 59				: (Camera-Pio	c #)	/#	
SITE ID: (Con	dition-#) SC- <u>63</u> LAT	410 U8 · 37	<u>†</u> " Long <u>7</u>	2° -	<u> 28 '</u>	<u> 45"</u> Li	МК	GPS	(Unit ID)
TYPE: Koa	ad Crossing		1			Geological For		Other:	
FOR ROAD/ RAILROAD	Arch Bottomless Single Double		MATERIAL:  Concrete  Metal  Other:		ALIGNMENT:  Flow-aligned  Not flow-aligned  Do not know		DIMENSIONS: (if variable, sketch)  Barrel diameter: (ft)  Height: (ft)		(ft)
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosion  Sediment deposition  Other (describe):  Downstream scour hole Failing embankment				CULVERT SLOPE:  ☐ Flat ☐ Slight (2° – 5°) ☐ Obvious (>5°)			Width: _	(ft)
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re			pair/rep	lacement 🔲 🛚	Jpstream st	torage retro	fit
Is SC ACTING	G AS GRADE CONTROL	No □ Y	es 🔲 Unk	nown					
	EXTENT OF PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVEI	RITY: (circ	le #)	
If yes for fish barrier	Total Partial Unkno  CAUSE: Drop too high Water D Flow too shallow Water D Other:	rop:(in)	A structure such a road culvert on a greater stream bl- upstream movem anadromous fish; passage device p	3rd ord ocking t ent of no fish	ler or the	A total fish blocked tributary that wou significant reach or partial blockag interfere with the anadromous fish.	ld isolate a of stream, e that may migration of	beaver dam the very hea very little via above it; na as waterfalls	
NOTES/SKET			5		4	3		2	1
						<b>В</b> еров	TED TO AU	THORITIES	☐ YES ☐ No

WATERSHED/SUB	WATERSHED/SUBSHED: Tucker				108	ASSESSED BY: KMB
JURVEY REACH I	D:TB 04C	TIME: []	_: <u>77</u> am/M	Рното ID: (Са	mera-Pic #)	/#
SITE ID: (Condition	1-#) TR- <u>02</u>	LAT 4 ° 48	40 "LONG	572.28.49	, '' LMK	GPS: (Unit ID)
TYPE: ☐ Industrial ☐ Commercial ☐ Residential	MATERIAL:  Plastic Tires Appliances Automotive	Paper Construction Yard Waste Other:	☐ Metal ☐ Medical	SOURCE:  Unknown Flooding Ullegal dump Local outfall	LOCATION:  Stream  Riparian Ar  Lt bank	AMOUNT (# Pickup truck loads):
POTENTIAL REST	CORATION CANDII	DATE Stream cl	eanup 🗌 Strea	am adoption segment	Removal/pr	revention of dumping
If yes for trash or debris removal	EQUIPMENT NEED WHO CAN DO IT:	DED: Heavy e		rash bags 🔲 Unkno Gov 🔲 Hazmat Te		DUMPSTER WITHIN 100 FT:  ☐ Yes ☐ No ☒ Unknown
CLEAN-UP POTENTIAL: (Circle #)	A small amount of tra than two pickup truck l inside a park with easy	loads) located with ea	sy access. Trash r	or bulk items, in a small an may have been dumped or it could be cleaned up in mall backhee.	ver A large amour	nt of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials
Nores	s in pieces	, b/w 2	-10 Ft	(3) long de	2 inder 1	~ (-f-t
				***************************************	Reporte	D TO AUTHORITIES YES NO



WATERSHED/SUB	SHED: Tuker		I	DATE: <u>7</u> /_	1/08	ASSESSED BY: FMR
JURVEY REACH I	D: TBOYC	TIME: 12: 00 AI	M/M I	РНОТО ID: (Ca.	mera-Pic #)	/# <del>28</del>
SITE ID: (Condition	#) TR- <u>0</u> Lat_	41.46.44.	Long 7	20 28 . 52	_" LMK_	GPS: (Unit ID)
TYPE:  Industrial Commercial Residential	☐ Tires ☐ C	aper Met onstruction Mec ard Waste ther:	al	URCE: Unknown Flooding Illegal dump Local outfall	LOCATION:  Stream  Riparian Ard Lt bank  Rt bank	AMOUNT (# Pickup truck
POTENTIAL REST	TORATION CANDIDATE	Stream cleanup  Other:	] Stream ac	doption segment	☑ Removal/pr	evention of dumping
If yes for trash or debris removal	EQUIPMENT NEEDED: WHO CAN DO IT:	Heavy equipment  Volunteers L	Trash ocal Gov	bags 🗌 Unkno		DUMPSTER WITHIN 100 FT:  ☐ Yes ☐ No ☑ Unknown
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., than two pickup truck loads) loo inside a park with easy access	with easy access.	Trash may ha me but it cou	items, in a small ar ave been dumped ov Id be cleaned up in ackhoe.	ver area, where ac	nt of trash or debris scattered over a large coess is very difficult. Or presence of drums of hazardous materials
	(5))	4		3	2	1
NOTES:	e of leaves a	ind yard c	lipping'	5		
)				n-acampania.	Reportei	D TO AUTHORITIES YES NO

# Reach Level Assessment



SURVEY REACH ID: WTRSHD/SUBSHD: WON	Ver Rexuor DATE: 614106 ASSESSED BY: 6A. BOCK 75.70
START TIME: 10: 76 AMPM LMK:	END TIME: 10:35 AM/PM LMK: GPS ID:
LAT 41 ° 50 ' 50 0" LONG 72 ° 26 ' 11.3"	LAT41 ° 50 '337" LONG 72 ° 76 '14.0"
DESCRIPTION: WONTHAS TUB WUST	DESCRIPTION: CULVAT DATE TO SU
RAIN IN LAST 24 HOURS  Heavy rain  Steady rain	PRESENT CONDITIONS
□ None □ Intermittent □ Trace	☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy
SURROUNDING LAND USE: ☐ Industrial ☐ Commercial ☐ Golf course ☐ Park	☐ Urban/Residential ☐ Suburban/Res ☐ Forested ☐ Institutional ☐ Crop ☐ Pasture ☐ Other: ☐ Institutional
	The state of the s
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS %	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional
	features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE  ☐ Silt/clay (fine or slick)  ☐ Cobble (2.5 –10")	Seminar of the semina
☐ Sand (gritty) ☐ Boulder (>10")	144
$\square$ Gravel (0.1-2.5") $\square$ Bed rock	BRAIDED OFOI O Grazus
WATER CLARITY	OUTFALL CULVETT
☐ Stained (clear, naturally colored) ☐ Opaque (milky)	NOCUMENT SOUTH (12/9)
Other (chemicals, dyes) NO WATER IN MOST of Report	FLOW Itolain or books & MATER
AQUATIC PLANTS Attached: A none some lots	A A A MONTH OF PORTS OF THE STATE OF THE STA
IN STREAM Floating: ☑ none ☐ some ☐ lots	///
(Evidence of)	1 // \
APOUND STREAM   Fish   Beaver   Deer	12/2 Notice Vilon
☐ Snails ☐ Other:	X CHOW LINE DOT TENCE I Pun
Mostly shaded (≥75% coverage)  STREAM SHADING ☐ Halfway (≥50%)	
(water surface) ☐ Partially shaded (≥25%)	/ free
☐ Unshaded (< 25%)	40
CHANNEL Downcutting Bed scour	UST LE
DYNAMICS Widening Bank failure	Yun
Headcutting Bank scour	
Unknown Aggrading Slope failure	
Sed. deposition Channelized	
CHANNEL ROOM Height: LT bank WBOOK (ft)	1 / 17 V. Wy, Hu,
DIMENSIONS FIRM CHAMMER RT bank NJBONK (ft)	My frit ou
(FACING NO TRY Width: Bottom 35 (ft)	1 x His de Was
or Hieseles Top 5.5 (ft)	The state of the s
REACH ACCESSIBILITY	Min. M. Tolk
Good: Open area in public expression developed area	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
public ownership, sufficient room to adjacent to stream. wettallu, steep stope, or sensitive areas to get to	TOOK StreAM
stockpile materials Access requires tree stream. Few areas to	B Chamelwioth
easy stream channel access for heavy landscaped areas. removal or impact to landscaped areas. stockpile available and/or located a great	Chamelwioth overgus From There Two ports
equipment using Stockpile areas distance from stream.	There Two parts
existing roads or trails.  small or distant from stream.  Specialized heavy equipment required.	M. D.
5 (4) 3 2 1	Wolker's Reservolia West
NOTES: (biggest problem you see in survey reach)	
	REPORTED TO AUTHORITIES YES Y NO

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT  (May modify criteria based on appropriate	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
habitat regime)	20 19 18 17 16	rate at high end of scale).  15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (0)
VEGETATIVE PROTECTION  (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambanl surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetatio has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
MADON	Left Bank 10 9	8 7 6	5 4 3	2 1 0
*3	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
		ALL BUFFER AND FLOODPLA		5 4 3 2 1 (0)
	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
LIVI			enection hoodplain full citon	noodplain fanction

WATERSHED/SUBS	HED: Walluis	RISWON	DATE: 6 /	4108 Asses	SED BY: JC 6A JS TT			
SURVEY REACH ID	: WROL T	IME: <u>/0:35</u> AM/PN	4 Рното ID: (Са		, , ,			
SITE ID (Condition-#)	: OT- 01 L	AT 41° 50 '37	7" LONG 72° 76	'140" LMK_	<b>GPS:</b> ( <i>Unit ID</i> )			
BANK:  LT RT Hea  FLOW:  None Trick Moderate Substantial Other:	Closed	MATERIAL:  Concrete  PVC/Plastic  Other:  Concrete  Ea	Metal Circular EBrick Elliptical Cother:	See Sketch Depth: Width (Top):_	No   No   Partially   Fully			
CONDITION:  None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS None Oily Flow Line Paint Other:		Brown Other:  POOL QUA Good	(in)  THIC GROWTH: ☐ None ☐ Orange ☐ Green  ALITY: ☐ No pool ☐ Odors ☐ Colors ☐ Oils ☐ Algae ☐ Floatables			
FLOWING TUR ONLY FLO. OTHER	FLOWING ONLY   None   Slight Cloudiness   Cloudy   Opaque   ONLY   FLOATABLES:   None   Sewage (toilet paper, etc.)   Petroleum (oil sheen)   Other:  OTHER   Excess Trash (paper/plastic bags)   Dumping (bulk)   Excessive Sedimentation							
If yes for daylighting	•	Storm water retr	of existing vegetation:		Sticks / taps H			
If yes for stormwate.  Is stormwater current!  Yes \( \text{No} \) \( \text{No} \)	y controlled?		Use description:vailable:					
SEVERITY: (circle #)	Heavy discharge with a dis strong smell. The amount of compared to the amount of stream; discharge appears significant impact downstre	of discharge is significant f normal flow in receiving to be having a sam.	Small discharge; flow mostly of discharge has a color and/or or discharge is very small compar flow and any impact appears to	dor, the amount of red to the stream's base	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.			
SKETCH/NOTES:	5	4	3	2	1			
SACICIPITOTES;	BRAIDED - NO CUTTO - LOIS OF		ANNEL I Some Frast		JOUNT 1 POOL GRADES J			
)		u*		REPORTED TO	AUTHORITIES: YES NO			

SC	
$\sim$	

WATERSHED		5 PUSCUDIR	/	DA	TE: <u>6</u>	14108	ASSE	ESSED BY: JK, 6A, 15, 20
URVEY REA	The second secon	TIME::_	_AM/PM			: (Camera-Pic	#)	# 13 +14 °
SITE ID: (Con	dition=#) SCO  LA	it 41 0 50 13=	<u> </u>	20	16	14.0 " LI	ИК	GPS (Unit ID)
TYPE: Roa	ad Crossing	ssing Manmade	Dam Beav	er Da	am 🗌	Geological Forn	nation 🗀	Other:
	SHAPE:	#BARRELS:	MATERIAL:			NMENT:		IONS: (if variable, sketch)
	☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical	Single  Double	Concrete			w-aligned	Barrel dia	( ,
FOR ROAD/	Circular	Triple				t flow-aligned not know		Height:(ft)
RAILROAD	Other:	Other:	Other.		D0	not know		
CROSSINGS ONLY	CONDITION: (Evidence of	)				ERT SLOPE:	Culvert le	ength: 65D (ft)
ONLI	Cracking/chipping/corros	<del></del>			Fla			Width:(ft)
	Sediment deposition	☐ Failing emb	oankment		N OP	ght $(2^{\circ} - 5^{\circ})$ vious $(>5^{\circ})$	D 1	1 2.7 (0)
	Other (describe):				<u>-₽</u>	vious (>3 )	Roadway	elevation: 20 (ft)
POTENTIAL I	RESTORATION CANDIDATI	F   Fish harrier r	emoval 🗖 Culs	ort r	anoir/ros	olacement 🔲 U	Instroom s	torogo rotrofit
no	ALSTONATION CANDIDATI		repair 🛮 Othe			we Debiza	-	lorage retrofft
	G AS GRADE CONTROL	□ No '□ Y				NC 2001EN	<b>&gt;</b>	
ISSC ACTIVE			es 🗀 Olik	nowi		CKAGE SEVER	TTV: /since	
	EXTENT OF PHYSICAL B				DLO	CRAGE SEVER	II X : {circ	ne #)
		nown	A structure such road culvert on a			A total fish blockage tributary that would		A temporary barrier such as a beaver dam or a blockage at
If yes for	CAUSE:		greater stream blo		king the significant reach of or partial blockage		n of stream, the very head of a stream very little viable fish habitat	
fish barrier		igh Water Drop:(in) upstream movement						
Ļ	Flow too shallow Water		passage device p			anadromous fish.	ingration or	as waterfalls.
	Other:		5			1 3		2 1
NOTES/SKET	CH:							
1								
						REPORT	TED TO AU	THORITIES TYES NO

# Reach Level Assessment

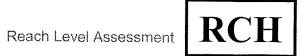
RCH

SURVEY REACH I	D: <u>W202</u> wt	RSHD/SUBSHD:	Kers Reservir	DATE: 6/ 4		SSED BY:	
	e: <u>11 :35</u> AM/PM		END TIME:		LMK:	GPS ID:	1
LAT 41° 50'	<u>54.3</u> " Long <u> </u>	120 26 1 26 41"	_	$51.0$ " Long $\overline{1}$	L. 26.21	<u>5,9"</u>	
DESCRIPTION:	I-84 culv	URT	DESCRIPTION:	-84 colver	C Seda Fei	J1400	
RAIN IN LAST 24 HO	URS  Heavy rain	☑ Steady rain	PRESENT CONDITIONS	☐ Heavy rain	Standy rain	☐ Intermittent	7
□ None	☐ Intermittent	☐ Trace	☐ Clear	☐ Trace	☐ Overcast	☐ Partly cloudy	
SURROUNDING LAN	D USE: ☐ Industrial ☐ Golf cour		☐ Urban/Residential☐ Crop	⊠Suburban/Res □ Pasture	Forested Other: Hick	□ Institutional -wry + Port	
AVERAGE	CONDITIONS (chec	k applicable)	REACH	SKETCH AND ST	and the state of t	The state of the s	
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	⊠ 50%-75% □ 75-100%	Simple planar sketch within the survey re		ack locations and I UT, TR, MI) as w	Ds for all site impacts ell as any additional	**
DOMINANT SUBSTR.  ☐ Silt/clay (fine or Exand (gritty))  ☐ Gravel (0.1-2.5)	slick) ⊅ Ćo □ Bo	(M) bble (2.5 –10") oulder (>10") d rock		аеетей арргоргийе			
WATER CLARITY ☐ Stained (clear, no	dyes)	Opaque (milky)				LE STESTILL STESTILL	1/9
AQUATIC PLANTS IN STREAM	Attached: none	e □ some □ lots □ some □ lots			cyr.	Ke 3 July 1	
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☐ Fish ☐ Beave ☐ Snails ☐ Other:	. • . =		1-94		parameter desperantamente como que en como de como en esta en en entre en el primero en el primero en el primero	
STREAM SHADING (water surface)	Mostly shaded (☐ Halfway (≥50%)☐ Partially shaded☐ Unshaded (< 250%)	) (≥25%)	4 8 4	which a	INTO dr.	drains circular and	e e displació de la companya de la companya de la companya de la companya de la companya de la companya de la c
CHANNEL DYNAMICS Chame I only 25+ Unknown Jones	Downcutting Widening Headcutting Aggrading Sed. deposition	Bed scour Bank failure Bank scour Slope failure Channelized	V	T DID T	5C-01 4st	and the second of the second o	
CHANNEL	Height: LT bank	(ft)		an i a a a a a a a a a a a a a a a a a a	CH	DIN LINK ENCL	1
DIMENSIONS (FACING	RT bank	$\frac{\sqrt{O}}{\sqrt{O}}$ (ft)	***		1/2 -	ENCE	12
DOWNSTREAM)	Width: Bottom	12 St (ft)	CYN IV		of John S		
Ř	Top  EACH ACCESSIBILIT		1 70.		01.		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas.	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great	1.0	n 1 of	concrete		
access for heavy equipment using existing roads or trails.	Stockpile areas small or distant from	distance from stream. Specialized heavy	July July				
5 4		equipment required.		51/2	DGR FRA PA	Duto	
NOTES: (biggest prob	lem you see in survey r	each)			7	7,000	-
<i>)</i> 				Repor	TED TO AUTHOR	RITIES 🗌 YES 🔄 NO	

	Optimal	Suboptimal	Marginal	Poor	
N-STREAM HABITAT  (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION  (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamban surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to propert or infrastructure.	
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: litt or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN	No evidence of floodplain encroachment in the form of fill material, land development, or	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on	
ENCROACH- MENT	manmade structures	but not enecting hoodplain function	effect on floodplain function	floodplain function	

to the state of th

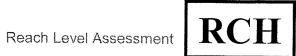
WATERSHED	D	DATE: <u>6 / 4 / 0 &lt; ASSESSED BY: 14 64 75 70</u>						
URVEY REA	CHID: WROZ	TIME: 11 : 40	Dam∕pm P	ното ID	: (Camera-Pic	#)	/#	, ,
SITE ID: (Con	dition-#) SC- <u>Ol</u> LAT	410 50 : 57	40" LONG 72	° 26 '	23.9 " LN	ик	GPS (Unit II	D)
Trum Pa	10 : [] 10							
TYPE: X Roa	d Crossing Railroad Cross		1	T	Geological Forn		Other:	
	SHAPE:  Arch Bottomless	#BARRELS:	MATERIAL:		NMENT: ow-aligned	DIMENSI Barrel dia	IONS: (if variable, s	sketch) 5(ft)
	Box Elliptical	Double	Metal		t flow-aligned			
FOR ROAD/	Circular	Triple	Other:	1	not know		Height:	(ft)
RAILROAD CROSSINGS	Other:	Other:				Culvert le	ength: <u>325</u>	(ft)
ONLY	CONDITION: (Evidence of)	Пъ	1 1	CULV X Fla	ERT SLOPE:		Width:	(ft)
	☐ Cracking/chipping/corrosio☐ Sediment deposition	n ☐ Downstrean ☐ Failing emb			ght $(2^{\circ} - 5^{\circ})$			(25)
	Other (describe):	ranning emb	ankinent	1	vious (>5°)	Roadway	elevation: 25	(ft)
POTENTIAL I	RESTORATION CANDIDATE		moval Culver	t repair/rep	olacement 🔲 U	Jpstream st	orage retrofit	
<b>D</b> (no		Local stream						
IS SC ACTING	G AS GRADE CONTROL	□ No □ Ye	es 🔲 Unkno					
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVER	ITY: (circ	le #)	
	Temporary Unkno	wn	A structure such as		A total fish blocka		A temporary barrier	
If yes for	–	road culvert on a 3rd greater stream block	ing the significant reach of or partial blockage		the very head of a st age that may very little viable fish			
fish barrier	CAUSE:  Drop too high Water D	upstream movement anadromous fish; no						
	Flow too shallow Water D		passage device pres		anadromous fish.	ingration of	as waterfalls.	1013 30011
)	Other:		5		1 3		2 1	
NOTES/SKET	CH:							
							,	
	•							
)								
τ	. 20000				Report	TED TO AUT	THORITIES YES	No.



SURVEY REACH ID: WRO3 WTRSHD/SUBSHD: WA	Wer's Reservoir DATE: 6/3/08 ASSESSED BY: Romal George, Jane
START TIME: 3:10 AM/PM LMK:	END TIME: 3:35 AM/PM LMK: GPS ID:
LAT 41 ° 51 '071" LONG 72 ° 25 '44.4"	LAT41° 57 '07%" LONG 72° 25 '47 ("
DESCRIPTION: 1st (each upstraam from Reservent	DESCRIPTION: En Breach est Colvent
RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☐ None ☐ Intermittent ☐ Trace	PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent  ☐ Clear ☐ Overcast ☐ Partly cloudy
	☐ Urban/Residential ☐ Suburban/Res ☒ Forested ☐ Institutional
AVERAGE CONDITIONS (check applicable)	□ Crop □ Pasture ☑ Other: Ad FIELD  REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % □ 0-25% □ 50%-75%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts
Channel Width   □25-50 %   ■3076-7376	within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional
DOMINANT SUBSTRATE  Silt/clay (fine or slick) ☐ Cobble (2.5 –10")  Sand (gritty) ☐ Boulder (>10")  ☐ Gravel (0.1-2.5") ☐ Bed rock	features deemed appropriate. Indicate direction of flow
WATER CLARITY ☐ Clear ☐ Turbid (suspended matter) ☐ Stained (clear, naturally colored) ☐ Opaque (milky) ☐ Other (chemicals, dyes)	3 of was Subver An work Sor
AQUATIC PLANTS Attached:  \[ \sigma \text{ none } \sqrt{\text{ some }} \sqrt{\text{lots}} \]  IN STREAM Floating:  \[ \sqrt{\text{ none }} \sqrt{\text{ some }} \sqrt{\text{lots}} \]	15 to Maroon
WILDLIFE IN OR AROUND STREAM  (Evidence of)  Fish Beaver Deer  Snails Nother: 1945	LZOSI acreso
Mostly shaded (≥75% coverage)  STREAM SHADING (water surface)  □ Halfway (≥50%) □ Partially shaded (≥25%) □ Unshaded (<25%)	Lux on Office
CHANNEL Downcutting Bed scour Widening Bank failure Headcutting Bank scour	
Unknown Aggrading Slope failure Sed. deposition Channelized	
CHANNEL DIMENSIONS RT bank RT bank (ft) (ft)	\$ 125 to 25 Williams
(FACING DOWNSTREAM) Width: Bottom $14.0$ (ft) Top $19.0$ (ft)	25 15 5 E
REACH ACCESSIBILITY	
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.  Fair: Forested or developed area adjacent to stream.  Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.  Steam I Fair: Forested or developed area adjacent to stream.  Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.  Steam I Fair: Forested or developed area adjacent to stream.  Access requires tree removal or impact to landscaped areas small or distant from stream.  Stockpile area adjacent to stream.  Access requires tree removal or impact to landscaped area adjacent to stream.  Stockpile area adjacent to stream.  Access requires tree removal or impact to landscaped areas.  Stockpile area adjacent to stream.  Stockpile available and/or located a great distance from stream.  Specialized heavy equipment required.	Marine true describe
NOTES: (biggest problem you see in survey reach)	

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT  (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION  (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamband surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	
		ALL BUFFER AND FLOODPLAI	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: littl or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetatio type is turf or crop land	
	20 19 18 17 16	15 14 13 12 (17)	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 13 12 11			

WATERSHED/SUBSHI	ED: Wolker	Ressevoirs	DATE: 6/3/04 ASSESSED BY: 35, 6A, 767				
JURVEY REACH ID:		ME: 3:35 AM/RM	Рното ID: (Camera-Pi		1		
SITE ID (Condition-#):	OT- <u>OL</u> LA	1 4 0 5 1 1 7.8 "La	ong 72° 25' 42.8'	' LMK	GPS: (Unit ID)		
BANK: Head	Түре:	MATERIAL: ☐ Concrete ☑Metal	SHAPE: Single	DIMENSIONS:	SUBMERGED:		
FLOW: None Trickle	Closed pipe	PVC/Plastic Brick Other:	☐ Circular ☐ Double☐ Circular ☐ Triple☐ Other:		□ No □ Partially □ Fully		
Moderate Substantial Other:	☐ Open channel	☐ Concrete ☐ Earthen ☐ Other:	Parabolic W	repth:         (in)           /idth (Top):         (in)           ' (Bottom):         (in)	NOT APPAICABLE		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS:  None Oily Flow Line Paint Other:	VEGGIE DENSITY:  None  Normal Inhibited Excessive Other:	PIPE BENTHIC GR Brown Ora Other:  POOL QUALITY: Good Odors Suds Algae Other:	nge    Green  No pool Colors Oils Floatables		
FLOWING TURBI ONLY FLOAT OTHER	FLOWING ONLY TURBIDITY: None Slight Cloudiness Cloudy Opaque  ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen)  OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation						
POTENTIAL RESTOR	ATION CANDIDATE	☐ Discharge investigatio☐ Storm water retrofit	n Stream daylighting	Local stream repair	outfall stabilization		
If yes for daylighting: Length of vegetative co		ft Type of exist	ting vegetation:	Slope:			
If yes for stormwater: Is stormwater currently ☐ Yes ☐ No ☐ No	controlled?	Land Use des Area availabl			-		
SEVERITY: st cc cc st	eavy discharge with a dist rong smell. The amount o impared to the amount of ream; discharge appears gnificant impact downstre	f discharge is significant normal flow in receiving to be having a	ischarge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor.	nount of discharge of causing	es not have dry weather staining; or appearance any erosion problems.		
SVETCH/Norms	5	4	3	2	1		
SKETCH/NOTES:							
)			R	REPORTED TO AUTHOR	ITIES: YES NO		



SURVEY REACH 1			IKO RISWOIR	DATE: 6 / 4	130,67	A 707,	308_
<b>!</b>	ie: <u>8:52</u> am/pm	<del></del>		]: 41 AM/PM	LMK:		PS ID:
LAT 41 ° 51 '	·	20 25 1428"	LAT 41 ° 51 '1				
DESCRIPTION: 51/0	rt a= Rench	pt Culvact	DESCRIPTION: Col.	wt st ex	7-67 Tetc	I-84	
RAIN IN LAST 24 HO	NIRS   Heavy rain	☑ Steady rain	PRESENT CONDITIONS	☐ Heavy rain	☐ Steady rain ☐	,	
□ None	☐ Intermittent		☐ Clear	☐ Trace	<del>-</del>	⊐ mierimii ⊐ Partly cl	I .
SURROUNDING LAN	D USE:   Industria	l	☐ Urban/Residential			Institutio	
	☐ Golf cou			☐ Pasture	Other: D07		
AVERAGE	CONDITIONS (che	ck applicable)	REACH S	SKETCH AND SIT	TE IMPACT TRAC	SAC SOCIETARIST CONTRACTOR	
BASE FLOW AS %	□ 0-25%	፟ጆ 50%-75%	Simple planar sketch o	of survey reach. Tra	ck locations and IDs	for all site	impacts
CHANNEL WIDTH	□25-50 %	∫ □ 75-100%	within the survey rea	ich (OT, ER, IB,SC, deemed appropriate.	UT, TR, MI) as well Indicate direction o	as any addi of flow	tional
DOMINANT SUBSTR  ☐ Silt/clay (fine or ☐ Sand (gritty) ☐ Gravel (0.1-2.5	slick) $\square$ Co	obble (2.5 –10") oulder (>10") ed rock		and the competition passes.			
WATER CLARITY	□ Clear ▼Turbio	(suspended matter)	And the second s				
☐ Stained (clear, n	aturally colored)				annote part of the second state of the second		
☐ Other (chemicals,	dyes)			8 4			
AQUATIC PLANTS		e ⊠ some □ lots	Name and American	Name			ļ
IN STREAM	~~~	e ⊠some □ lots	The appropriate in the state of	er Salah Adamin kersan lagah sebagai dan 1900 ke Pertu di Baharan Pertu Salah Salah Salah Salah Salah Salah Sa	***************************************	Marie Charles professor programme in	
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beav □ Snails ☒ Other	er 🗆 Deer :::Chura 6e(SE)	and S				
_	☐ Mostly shaded			Qxi+ 6-	7	The particular particular and the second second second second second second second second second second second	para Mari
STREAM SHADING (water surface)	☐ Halfway (≥50%) Partially shaded	5) 1 (>25% )		the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the sa	and the second of the second o		
,	☐ Unshaded (< 25		i i	COLUMN /	56-02		
CHANNEL	Downcutting	Bed scour	1	( )	· · · · · · · · · · · · · · · · · · ·		
DYNAMICS	Widening	Bank failure	RIPIRA	P	$\mathcal{A}_{\mathbf{v}}$		
2 11	Headcutting	Bank scour		1	Sono!	'nχ	
Unknown	Aggrading	Slope failure	p 2 de maria	Laiding	1/22	Į,	
	Sed. deposition	1 Channelized		A Company	₹. · · · · · · · · · · · · · · · · · · ·		
CHANNEL	Height: LT bank	<u>10000₹</u> (ft)	(0)	4 / W. W.	412		,
DIMENSIONS	RT bank	<u>NBOOK</u> (ft)	10/01	Mary H	łv.		
(FACING DOWNSTREAM)	Width: Bottom	<u> </u>		J.P.S.IP			
	Тор	(ft)	l ga,	1.70 (Co. )		c .1 .	
P	REACH ACCESSIBILE		[R. ]	the winers	Channels of Coltails + Con First culout By 1575 of		
Good: Open area in	Fair: Forested or developed area	Difficult. Must cross wetland, steep slope, or		011	coltails + co.	JORA SE	>55
public ownership, sufficient room to	adjacent to stream.	sensitive areas to get to		demand and the second	FIRST Colons	( surror	nsis
stockpile materials,	Access requires tree removal or impact to	stream. Few areas to stockpile available	- AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND - AND		By 1575 0)	putur	OLVE
easy stream channel access for heavy	landscaped areas.	and/or located a great	- I	* * * * * * * * * * * * * * * * * * *	J 0		
equipment using	Stockpile areas small or distant from	distance from stream. Specialized heavy			ic-01		
existing roads or trails.	stream.	equipment required.		Reservoir	करें		
NOTES: (biggest prob	dem you see in survey				1		
Troites (biggest prob	nem you see in survey	reach)					
				PEROP	TED TO AUTHORIT	ire 🗀 Vra	· MNO

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT  (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
to Agas	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field Wellows Plants	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0	
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0	
CLOODPLAIN ENCROACH- 1ENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0	

WATERSHED/SUBSHED:	Wallars	Reservoir	DATE: 614 108 ASSESSED BY: FY 1200 S				
SURVEY REACH ID: WY	204 <b>T</b> II	ME: 9:18 AM/PM	Рното ID: (Camera-Pie		1, 8		
SITE ID (Condition-#): OT-	- <u>00</u> La	141051 1218"La	ONG 72 ° 25 ' 45,4"	LMK	GPS: (Unit ID)		
	The second of th						
FLOW: None Trickle	TYPE:  Closed pipe	MATERIAL:  ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENSIONS:  Diameter: (in)	SUBMERGED:  No Partially Fully		
Moderate Substantial Other:	Open channel	Concrete Earthen Other:	Parabolic W	epth: (in) idth (Top): (in) (Bottom): (in)	NOT APPESCABLE		
☑ None                     ☐ Chip/Cracked                     ☐ Peeling Paint                     ☐ Corrosion	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS:  ☐ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	VEGGIE DENSITY:  None  Normal Giffersulu  Inhibited Excessive Other:	PIPE BENTHIC GRO  Brown Oran; Other:  POOL QUALITY: [ Good Odors Suds Algae [ Other:	ge		
ONLY FLOATABLE  OTHER ONCERNS: Needs	FLOWING ONLY						
Length of vegetative cover	from outfall:	ft Type of exist	ing vegetation:	Slope:	°		
If yes for stormwater:	tuallad?	· · · · · · · · · · · · · · · · · · ·					
Is stormwater currently cont ☐ Yes ☐ No ☐ Not inv		Land Use des Area availabl	scription:				
OUTFALL Heavy strong compar stream,	discharge with a disti	inct color and/or a if discharge is significant normal flow in receiving to be having a	ischarge; flow mostly clear and od ge has a color and/or odor, the amo ge is very small compared to the st d any impact appears to be minor /	ount of discharge; s	not have dry weather taining; or appearance ny erosion problems.		
	5	4	3	2	1		
SKETCH/NOTES:			R	EPORTED TO AUTHORIT	TIES: □ YES □ NO		

$\mathbf{O}$	
U	1

WAYERSHED/SUBSHE	D: Walker's	Reservoir	DATE: 6/4/08 ASSESSED BY: Friends				
SURVEY REACH ID: WROU TIME: 9:05(AM)PM			<b>PHOTO ID:</b> (Camera-Pic #) /# 5,				
SITE ID (Condition-#): (	)T- <u>0</u> ! 1	Lat <u> </u>	ong <u>72° 25' 15.1'</u>		GPS: (Unit ID)		
BANK:  LT RT Head  FLOW:  None Trickle	TYPE:  Closed pipe	MATERIAL:  ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	SHAPE: ☐ Single ☐ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:	DIMENSIONS: Diameter: 3 http://doi.org/10.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.10000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2.1000/j.jc.2	SUBMERGED:  No Partially Fully		
Moderate Substantial Other:	Open channel	☐ Concrete ☐ Earthen☐ Other:	Parabolic W	epth: (in)  /idth (Top): (in)  ' (Bottom): (in)	NOT APPECABLE		
CONDITION:  None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: ☑ No ☐ Gas ☐ Sewage ☐ Rancid/Sou ☐ Sulfide ☐ Other:	□ None □Oily	VEGGIE DENSITY:  ☐ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:	PIPE BENTHIC GROWN Oran Other:  POOL QUALITY: Good Odors Suds Algae Other:	ge		
CONCERNS: Nee	ABLES: No Ress Trash (paper/ids Regular Maint	one Slight Cloudiness one Sewage (toilet paper, plastic bags) Dumping	☐ Cloudy ☐ Opaque etc.) ☐ Petroleum g (bulk) ☐ Excessive osion ☐ Other:	Sedimentation	Other:		
no		Storm water retrofit	Other:				
If yes for daylighting: Length of vegetative cov	er from outfall: _	ft Type of exis	ting vegetation:	Slope:	0		
If yes for tormwater:							
Is stormwaer currently c		Land Use des					
☐ Yes ☐ No ☐ Not		Area availab	le:				
SEVERITY str (circle #) stre		of normal flow in receiving discharge is to be having a	discharge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor.	nount of discharge; tream's base	s not have dry weather staining; or appearance any erosion problems.		
	5	4	3	2	1		
SKETCH/Notes:			R	REPORTED TO AUTHORI	TIES: □ YES □ NO		

SC

WATERSHED	WATERSHED/SUBSHED: (1) a Vers Reservoir DATE: 6/4/08 ASSESSED BY: Friends								
URVEY REACH ID: WROY TIME: X:52 AM/PM PHOTO ID: (Camera-Pic #)									
SITE ID: (Con	SITE ID: (Condition-#) SC-01 LAT 41°51 '7.8" LONG 72°25 '42.8" LMK GPS (Unit ID)								
TYPE: Roa	ad Crossing Railroad Crossin	ng Manmade	Dam 🔲 Beav	er Da	ım 🔲	Geological Forr	nation [	Other:	
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Effiptical Circular Other:	# BARRELS:  Single Double Triple Other:	MATERIAL:  Concrete Metal Other:		ALIGI Flo	NMENT: w-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if variable, ske ameter: 4.5 Height:	(ft) (ft)
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosion Sediment deposition Other (describe):	n ☐ Downstrean ☐ Failing emb			☑ Fla	ERT SLOPE: t ght (2° – 5°) vious (>5°)	Culvert le	ength: 60 Width:	(ft) (ft)
no	RESTORATION CANDIDATE	☐ Fish barrier re☐ Local stream						torage retrofit  Pulum OKVE	Č.
IS SC ACTING	G AS GRADE CONTROL	MNo □ Ye	es Unk	nowr					
If yes for fish barrier	EXTENT OF PHYSICAL BLO Total Partial Temporary Unknow  CAUSE: Drop too high Water Dr Flow too shallow Water De Other:	vn rop:(in)	A structure such road culvert on a greater stream bl upstream movem anadromous fish; passage device p	3rd or ocking ent of no fisl	am or der or the h	A total fish blocka tributary that wou significant reach o or partial blockag interfere with the anadromous fish.	ge on a ld isolate a of stream, e that may	A temporary barrier sucl beaver dam or a blockay the very head of a streal very little viable fish hab above it; natural barriers as waterfalls.	ge at m with bitat
NOTES/SKET			5	-		3		2 1	
I TO LEGIONE I									
<u>)</u>				·		Repor	TED TO AU	THORITIES   YES	] No

SC

WATERSHED	/SUBSHED: Walkes	Reservoir		DATE: _	<u>614 108</u>	ASSI	ESSED BY: Friends		
\$6000 0000 00 March 5.7 (Author)	SURVEY REACH ID: W204 TIME: 9:23 AM/PM PHOTO ID: (Camera-Pic #) /# 9, 10								
SITE ID: (Con	SITE ID: (Condition-#) SC-02   LAT 41° 51 ' 13.3" LONG 72° 25 ' 45.3" LMK GPS (Unit ID)								
TYPE: M Ros	ad Crossing	ing Manmade	Dam Reave	r Dam [	7 Geological For	nation [	Other:		
FOR ROAD/ RAILROAD	SHAPE:  Arch Bottomless  Box Elliptical  Circular Other:	#BARRELS: Single Double Triple Other:	MATERIAL:  Concrete  Metal  Other:	ALI	GNMENT: Flow-aligned Not flow-aligned Do not know		SIONS: (if variable, sketch)		
CROSSINGS ONLY	CONDITION: (Evidence of)  □Cracking/chipping/corrosio  ☑ Sediment deposition  □ Other (describe):	n			LVERT SLOPE: Flat Slight (2° – 5°) Obvious (>5°)	Culvert le	ength:(ft) Width:(ft)  v elevation:(ft)		
POTENTIAL I	RESTORATION CANDIDATE	☐ Fish barrier re☐ Local stream			replacement 🔲 l	Jpstream s	torage retrofit		
Is SC ACTING	G AS GRADE CONTROL	□ No □ Y	es Unkn						
If yes for fish barrier	Flow too shallow Water D	wn rop:(in)	A structure such a road culvert on a 3 greater stream blo upstream moveme anadromous fish; I passage device pr	s a dam or Brd order or cking the ent of no fish	A total fish blocka tributary that woul significant reach of or partial blockage interfere with the in anadromous fish.	ge on a ld isolate a of stream, e that may	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.		
<u> </u>	Other:	n	5	***************************************	4 3		2 1		
NOTES/SKET	CH:								
					Repor'	TED TO AU	THORITIES   YES   NO		

## Reach Level Assessment

RCH

SURVEY REACH 1	m: <u>\[205</u> ] w	trshd/Subshd: Wa	Kus Res	DATE:	1 6 3 1 .	ESSED BY: Rence Gearge
START TIM	e: <u>4 : 20</u> am/p			5 : 43 AM/PM		
LAT41 ° 51	<u>07.%"</u> Long	120 25 142.8"	LAT 41 ° 51 '	46" LONG 7	2025 134	s, <del>9</del> 11
DESCRIPTION: Pec	_		DESCRIPTION: 7			
RAIN IN LAST 24 HC	ours   Heavy rain	☐ Steady rain	PRESENT CONDITIONS			ı □ Intermittent
None	☐ Intermitten	t   Trace	□ Clear	☐ Trace	☐ Overcast	☐ Partly cloudy
SURROUNDING LAN		al ☐ Commercial urse ☐ Park	☐ Urban/Residential ☐ Crop	Suburban/Res     □ Pasture	区 Forested Other: 山火	□ Institutional
AVERAGE	CONDITIONS (che	eck applicable)	REACH	SKETCH AND SI	TE IMPACT TI	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% ▼ 75-100%	within the survey re	of survey reach. Tra ach (OT, ER, IB,SC, deemed appropriate	UT, TR, MI) as w	IDs for all site impacts vell as any additional on of flow
DOMINANT SUBSTR  ☐ Silt/clay (fine or  ☐ Sand (gritty)  ☐ Gravel (0.1-2.5	slick) 🗍 C	(in i + cook)  obble (2.5-10")  soulder (>10")  ed rock	38 / C 3	7-01		f.
WATER CLARITY  ☐ Stained (clear, no   ☐ Other (chemicals,	aturally colored) dyes)	Opaque (milky)	Single Cost	Sh X A	Start	horres
AQUATIC PLANTS IN STREAM		ne ⊠some □ lots e □ some □ lots		(1x )		,
WILDLIFE IN OR AROUND STREAM	(Evidence of) Second Fish ☐ Beau ☐ Snails ☑ Other	/er ⊠/Deer		2.5		SCQ2
STREAM SHADING (water surface)	Mostly shaded ☐ Halfway (≥50% ☐ Partially shade ☐ Unshaded (< 2.	%) d (≥25%)	A HOW	A ree Down	Some & on	Steels
CHANNEL DYNAMICS Unknown	Downcutting Widening Headcutting Aggrading	Bed scour Bank failure Bank scour Slope failure	SC-UNION TOO	Dougle	ag 1658	THE ST
CHANNEL	Sed. deposition  Height: LT bank	Channelized  2.4 (ft)	16 104	e Action)	**************************************	
DIMENSIONS	RT bank	(ft)	madelet in carried and	*5.XY	07-02-11	Steel Bunits
(Facing downstream)	Width: Bottom			4 JUS	0,	130
_ 0	Тор	<u>/4, 5</u> (ft)	1 (8H 200)		5 1	155p
R	EACH ACCESSIBILI	TY		2/62	10x (50)	, - <b>,</b>
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	1864 1864	to come to the character of the characte	Ser 30th	OT-OF
NOTES: (biggest prob	tem you see in survey	reach)	To of 11	Ω		
)		Charles	by Wood many	, " 0		
		Der	world of			
		V	Au Mr.	Repor	TED TO AUTHOR	RITIES YES NO

Me Bolomines

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT  (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 (13 )2 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION  (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamban surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.  <5% of bank affected.		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to propert or infrastructure.
	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull, not able to enter floodplain. Stream deeply entrenched.
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: littl or no riparian vegetation due to human activities.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetatio type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 (1)	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACH- MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <b>6</b>	5 4 3 2 1 0

WATERSHED/SUBSHED: Walker Response		DATE: 6 / 3 / C	ASSESSED BY	: 35 27,64	
JURVEY REACH ID: V	1205 TI	ME: <u>5</u> : <u>0</u> , AM/RM	Рното ID: (Camera-Pi		State State of State
SITE ID (Condition-#): O'	T- <u>01</u> La	AT <u>41° 57'114</u> "L			GPS: (Unit ID)
BANK:  LT RT Head	TYPE:	MATERIAL:  Concrete Metal	SHAPE: Single	DIMENSIONS:	SUBMERGED:
FLOW:	Closed	☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick	☐ Circular ☐ Double ☐ Elliptical ☐ Triple	Diameter:(	in) No
FLOW:  None Trickle	pipe	Other:	☐ Other:	Diameto	- I raitially
Moderate					Fully
Substantial	☑ Open	Concrete Earthen		epth: (in)	
U Other:	channel	Other:	☐ O41	/idth (Top):(in)	
CONDITION:	Odor: No	DEPOSITS/STAINS:		' (Bottom): (in)	
None	Gas Gas	DEPOSITS/STAINS:  ☐ None	VEGGIE DENSITY: ☐ None	PIPE BENTHIC G	
Chip/Cracked	☐ Sewage	Oily	Normal	Brown Ora	ange Green
Peeling Paint	Rancid/Sour	Flow Line	Inhibited	POOL QUALITY:	□ No pool
Corrosion Other:	Sulfide	Paint Other:	Excessive	Good Odors	
Utner:	Other:	Utner:	Other:	Suds Algae	Floatables
			,	Other:	
For Color:	☑ Clear	r 🗌 Brown 🔲 Grey	Yellow Green	Orange Red	Ott
FLOWING TURBIDI	TY: None	Slight Cloudiness	Cloudy Dpaque	Orange [ ] Red [ ]	Otter.
ONLY FLOATAI		Sewage (toilet paper,	etc.) Petroleum (	oil sheen)	Other:
	ss Trash (paper/pla			Sedimentation	/
CONCERNS: Needs	s Regular Mainten	ance Bank Ero	osion M Other: NC.	moses rund) ?	Deep chance
POTENTIAL RESTORAT	TON CANDIDATE	The same of the sa			
no	TON CANDIDALE	Discharge investigation		Local stream repai	r/outfall stabilization
If yes for daylighting:		Storm water retrofit	Other:		
Length of vegetative cover	from outfall:	ft Type of exist	ting vegetation:	Clama	0
		tt Type of exist	ing vegetation.	Slope	·°
If yes for stormwater:					
Is stormwater currently cor		Land Use des	scription:		
Yes No Not ir		Area availabl	e:		
OUTFALL Heavy SEVERITY: Strong	y discharge with a disting smell. The amount of	discharge is significant   SITIBILO	lischarge; flow mostly clear and od	orless. If the	
comp	pared to the amount of r	normal flow in receiving dischar	ge has a color and/or odor, the am- ge is very small compared to the st	ount of discharge	es not have dry weather ; staining; or appearance
· Sueai	m; discharge appears to icant impact downstrea		d any impact appears to be minor /		any erosion problems.
	5	4	(3)	2	1
SKETCH/NOTES:	<del></del>	ž 3	2		1
1	Mala Day	no A chan	nel Marinah	DISIDO	n 1/2/
	May Dec	A COL DIA	2 2 2 2 2 2 2		
	2000 M	i Dwnes	Abotos From	n (and)	From
	Malou	X	A Coll	, /	
		5. MAR / SPI	My. FINSK C	n-Hund 1	( BANNAM
Ì	JAMANIA		, 0	U	ji da da da da da da da da da da da da da
4	1 AINC	in chance			
<i>}</i>			R	EPORTED TO AUTHOR	ITIES: L YES NO

	7	7
1)	•	
_	_	-

WATERSHED/SUBSHED: WOLL	n Reservoir	DATE: 6/3/08 ASSESSED BY: 35, 77, 6A						
SURVEY REACH ID: WZOS	TIME: <u>5</u> : <u>25</u> AM/RM	PHOTO ID: (Camera-Pic #)   4 /#						
SITE ID (Condition-#): OT	LAT 410 51 135 "L	ong <u>72 ° 25 '40/1</u> " LM	<b>GPS</b> : (Unit ID)					
BANK: TYPE:  LT RT Head  FLOW: Closed pipe  Moderate	MATERIAL:  Concrete Metal  PVC/Plastic Brick Other:	☐ Circular ☐ Double	SUBMERGED:  No eter: (in) Partially  Fully					
Substantial Open Channe	Concrete Earthen	□ O41	(in) NOT APPE CABLE (in)					
CONDITION: None Gas Chip/Cracked Peeling Paint Corrosion Other: Other: ODOR: Gas Rancid Rancid Other:	□ None   □ Oily  /Sour □ Flow Line	□ None     □ Browner       ☑ Normal     □ Other       □ Inhibited     Pool (a)       □ Excessive     □ Good	QUALITY: No pool d Odors Colors Oils S Algae Floatables					
FLOWING ONLY TURBIDITY: FLOATABLES:  OTHER CONCERNS:  Needs Regular M	FLOWING ONLY FLOATABLES: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) OTHER CONCERNS: Needs Regular Maintenance Bank Erosion Other:  POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization							
If yes for daylighting: Length of vegetative cover from outf	all:ft Type of exist	ting vegetation:	Slope: °					
If yes for stormwater:  Is stormwater currently controlled?  ☐ Yes ☐ No ☐ Not investigated	Land Use de Area availabl	scription:le:						
SEVERITY: strong smell. The a compared to the ar	discharding the discharding and the discharding and the discharding and the discharding and the discharding and the discharding and the discharding and the discharding the di	discharge; flow mostly clear and odorless. If the ige has a color and/or odor, the amount of ige is very small compared to the stream's base d any impact appears to be minor / localized.	discharge; staining; or appearance of causing any erosion problems.					
SKETCH/NOTES:	5 4	3	2 1					
		Reported	o to authorities: □ yes □ no					

WATERSHED	o/subshed: Worker's		DA	TE: <u>6</u>	13108	ASSE	SSED BY: 35 27 6A		
URVEY REACH ID: \(\mathbb{R}\)\(\text{POS}\) TIME:\(\sum_{\text{S}}\) \(\text{TSAM/PM}\) PHOTO ID: (Camera-Pic #) /#									
SITE ID: (Condition-#) SC-02   LAT 41° 51' 146" LONG 72° 25' 369" LMK GPS (Unit ID)									
TYPE: Ros	ad Crossing	ng Manmade	Dam Beaver Da	am $\square$	Geological For	nation [	Other:		
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Shape Elliptical Circular Other:	# BARRELS:    Single   Double   Triple   Other:	MATERIAL: Concrete Metal Other:	ALIGI Flo	NMENT: ow-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if variable, sketch) ameter: (ft) Height: 6.54 ct (ft)		
CROSSINGS ONLY	CONDITION: (Evidence of)  Cracking/chipping/corrosion Sediment deposition Other (describe):	Louks 6000 Downstrean  Failing emb		Ela	ght (2° – 5°) vious (>5°)	Culvert le	ength:		
POTÉNTIAL I	RESTORATION CANDIDATE	Local stream	emoval	epair/rep	olacement 🔲 l	Upstream s	torage retrofit		
IS SC ACTING	G AS GRADE CONTROL	XNo □ Ye	es Unknowi						
	EXTENT OF PHYSICAL BLO  Total Partial	CKAGE:		BLO	CKAGE SEVER	RITY: (circ	le #)		
If yes for fish barrier	Temporary Unknow	op:(in)	A structure such as a d road culvert on a 3rd or greater stream blocking upstream movement of anadromous fish; no fis passage device presen	der or the h t.	A total fish blocka tributary that wou significant reach o or partial blockag interfere with the anadromous fish.	ld isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.		
NOTES/SKET	·CH:		5		4 3		2 1		
	The state of the s	Olo Ten	10% Sedin	F10h	1 1 1 - 4				

WATERSHED		ukers	Resevoia		DA	ге: <u>6</u>	13 108	ASSE	ESSED BY	C: RWMA
IRVEY REA	CHID: WROS	_AM/PM	PH	ото ID	: (Camera-Pi					
SITE ID: (Con	SITE ID: (Condition-#) SC-01 LAT 41 ° 51 ' 69.7" LONG 72 ° 25 ' 41.4 " LMK GPS (Unit ID)									
TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other:										
FOR ROAD/ RAILROAD	SHAPE: Arch Bo	ttomless liptical	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		ALIGN Flo	NMENT: w-aligned flow-aligned not know	DIMENS Barrel dia	IONS: (if ameter: Height:	6.28 RT
CROSSINGS ONLY	CONDITION: (Evid  Cracking/chippin  Sediment deposi  Other (describe)	ng/corrosion	ing emb			CULVERT SLOPE:  Flat Slight (2° – 5°) Obvious (>5°)		Culvert le	Width:	9 H H (ft) 9 H H (ft) 9 H H (ft) 6 H H H H
POTENTIAL I	RESTORATION CAN	DIDATE	☐ Fish barrier re☐ Local stream r	moval 🗌 Culv		epair/rep	lacement 🔲	Upstream s	torage re	trofit
Is SC ACTING	G AS GRADE CONTI	ROL	No Ye	es 🔲 Unk	nowr	1				
	EXTENT OF PHYS		CKAGE:			BLO	CKAGE SEVE	RITY: (circ	:le #)	
If yes for fish barrier	CAUSE:  Drop too high Flow too shallow		rop:(in)	A structure such a road culvert on a greater stream bl upstream movern anadromous fish; passage device p	3rd or locking nent of ; no fis	der or the	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	old isolate a of stream, e that may migration of	beaver d the very very little	rary barrier such as a am or a blockage at head of a stream with viable fish habitat natural barriers such falls.
) NOTES/SKET	Other:			5		4	3		2	1
NOTES/SKET	· ·	er men	Ascand	45		U met	d d	onpod		



#### **APPENDIX B**

Upland Assessment Field Forms

WATERSHED: GINCUL	SUBWATERSHED:	CAKS		UNIQUE SITE	ID: SA	CB-HS1-2
DATE: 1 ( G / Og	ASSESSED BY:	JDB.	CAMERA ID:		PIC#:	
Map Grid:	Lat°		Long°		LMK#	
A. SITE DATA AND BASIC CLASSIFICATION						
Name and Address: No more	Category:		al N Industrial  I Municipal	Miscellaneous Golf Course		
Sand, gravel, & construction	<u> </u>	Transport-I		Marina	,	
· wloch	_		.•	Animal Faci	lity	
SIC code (if available):	Basic Descripti			-le		
NPDES Status: Regulated Unregulated Unknown	<b>V</b>	cessing o	+ File 6010	ce		INDEX*
B. VEHICLE OPERATIONS N/A (Skip to	part C)			Observed F	Pollution Sou	rce?
<b>B1.</b> Types of vehicles:  Fleet vehicles	School buses	Other: _				
B2. Approximate number of vehicles:						
B3. Vehicle activities (circle all that apply):		red Recyc	led Fueled Wa	shed Stored		0
<b>B4.</b> Are vehicles stored and/or repaired outs. Are these vehicles lacking runoff diversion in		☑ Can't Te N ☑ Can				O
<b>B5.</b> Is there evidence of spills/leakage from	vehicles? Y	N 🙀 Can	't Tell			0
B6. Are uncovered outdoor fueling areas pre	esent? Y N	☐ Can't T	Cell	·····		
B7. Are fueling areas directly connected to s	storm drains? Y	_/ □ N □	Can't Tell	· · · · · · · · · · · · · · · · · · ·		
B8. Are vehicles washed outdoors?						O
Does the area where vehicles are washed dis		lrain? 🔲 Y	□ N 🛛 Can	't Tell		
C. OUTDOOR MATERIALS N/A (Skip to		4.450 m		Observed I	Pollution Sou	rce?
C1. Are loading/unloading operations present	<b>v</b>	Can't Tell		2. T. 11		0
If yes, are they uncovered and draining towa			· · · · · · · · · · · · · · · · · · ·	't Tell		
C2. Are materials stored outside? ☑ Y ☐ Where are they stored? ☐ grass/dirt area	concrete/asphalt	bermed	y [] Liquid X S	olid Description	1: DI/	<b>Ø</b> 3
C3. Is the storage area directly or indirectly	connected to storm d	rain (circle o	one)? [Y ]	N M Can't Te	:11	
C4. Is staining or discoloration around the a	rea visible? X [	]и 🗓 С	an't Tell			
C5. Does outdoor storage area lack a cover?	□Y □N ☒	Can't Tell				
C6. Are liquid materials stored without seco	ndary containment?	□ Y □ :	N X Can't Tell			
C7. Are storage containers missing labels or						0
D. WASTE MANAGEMENT N/A (Skip to	-				Pollution Sou	
D1. Type of waste (check all that apply):	☐ Garbage 🌠Con:	struction ma	terials  Hazar	dous materials		To
<b>D2.</b> Dumpster condition ( <i>check all that app</i> evidence of leakage (stains on ground)		is open	Damaged/poor co	ondition \[ \] L	eaking or	O
D3. Is the dumpster located near a storm dra If yes, are runoff diversion methods (be:	in inlet? 🔲 Y 🔲 N					0
E. PHYSICAL PLANT N/A (Skip to part)	Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo San Carlo			Observed F	Pollution Sour	rce?
E1. Building: Approximate age:	yrs. Condition of s					Ο
Evidence that maintenance results in discha	rge to storm drains (s	taming/disc	oloration)?	∐ N 🎑 Don't 🗎	know	Ο
*Index: O denotes potential po	llution source;	denotes	confirmed pollu	iter (evidence v	was seen)	

E2. Parking Lot: Approximate age yrs. Condition:						Di	rty		Bre	aki	ng t	ıp						а	\^
Surface material Paved/Concrete Gravel Permeab							1 2 7		· <del>,</del> .	11								,	
E3. Do downspouts discharge to impervious surface? Y N Are downspouts directly connected to storm drains?		Υ Y	on'	t ki ] N	ow	L D	J No On'	one t kr	VISI IOW	ble								· C	)
E4. Evidence of poor cleaning practices for construction activities (	(stai	ns le	eadi	ng	to s	torr	n dı	ain	)? 🛭	Y [5	<u> </u>	 ] N		Ca	n't ′	Tel	i	C	)
F. TURF/LANDSCAPING AREAS N/A (skip to part G)									(	)bs	erve	ed l	Poll	utio	n S	our	ce?	Π	
F1. % of site with: Forest canopy% Turf grass% La	ndsc	api	ng _		_%	Ва	are	Soil	8	50%	ó							Œ	7
F2. Rate the turf management status: High Medium I	Low																	C	)
F3. Evidence of permanent irrigation or "non-target" irrigation	Y_[	<u>]</u> 1	1 [	] (	an'	t Te	=11											C	)
F4. Do landscaped areas drain to the storm drain system?	ŹΥ		N		] Ca	ın't	Tel	1	***************************************									C	)
F5. Do landscape plants accumulate organic matter (leaves, grass clippings	s) on	adja	acen	t im	per	/iou	s su	rfac	e? [		Υ	] N	[X]	Car	ı't I	Γell		C	)
G. STORM WATER INFRASTRUCTURE N/A (skip to par	t H)		(3.317) (3.35)						(	)bs	erv	ed l	/ Poll	utio	n S	our	ce?		
G1. Are storm water treatment practices present?  Y N	Unl	ano	wn	If y	es,	ple	ase	des	crib	e: _								C	)
G2. Are private storm drains located at the facility? \( \subseteq Y \subseteq N \subseteq \) Is trash present in gutters leading to storm drains? If so, co					ev l	nelo	1337											Ċ	)
Index Rating for								·s									縺		
Clean										Fil	thy								
Sediment 1 2	] 3						4				[		5						
Organic material 1 2 [ Litter 1 2 ]	□ 3 □ 3					님	4				Į		5 5						
G3. Catch basin inspection – Record SSD Unique Site ID here:				one	litic	n: [	<del>-</del> -	Dirt	v [	٦	<u> </u>		<u>,                                     </u>				***************************************		
H. INITIAL HOTSPOT STATUS - INDEX RESULTS									<i>y</i> .										
Not a hotspot (fewer than 5 circles and no boxes checked)	Pote	ntia	ıl ho	tsp	ot (	5 to	o 10	) cir	cles	but	t no	bo	xes	chec	cked	1)			
Confirmed hotspot (10 to 15 circles and/or 1 box checked)				_												-	ed)		
Follow-up Action:																			
Refer for immediate enforcement																			
Suggest follow-up on-site inspection Test for illicit discharge															1				
Include in future education effort		-				,					_			-			+		+-
Check to see if hotspot is an NPDES non-filer	-					7		. ,	, (	_	1	-	$\dashv$				$\dashv$		-
Onsite non-residential retrofit	<u></u>					10	ր <del>X-1</del>	14	1/2	_/									
Pervious area restoration; complete PAA sheet and record						P		,-(	v	-									
Unique Site ID here:					L														
Schedule a review of storm water pollution prevention plan																			
Notes:																			
Films woodel acusal a list																			
Follow needed - private industry																			
pipes & debn's in your						<u> </u>	2												
and large dirt piles							C	et	-										
pipes & debois in yard and large dirt piles Su practices unknown					I	,	d	W	t										
1		<u> </u>																	
								<u> </u>											
					<u> </u>														
· ·	1	ŧ .	1	l	t		i	1						-					

7/16/08 TULLER BROOK - Bletiske geportenty - Boom montenonce - alconout, odd foreby if more Some libly town-ouned since part of softwice small DVI pipes discharging to V.S. storm times

WATERSHED: Tolk Cer	SUBWATERSHED:	Unique Site ID: 172	HS1-0
DATE: 7 / 16/ 68	ASSESSED BY: (B, D) CAMERA ID:	Pic#:	
MAP GRID:	LAT 41 ° 49 ' 37" LONG 72° 28	<u>'53</u> " LMK#	
A. SITE DATA AND BASIC CLASSIFICATION			
Name and Address:		Miscellaneous	
Highway Garage - CTDO	☐ Institutional ☐ Municipal ☐ Transport-Related	☐ Golf Course ☐ Marina	
1 NOT MORTENANO	- \ \	Animal Facility	Sil
SIC code (if available):	Basic Description of Operation:	cand stonal of	11
NPDES Status: Regulated かか	nct 1 large garage, solt	31,01 2 1010 de 1	INDEX*
B. VEHICLE OPERATIONS N/A (Skip to	part C) - 13(1)(1)	Observed Pollution Source	e?
B1. Types of vehicles:  Fleet vehicles	School buses Other: Comme		
B2. Approximate number of vehicles:			
B3. Vehicle activities (circle all that apply):		shed Stored	0
<b>B4.</b> Are vehicles stored and/or repaired outs			0
Are these vehicles lacking runoff diversion in <b>B5.</b> Is there evidence of spills/leakage from			
			O
B6. Are uncovered outdoor fueling areas pre			Ø
<b>B7.</b> Are fueling areas directly connected to s <b>B8.</b> Are vehicles washed outdoors?			Ø
Does the area where vehicles are washed dis		t Tell	0
C. OUTDOOR MATERIALS N/A (Skip to		Observed Pollution Source	62
C1. Are loading/unloading operations presen	nt? 📈 Y 🔲 N 🔲 Can't Tell		
If yes, are they uncovered and draining toward	ırds a storm drain inlet? 🔲 Y 🔲 N 🔲 Can	't Tell	O
C2. Are materials stored outside? X Y Where are they stored? grass/dirt area	N Can't Tell If yes, are they Liquid S S concrete/asphalt bermed area	ا المالات	/\X
C3. Is the storage area directly or indirectly	connected to storm drain (circle one)?		. O
C4. Is staining or discoloration around the a	rea visible? 🗌 Y 🔲 N 💢 Can't Tell		0
C5. Does outdoor storage area lack a cover?	XY N Can't Tell		Ø.
C6. Are liquid materials stored without seco	ndary containment? 🔲 Y 🔲 N 🔀 Can't Tell		Ο,
C7. Are storage containers missing labels or	in poor condition (rusting)? 🗌 Y 🔲 N 💆 Car	ı't Tell	0
D. WASTE MANAGEMENT [] N/A (Skip to	p part E)	Observed Pollution Source	e?
<b>D1.</b> Type of waste (check all that apply):	🛚 Garbage 🏻 Construction materials 🔲 Hazard	lous materials	0
evidence of leakage (stains on ground)		ondition Leaking or	Ø
D3. Is the dumpster located near a storm dra If yes, are runoff diversion methods (be			Ο
E. PHYSICAL PLANT N/A (Skip to part	7)	Observed Pollution Source	e?
E1. Building: Approximate age: 50  Evidence that maintenance results in discha	yrs. Condition of surfaces: Clean Stain rge to storm drains (staining/discoloration)? Y		0
*Index: O denotes potential po	llution source; denotes confirmed pollu	ter (evidence was seen)	

E2. Parking Lot: Approximate age yrs. Condition: \( \subseteq \text{Clea} \) Clea Surface material \( \superpresete \text{Paved/Concrete} \) Gravel \( \superpresete \text{Permeable} \)					Dir	ty [	Br	eakir	ıg u	ıp						O	
E3. Do downspouts discharge to impervious surface? Y N Don't know None visible												<u> </u>					
Are downspouts directly connected to storm drains? Y N Mon't know										_		<u> </u>					
E4. Evidence of poor cleaning practices for construction activities (	stains	s lea	ding	to s	torm	drai	n)? [	_] Y	K,	JN	Ш	Can	't Te	11		0	
F. TURF/LANDSCAPING AREAS N/A (skip to part G)								000000000000000000000000000000000000000		ed P	ollı	ıtioi	Sot	rce	<u>2]</u>		
F1. % of site with: Forest canopy 0 % Turf grass 10 % Lan		ping	<u> </u>	<u>\</u> %	Ba	re Sc	il <u>(</u>	<u>2</u> %	)		~		***************************************			O.	
F2. Rate the turf management status:  High Medium  Low												0					
F3. Evidence of permanent irrigation or "non-target" irrigation Y N Can't Tell												Ο.					
F4. Do landscaped areas drain to the storm drain system? XY N Can't Tell												0					
F5. Do landscape plants accumulate organic matter (leaves, grass clippings	F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? \( \subseteq \text{Y} \subseteq \text{N} \subseteq \text{Can't Tell} \)									1		$\overline{\circ}$					
G. STORM WATER INFRASTRUCTURE N/A (skip to part	tH)				i i			Obse	erve	ed P	olli	ıtioı	i Soi	rce	<u>?</u> [		l
G1. Are storm water treatment practices present? $\square$ Y $\nearrow$ N $\nearrow$	Unkr	10W1	ı If	yes,	plea	se de	scrib	e:								0	
G2. Are private storm drains located at the facility? Y Y N S Is trash present in gutters leading to storm drains? If so, co				lex l	elov	v										O	
Index Rating fo							***************************************				·						
Clean								Filt	hy								
Sediment 1 2	] 3					ļ				<u></u> 5							
Organic material 1 2 1 Litter 1 2	]3 ]3				H'	ļ 1			Ļ	_] 5 □ 5							
G3. Catch basin inspection – Record SSD Unique Site ID here:	3	<del></del>	Con	ditic	<u>∐ ′</u> m· [	] Di	rtv	$\Box$	Llea		)						
H. INITIAL HOTSPOT STATUS - INDEX RESULTS					л		·		<u>Jicu</u>	11							
☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☐ I	Z Poten	tial l	notsi	not (	′5 to	10 c	ircle	s but	no.	box	ces c	hec	ked)				
Confirmed hotspot (10 to 15 circles and/or 1 box checked)					-								,	ced)	+		
Follow-up Action:	$\prod$			T					П	$\top$	$\top$		T				
Refer for immediate enforcement									$\neg \dagger$								
Suggest follow-up on-site inspection  Test for illicit discharge						+	1							$\vdash$			
Include in future education effort		+	+	<del> </del>				$\vdash$	$\dashv$	$\dashv$	$\neg \dagger$	$\dashv$	+-	<del> </del>			
Check to see if hotspot is an NPDES non-filer		$\dashv$	+-	<del> </del>		+		$\vdash$					+-				
Onsite non-residential retrofit	-		-	<del> </del>		-	+-		_			-	-				
Pervious area restoration; complete PAA sheet and record Unique Site ID here:	$\vdash$	_	+	+-		+		$\vdash$	$\dashv$	-			-	-			
Schedule a review of storm water pollution prevention plan	-			┼		+		$\vdash$	$\dashv$					-		-	
	$\vdash$	-		-			-		_		_	-		-			
Notes: Cour Dot Facility	H		-	<del> </del>		_			_	_		-	+	ļ			
COW DOLLARS			$\perp$	_						_		_	-	<u> </u>		_	
	$\vdash$	+	-	-			_			_	_	_		<u> </u>			
			_	ļ						_	_						
		$\perp$	_ _	1					$\perp$					_			
		$\perp$		<u> </u>							_	_		<u> </u>			
												_		<u> </u>			
		1															
				ļ													

### Hotspot Site Investigation

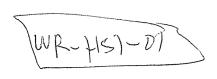
HSI

WATERSHED: THEKER	SUBWATERSHED: Walker	Unique Site ID: WR - {	451-01
DATE: 7/16/08	Assessed By: LB, DB CAMERA II		8-3701
MAP GRID:	LAT41.51 11 "LONG 72.	25 <u>.45"</u> LMK#	
A. SITE DATA AND BASIC CLASSIFICATION			
Name and Address:	Category: Commercial Industr		
[+3] of of IS4	☐ Institutional ☐ Munic ☐ X Transport-Related	ipal Golf Course Marina	
	<u>-</u>	Animal Facility	
SIC code (if available):	Basic Description of Operation:		
NPDES Status: Regulated Unregulated Unknown	DOT Communter Lot		INDEX*
B. VEHICLE OPERATIONS N/A (Skip to	part C)	Observed Pollution Sour	202
B1. Types of vehicles:   Fleet vehicles	1		
B2. Approximate number of vehicles: 150		770	
B3. Vehicle activities (circle all that apply):	Maintained Repaired Recycled Fueled	Washed Stored Pay Cing	Ø
<b>B4.</b> Are vehicles stored and/or repaired outs			0
Are these vehicles lacking runoff diversion r  B5. Is there evidence of spills/leakage from		II alla Vallent 1	
B6. Are uncovered outdoor fueling areas pre		01-11-11	XØ
B7. Are fueling areas directly connected to s		t/Salting/Sanding	0
	N Can't Tell	f	100
Does the area where vehicles are washed dis	<u> — — — — — — — — — — — — — — — — — — —</u>	Can't Tell	0
C. OUTDOOR MATERIALS X N/A (Skip to	part D)	Observed Pollution Sour	ce?
C1. Are loading/unloading operations presen			0
If yes, are they uncovered and draining toward		Can't Tell	
<b>C2.</b> Are materials stored outside? ☐ Y ☐ Where are they stored? ☐ grass/dirt area	N ☐ Can t Tell If yes, are they ☐ Liquid ☐ concrete/asphalt ☐ bermed area	Solid Description:	0
C3. Is the storage area directly or indirectly	connected to storm drain (circle one)? 🛛 Y	□ N □ Can't Tell	0
C4. Is staining or discoloration around the a	rea visible? 🗌 Y 💢 N 🔲 Can't Tell		0
C5. Does outdoor storage area lack a cover?	∏ Y ☑N ☐ Can't Tell		0
C6. Are liquid materials stored without seco	ndary containment?  Y N Can't	Tell	0
C7. Are storage containers missing labels or	in poor condition (rusting)? 🗌 Y 📗 N 📗	Can't Tell	0
D. WASTE MANAGEMENT N/A (Skip to	o part E)	Observed Pollution Sour	ce?
D1. Type of waste (check all that apply):	Garbage Construction materials H	lazardous materials	0
evidence of leakage (stains on ground)		oor condition  Leaking or	O
D3. Is the dumpster located near a storm dra If yes, are runoff diversion methods (be		Tell	Ο
E. PHYSICAL PLANT N/A (Skip to part		Observed Pollution Sour	ce?
	yrs. Condition of surfaces: Clean creation Clean cr		0
*Index: O denotes potential po	ollution source; denotes confirmed	polluter (evidence was seen)	

WR-451-01 Hotspot Site Investigation

**	
H	<b>\</b>

	imate age \( \bigcup \) yrs. Condition: \( \bigcup \) Condition: \( \bigcup \) Perme			<b>\&amp;</b>
E3. Do downspouts disch	arge to impervious surface? Y circctly connected to storm drains?	N Don't knov	w None visible Don't know	. O
	aning practices for construction activities			☐ Can't Tell O
	GAREAS X N/A (skip to part G)			ollution Source?
		Landscaping %	Bare Soil %	Ιο
	nent status: High Medium	Low		
	nt irrigation or "non-target" irrigation	 □ Y □ N □ Can	't Tell	
F4. Do landscaped areas	drain to the storm drain system?	□Y □N □C	Can't Tell	
F5. Do landscape plants acc	umulate organic matter (leaves, grass clippi	ings) on adjacent imper	rvious surface? Y N	☐ Can't Tell ☐
G. STORM WATER IN	FRASTRUCTURE N/A (skip to p	art H)	Observed P	ollution Source?
G1. Are storm water trea	ment practices present?  Y X N	Unknown If yes,		<u> </u>
G2. Are private storm dra	ains located at the facility? X Y N	Unknown		7
Is trash present i	n gutters leading to storm drains? If so,	, complete the index	below.	<i>,</i> ⊗∕
		g for Accumulation is		RACIONAL S. M. LECOL. MANY.
Sediment	Clean 2	<b>⊠</b> 3	Filthy	
Organic material		<u>3</u>	4 5	•
Litter	□ 1 🔀 2	☐ 3	<u>4</u> <u>5</u>	
	on – Record SSD Unique Site ID here:	Conditie	on: Dirty Clean	
H. INITIAL HOTSPOT	STATUS - INDEX RESULTS			
- '	han 5 circles and no boxes checked) $\int$	•	·	•
	0 to 15 circles and/or 1 box checked)	Severe hotspot (>	15 circles and/or 2 or more	e boxes checked)
Follow-up Action:  Refer for immediate e	nforcement			
Suggest follow-up on			per general de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya del la companya de la companya de la companya del la companya de la c	
☐ Test for illicit dischar	ge		1114784	
Include in future educ				
Onsite non-residentia	ot is an NPDES non-filer			
	ion; complete PAA sheet and record			
Unique Site ID	nere:		D. June /	
Schedule a review of	storm water pollution prevention plan			
Notes:			MUNITER	
	ion parking lat			
	11 1 2000			
directly ent	ers wetland area		7   70	
& likely conta	ains eil and		THE SHIP	
Codinante de «	ains eil and salts. Retrofit			1/4/
36/(1/2013)	Crop Con			7/12
possible with	n large buffer.			
,	,			Marsh lunta
				Mossives along
				Orttaile &
		A-6		march of some
				Contails & Some
				i >



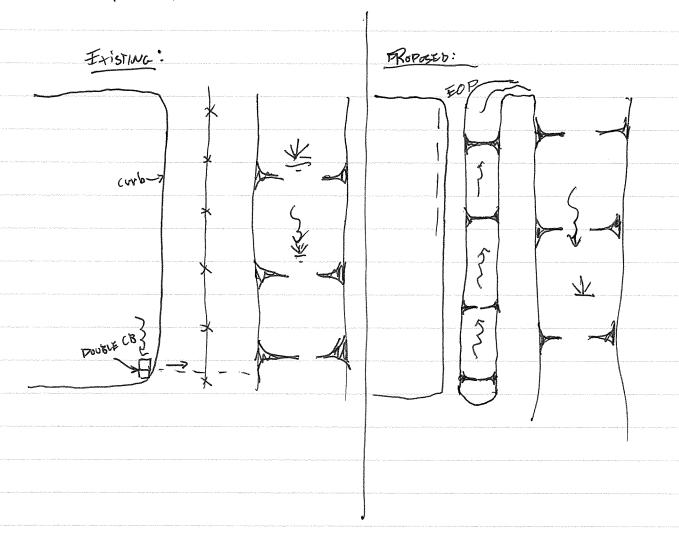
1/16/06 Horspeit Newestyntian - 41051'11" 72° 25' 45"

Dot commuter let - WK subnaturahed

Drainage are vland to SE corner

Discharge to wetland

Wide grass Strip between curb I wethound could be used for Swele



WATERSHED: Theler	SUBWATERSHED: Gages	Unique Site	1D: GB-451-02
DATE: 7/16/08	Assessed By: LWS CAMERA		Pic#:
MAP GRID:	LAT 41° 51 '30 "LONG 72°	25.09"	LMK#
A. SITE DATA AND BASIC CLASSIFICATION		<b>建筑设施</b> 。李斯	
Name and Address:	Category: Commercial Indust		
Davi Farms (ce Cream	Transport-Related	Marina	
Distribution	<u>-</u>	Animal Faci	lity
SIC code (if available):	Basic Description of Operation:		
NPDES Status: Regulated Unregulated Unknown	Distribution Center		INDEX*
B. VEHICLE OPERATIONS N/A (Skip to	part C)	Observed F	Pollution Source?
B1. Types of vehicles: N Fleet vehicles	School buses Other: CAYS/And		200 A 100 A
B2. Approximate number of vehicles: 20			
	Maintained Repaired Recycled Fueled	and the same of th	O/
B4. Are vehicles stored and/or repaired outs			O
Are these vehicles lacking runoff diversion in <b>B5.</b> Is there evidence of spills/leakage from		1444444	
<b>.B6.</b> Are uncovered outdoor fueling areas pre			
B7. Are fueling areas directly connected to s		n, [ . [ ].	
B8. Are vehicles washed outdoors? \( \subseteq \text{Y} \)	□ N	- Marinet	
Does the area where vehicles are washed dis		Can't Tell	O 1
C. OUTDOOR MATERIALS N/A (Skip to	part D)	Observed P	Pollution Source?
C1. Are loading/unloading operations preser		_	O
If yes, are they uncovered and draining towa		Can't Tell	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
C2. Are materials stored outside? ∑ Y ☐ Where are they stored? ☐ grass/dirt area	N	Solid Description	
C3. Is the storage area directly or indirectly	connected to storm drain (circle one)? 🗵 Y	□ N □ Can't Te	11 0
C4. Is staining or discoloration around the a	rea visible? 🗌 Y 🔲 N 🔎 Can't Tell		0 /
C5. Does outdoor storage area lack a cover?	XY N Can't Tell		⊚ .
C6. Are liquid materials stored without seco	ndary containment? 🗌 Y 🔲 N 🎽 Can'	t Tell	( O
C7. Are storage containers missing labels or	in poor condition (rusting)? 🗌 Y 🔀 N [	☐ Can't Tell	0
D. WASTE MANAGEMENT [ N/A (Skip to	o part E)	Observed P	Pollution Source?
<b>D1.</b> Type of waste (check all that apply):	$oldsymbol{ abla}$ Garbage $\ \square$ Construction materials $\ \square$ I	Hazardous materials	O
<b>D2.</b> Dumpster condition ( <i>check all that app</i> evidence of leakage (stains on ground)			eaking or O
D3. Is the dumpster located near a storm dra If yes, are runoff diversion methods (ber	/	t Tell	O
E. PHYSICAL PLANT \[ \sum \text{N/A} (Skip to part in		Observed P	Collution Source?
E1. Building: Approximate age: 5  Evidence that maintenance results in discha	yrs. Condition of surfaces: \( \sum_{\text{clean}} \) Clean \( \sum_{\text{rge}} \) rge to storm drains (staining/discoloration)?		
*Index: O denotes potential po	llution source; denotes confirmed	polluter (evidence v	was seen)

Hotspot Site Investigation HSI

	*																	
E2. Parking Lot: Approximate age yrs. Con-			_		_		Dirty		Break	ing ι	ıp						(	)
Surface material Paved/Concrete Grave																ļ.		
E3. Do downspouts discharge to impervious surface Are downspouts directly connected to stor.		_	J D	on't	kno N		N Don		visible ow	; 							(	B
E4. Evidence of poor cleaning practices for constructions	ction activities (s	stair	ıs le	adiı	ng to	sto	rm di	rain)	? 🔲 ን	7 [	] N	X	Car	n't ົ	Γell		(	)
F. TURF/LANDSCAPING AREAS N/A (skip	to part G)								Obs	erv	ed 1	Poll	utio	n S	our	ce?	Π	
F1. % of site with: Forest canopy% Turf gras	s 🛱 % Lan	ndsc	apir	1g <u> </u>	0 9	% ]	Bare	Soil	9	6							(	) (
F2. Rate the turf management status: High	Medium 🔲 L	ow															(	) /
F3. Evidence of permanent irrigation or "non-target	" irrigation 🏻	Υ[	] N	ī [	] Ca	n't ′	Γell										(	0/
F4. Do landscaped areas drain to the storm drain sys	stem? 💢	Y		N		Can	't Te	11									. (	Ø
F5. Do landscape plants accumulate organic matter (leave	es, grass clippings)	) on	adja	cent	imp	ervi	ous su	rface	? 🔲	ΥŽ	N		Can	ı't T	ell		(	<b>5</b>
G. STORM WATER INFRASTRUCTURE N/A	(skip to part	H)	,						Obs	erv	ed ]	Poll	utio	n S	our	ce?		
G1. Are storm water treatment practices present?	] Y   D N   Q I	Unk	nov	vn ]	If ye	s, p	lease	desc	ribe: _						_		(	)
G2. Are private storm drains located at the facility?  Is trash present in gutters leading to storm	Y N Grains?/If so. con	] U1 mple	ıkno	own	nde	k be	low.	σ									(	)
	Index Rating for				,			rs						<del></del>				
Clean									Fi	lthy								
Sediment 1 1	2	] 3				Ę	] 4			[	_	5						
Organic material 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2	] 3				L	_] 4 ¬⊿					5 5						
G3. Catch basin inspection – Record SSD Unique S	Lite ID here:			C	ondi	L tion	<del></del> •	Dirt	, _П	Clea	<u> </u>							
H. INITIAL HOTSPOT STATUS - INDEX RESU							• 🗀		,		• • •							
Not a hotspot (fewer than 5 circles and no boxes		ote:	ntia]	l ho	tspoi	t (5	to 10	) cir	cles bi	ıt no	ho:	xes	chec	kec				
Confirmed hotspot (10 to 15 circles and/or 1 bo					_											ed)		
Follow-up Action:					$\top$	Т							Т	Ī	T	Ť		T
Refer for immediate enforcement						$\top$							$\dashv$	+			_	
Suggest follow-up on-site inspection				_			+	$\Box$					_	$\dashv$	十	+	+	
Test for illicit discharge Include in future education effort		$\vdash$		-	-	_	-						$\dashv$	$\dashv$	+	+	+	+
Check to see if hotspot is an NPDES non-filer				$\dashv$	-					-			-	$\dashv$	+	+	+	_
Onsite non-residential retrofit														-	+	+	-	
Pervious area restoration; complete PAA sheet a	ind record	-		-	_			-	_	-				+	_	+		
Unique Site ID here:  Schedule a review of storm water pollution prev	rention plan					-	_						_	-	<del> </del>	+	_	
	on pun				_	-	-	-		ļ			_	_	_	+	_	
Notes:				_		_				1				_	_	$\bot$	_	
														_			4	
													_	$\perp$				
														[				
													T					
,					$\top$								$\neg$	$\top$	十	$\top$		

WA RSHED: Tank	SUBWATERSHED: Gages	Unique Site	1D:GB-HSI-01
DATE: 7/16/08	ASSESSED BY: $\angle \beta$ , $D\beta'$ CAMERA ID:		Pic#: 3687
Map Grid:	LAT 11 ° 51 '38 "LONG 72 18	25, 15"	LMK#
A. SITE DATA AND BASIC CLASSIFICATION		Control of the second	
Name and Address:	_ Category:		
Industrial Park West	Transport-Related	l ∐ Golf Course ☐ Marina	;
	_	Animal Faci	lity
SIC code (if available):	Basic Description of Operation: Afice Bu	ilding bev	ber lechnologies
NPDES Status: Regulated	Will two by School Will Colly Colly	West But a	INDEX*
☐ Unregulated ☐ Unknown  B. VEHICLE OPERATIONS ☐ N/A (Skip to	anart Cl		(15) (15) (15) (15) (15) (15) (15) (15)
B1. Types of vehicles:  Fleet vehicles			ollution Source?
B2. Approximate number of vehicles:		nicies	
	(Maintained) Repaired Recycled Fueled V	Jachad Starad	O
<b>B4.</b> Are vehicles stored and/or repaired outs		ashed Stored	
Are these vehicles lacking runoff diversion			
<b>B5.</b> Is there evidence of spills/leakage from	vehicles? 🗌 Y 🔎 N 🔲 Can't Tell		0
<b>B6.</b> Are uncovered outdoor fueling areas pre	esent? Y XN Can't Tell		0
B7. Are fueling areas directly connected to s	storm drains?		O
<b>B8.</b> Are vehicles washed outdoors? $\square$ Y	<del></del>	N. CT. 11	О
Does the area where vehicles are washed dis C. OUTDOOR MATERIALS N/A (Skip to		n't Tell	Similar I
C1. Are loading/unloading operations present	•	Observed I	Pollution Source?
If yes, are they uncovered <i>and</i> draining towards	/ •	an't Tell	0
	N Can't Tell If yes, are they Liquid		ı·
Where are they stored? grass/dirt area		Bond Bosonphor	. —   0 -
C3. Is the storage area directly or indirectly	connected to storm drain (circle one)?	N Can't Te	11 O
C4. Is staining or discoloration around the a	rea visible? 🗌 Y 🔲 N 📈 Can't Tell		0
C5. Does outdoor storage area lack a cover?	Y N Can't Tell		0
C6. Are liquid materials stored without seco	ondary containment? 🗌 Y 🂢 N 📗 Can't Te	:11	0
C7. Are storage containers missing labels or	r in poor condition (rusting)? $\square$ Y $\square$ N $\square$ C	an't Tell	/ O /
D. WASTE MANAGEMENT N/A (Skip to	o part E)	Observed I	Pollution Source?
D1. Type of waste (check all that apply):	Garbage Construction materials Haz	ardous materials	0
<b>D2.</b> Dumpster condition ( <i>check all that app</i> evidence of leakage (stains on ground)	oly): No cover/Lid is open Damaged/poor	condition \[ \]L	eaking or O
D3. Is the dumpster located near a storm dra	nin inlet? YNCan't Tell		, O
If yes, are runoff diversion methods (be		ll -	
E. PHYSICAL PLANT N/A (Skip to part	H). The first the state of the	Observed I	Pollution Source?
E1. Building: Approximate age:			
Evidence that maintenance results in discha	arge to storm drains (staining/discoloration)?	Y N Don't	know
*Index: O denotes potential po	ollution source: denotes confirmed no	luter (evidence s	vac ceen)

6B HS101

# Hotspot Site Investigation

**HSI** 

E2. Parking Lot: Approximate age yrs. Condition: Clear						Dirty	· [	Bre	akir	ıg u	p					- 1	0
Surface material Paved/Concrete Gravel Permeabl  E3. Do downspouts discharge to impervious surface? Y N						٦,	Jone	vis	hle						$\dashv$		
Are downspouts directly connected to storm drains?		Y		N			i't kı					···-·					O .
E4. Evidence of poor cleaning practices for construction activities (	stains	s lea	din	g to	sto	rm (	lrain	)?[	] Y		] N		Can	't Te	11		0
F. TURF/LANDSCAPING AREAS N/A (skip to part G)								(	bse	rve	ed P	ollu	tion	Sou	rce	2	A <b>T</b> AWATANAA
F1. % of site with: Forest canopy% Turf grass _\(\frac{\infty}{\tilde{U}}\) % Lan	ıdsca	ping	g (0	W	% ]	Bare	Soi	1	%	)					Sec.		0
F2. Rate the turf management status: High Medium L	ow																<u> </u>
F3. Evidence of permanent irrigation or "non-target" irrigation	Y [	N	X	Ca	n't '	Γell											0
F4. Do landscaped areas drain to the storm drain system?	Υ [	<u></u> 1	1		Can	't T	ell										0
F5. Do landscape plants accumulate organic matter (leaves, grass clippings	) on a	djac	ent	imp	ervi	ous s	urfac	e? [	Y	<u> </u>	] N	<b>区</b> (	Can'	t Tel	1		<u>O</u>
G. STORM WATER INFRASTRUCTURE N/A (skip to part	H)								)bsε	erye	ed F	ollu	tion	Sou	rce	tone comple	
G1. Are storm water treatment practices present? X Y N N	Unkr	10W	n I	f ye	s, p	leas	e des	crib	e:								0
G2. Are private storm drains located at the facility? X Y N I Is trash present in gutters leading to storm drains? If so, co				nde	x be	low											0
Index Rating fo																	
Clean									Filt	hy							
Sediment	] 3					] 4				[		5					
Organic material	_] 3 □ 3				L	_  4 				L	-     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       - </td <td>, ,</td> <td></td> <td></td> <td></td> <td></td> <td></td>	, ,					
G3. Catch basin inspection – Record SSD Unique Site ID here:			Co	ndi	tion	<u></u> : [	Dir	tv l	70	 Clea		<u>,                                     </u>					
H. INITIAL HOTSPOT STATUS - INDEX RESULTS																	
Not a hotspot (fewer than 5 circles and no boxes checked) ☐ I	oten	tial	hot	spo	t (5	to 1	0 ci	rcles	but	no	box	kes o	hecl	ced)	ESS MAG		
	Sever			_											ked)	J	
Follow-up Action:																	
Refer for immediate enforcement																	
Suggest follow-up on-site inspection	H		$\dashv$	$\top$	$\top$	$\top$	$\top$	<del> </del>					_	-	$\forall$	$\Box$	
Test for illicit discharge Include in future education effort	$\vdash$							╁──						-	$\vdash$	-	
Check to see if hotspot is an NPDES non-filer			- 1		1	$\perp$	1	_	<u> </u>	.	.	_	_		1	ļl	
Onsite non-residential retrofit			ont	let	ba	4 p	anta	19	2004	104	$\perp$		_				
Pervious area restoration; complete PAA sheet and record		,	on	40	0 2		NA	and			1						
Unique Site ID here:		1	ial l	(A)	1	2 v	Len	1	e d								
Schedule a review of storm water pollution prevention plan							T		0								
Notes: Sommation busin be installed			$\top$	1	$\top$												
Stormwater de tention busin be installed						1	1	╁			$\neg$				T		
TO TON HON DUCIO DE INCHAMICA			1			$\top$	1	1					_	$\top$	T		
Sol to Controllering		_	+	$\dashv$	$\top$	$\dashv$	_	†				1	$\dashv$	+			
W 6 V / W								T						+	+		
		1	1		+	$\dashv$	$\dashv$	<del> </del>				$\neg \dagger$	$\dashv$	-	$\vdash$	$\vdash$	<del>    -</del>
	H	+	+	$\dashv$	$\dashv$	$\dashv$	+-	+-	$\vdash \vdash$			$\dashv$	-	1	+	$\vdash$	
1 2 2 2 2 2 1 3 1 3 1 3 1 3 1 3 1 3 1 3	$\vdash$	$\dashv$	-	+		+	+	+				+	-	+	$\vdash$	-	
110140	-	$\dashv$	$\dashv$	$\dashv$	+	+	+	-					+	-	+-	Н	
July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July   July	-		-	-		+	+	$\perp$	$\vdash$				-	+-	+	$\vdash$	
	1 1	1	- 1	- 1	1	1	1	1	, 1	1	1	- 1	- 1	ı	1	1 '	

GTS-HS/-01 1/16/08 Gerber Dribe - Stermweber Letro At · EXISTING-BUSIN, NO SED FOREBAY " SIGNIFICANT SEB. ACCUMULATION · INLET NOT IDENTIFIED O DUTLET A RIPRAP CHANUEL FULL OF TREES & SHAVES Recall that evosion was present donnerresur " Good potential constitute for mointenance & retrafit

### Hotspot Site Investigation

**HSI** 

WATERSHED: Tanker	SUBWATERSHED	o: Chrk		Unique Site	10: CB-16-14	51701
DATE: 7 16104	ASSESSED BY:	KB, DB	CAMERA ID:		PIC#:	
MAP GRID:	LAT°		_" LONG°	1 11	LMK#	
A. SITE DATA AND BASIC CLASSIFICATION		17.0				
Name and Address:	Category:		cial 🔲 Industrial nal 🔲 Municipal	Miscellaneous  Golf Course		
Supprior Evergy Et. 30	-		t-Related	Marina		
		imtian a£0		Animal Faci	lity	
SIC code (if available): NPDES Status:  Regulated	10	iption of Ope	ration:			
Unregulated Unknown	propau	<u> </u>			I	NDEX*
B. VEHICLE OPERATIONS N/A (Skip to	part C)			Observed P	ollution Source?	
B1. Types of vehicles:  Fleet vehicles	School buses	Other:			1.5	
B2. Approximate number of vehicles: 5	· propave t	· · · · · · · · · · · · · · · · · · ·				
B3. Vehicle activities (circle all that apply):			ycled Fueled W	ashed Stored		0
<b>B4.</b> Are vehicles stored and/or repaired outstart these vehicles lacking runoff diversion r	ide?  Y N					0
B5. Is there evidence of spills/leakage from			an't Tell an't Tell			
B6. Are uncovered outdoor fueling areas pre		N ☑ Can'		VI		0
B7. Are fueling areas directly connected to s	****	<del></del>				0
<b>B8.</b> Are vehicles washed outdoors? Y			Can't Tell			0
Does the area where vehicles are washed dis			Y N Cai	n't Tell		0
C. OUTDOOR MATERIALS N/A (Skip to	part D)			Observed P	ollution Source?	
C1. Are loading/unloading operations preser		Can't To	ell			
If yes, are they uncovered and draining towa	***************************************			n't Tell	*	0
C2. Are materials stored outside? X Y Where are they stored? grass/dirt area	N □ Can't Tell Å concrete/asphal	If yes, are t lt ☐ berme	hey ☐ Liquid ☐ : d area	Solid Description	ı:	Ο
C3. Is the storage area directly or indirectly of	connected to storn	n drain (circle	e one)? 🗌 Y 📋	N ☑ Can't Tel	11	O
C4. Is staining or discoloration around the ar	ea visible? TY	□и□	Can't Tell			0
C5. Does outdoor storage area lack a cover?	XY N [	Can't Tell				O
C6. Are liquid materials stored without second	ndary containment	t? 🙋 Y 🗋	N Can't Tel	1		0
C7. Are storage containers missing labels or			-	an't Tell Rust		0
D. WASTE MANAGEMENT N/A (Skip to	_				ollution Source?	
D1. Type of waste (check all that apply):	Garbage C	onstruction n	naterials	rdous materials		0
<b>D2.</b> Dumpster condition ( <i>check all that appl</i> evidence of leakage (stains on ground)	y): No cover/L Overflowing	id is open [	Damaged/poor o	condition Le	eaking or	0
D3. Is the dumpster located near a storm drain If yes, are runoff diversion methods (ber		N ☐ Can't '	Γell N □ Can't Tell			0
E. PHYSICAL PLANT N/A (Skip to part H	CONTRACTOR OF THE PROPERTY OF				ollution Source?	
E1. Building: Approximate age: 30-40	ura Condition	of gurefa	□ c1 □ c. ·		A THE COMPANY OF A STREET OF STREET	O
Evidence that maintenance results in dischar	ge to storm drains	or surraces: s (staining/dis	coloration)?	ned Dirty Don't k	Damaged mow	0
*Index: O denotes potential pol	lution source;	denote	es confirmed poll	uter (evidence w	vas seen)	

Hotspot Site Investigation HSI

															207	SOCIAL PROPERTY	00.740.000.000.000.000.000.0
E2. Parking Lot: Approximate age yrs. Condition: Clea						rty	Ш	Brea	aking	g up						(	)
Surface material Paved/Concrete Gravel Permeab	le 🗌	] Do	n't k	mow													
E3. Do downspouts discharge to impervious surface? Y N			-						ble							- 1	<u> </u>
Are downspouts directly connected to storm drains?		Y	harmed .		· D												
<b>E4.</b> Evidence of poor cleaning practices for construction activities (	(stain	ıs le	adin	g to s	torr	n dr	ain)	? [	] Y	[] N	1	] Ca	an't	Tel	1	. (	Э .
F. TURF/LANDSCAPING AREAS N/A (skip to part G)								o	bser	ved	Pol	lofi	on S	Som	ce.		
F1. % of site with: Forest canopy % Turf grass % La	indsc	apir	ıg	%	В	are S	Soil	- Shark-Street	%			300000000000000000000000000000000000000				VA.515.51	O C
	Low	_													i	4	
F3. Evidence of permanent irrigation or "non-target" irrigation		] N		Can	't Te	 -11		-								SANGAN Sangan	
	Y		N	ЭС	an't	Tel	1									(	<u> </u>
F5. Do landscape plants accumulate organic matter (leaves, grass clippings	s) on a	adja	cent i	mper	viou	s su	rface	? [	JΥ		٦ [	Ca	n't '	Tell		782 A	<u>.</u>
G. STORM WATER INFRASTRUCTURE N/A (skip to par		MARKETON CONTRACT							bser	25.923	100	51305	AZS:A	1	aresio.	$\prod$	
G1. Are storm water treatment practices present? Y X N	Unk	nov	n If	yes.	ple	ase	desc	7 . 2				od-mar V seas	<u> </u>	<i>,,</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Ť	at the same of	<u> </u>
G2. Are private storm drains located at the facility? $\square$ Y $\square$ N $\square$				- '	•												
Is trash present in gutters leading to storm drains? If so, co				dex	belo	w.										(	C
Index Rating fo	or Ac	cun	ıulat	ion i	n Gı	ıtter	'S										1000000
Clean									Filth	y							
Sediment 1 2	3					4					5						
Organic material 1 2	☐ 3					4					5						
Litter	3					4					5						
G3. Catch basin inspection – Record SSD Unique Site ID here:			Co	nditi	on:	I	Dirt	y [	] C1	ean	- Mr	e with the latest					
																48/48/84	
H. INITIAL HOTSPOT STATUS - INDEX RESULTS																	
	Poter	ntia	hots	spot	(5 t	o 10	cir	cles	but 1	10 be	oxes	che	ecke	ed)			
☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☐	Pote:			-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)	Poter Sever			-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement  Suggest follow-up on-site inspection  Test for illicit discharge				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement  Suggest follow-up on-site inspection  Test for illicit discharge  Include in future education effort				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record Unique Site ID here:				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record Unique Site ID here:				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record Unique Site ID here: Schedule a review of storm water pollution prevention plan				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record Unique Site ID here: Schedule a review of storm water pollution prevention plan				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement  Suggest follow-up on-site inspection  Test for illicit discharge  Include in future education effort  Check to see if hotspot is an NPDES non-filer  Onsite non-residential retrofit  Pervious area restoration; complete PAA sheet and record  Unique Site ID here:  Schedule a review of storm water pollution prevention plan				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record Unique Site ID here: Schedule a review of storm water pollution prevention plan				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record Unique Site ID here: Schedule a review of storm water pollution prevention plan				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record Unique Site ID here: Schedule a review of storm water pollution prevention plan				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement Suggest follow-up on-site inspection Test for illicit discharge Include in future education effort Check to see if hotspot is an NPDES non-filer Onsite non-residential retrofit Pervious area restoration; complete PAA sheet and record Unique Site ID here: Schedule a review of storm water pollution prevention plan				-										-	ed)		
Not a hotspot (fewer than 5 circles and no boxes checked)  Confirmed hotspot (10 to 15 circles and/or 1 box checked)  Follow-up Action:  Refer for immediate enforcement  Suggest follow-up on-site inspection  Test for illicit discharge  Include in future education effort  Check to see if hotspot is an NPDES non-filer  Onsite non-residential retrofit  Pervious area restoration; complete PAA sheet and record  Unique Site ID here:  Schedule a review of storm water pollution prevention plan				-										-	ed)		

WATERSHED: Tanker	SUBWATERSHED: Carts	Unique	SITE ID: CR -NSA	1-01
DATE: 1/1/08	Assessed By:  CB , DB	CAMERA		PIC#:
A. Neighborhood Characteriz			Neighborhood Area (ac	
Neighborhood/Subdivision Name:			Neighborhood Area (ac	res)
If unknown, address (or streets) surveyed				250
Homeowners Association?  Y N	Unknown If yes, name and conta	act information:		[39]
Residential (circle average single family	lot size):			
Single Family Attached (Duplexes, R			ifamily (Apts, Townho	mes, Condos)
Single Family Detached	<\frac{1}{4} \frac{1}{4} \frac{1}{2} \frac{1}{2} \frac{1}{2} \frac{1}{2}	····	ile Home Park	
Estimated Age of Neighborhood: 20	years Percent of Homes with Gara	ges:% V	Vith Basements%	
Sewer Service? Y N				О
Index of Infill, Redevelopment, and Rem		of units ∐ 5-10	9% ∐ >10%	0
Record percent observed for each depending on applicability		Percentage	Comments/Notes	
B. YARD AND LAWN CONDITIONS				
B1. % of lot with impervious cover		40		1000
B2. % of lot with grass cover		40	- I de la companya de	
B3. % of lot with landscaping (e.g., mule	ched bed areas)	20		<b>Ø</b>
B4. % of lot with bare soil		0		O
*Note: B1 through B4 must tota	1 100%			_
<b>B5.</b> % of lot with forest canopy		10		<b>②</b>
B6. Evidence of permanent irrigation or	'non-target" irrigation	100/09	)	Ó
		High: <u>50</u>		O
<b>B7.</b> Proportion of total neighborhood turn	f lawns with following	Med: <u>40</u>		
management status:		Low: 15		
B8. Outdoor swimming pools? Y N	Can't Tell Estimated #			
	N Can't Tell			0
C. DRIVEWAYS, SIDEWALKS, AND O				+ O
C1. % of driveways that are impervious	□ N/A	1000		
C2. Driveway Condition Clean	· · · · · · · · · · · · · · · · · · ·	100		
C3. Are sidewalks present? Y N		Or along has	1: 1	or j <b>⊗</b>
	with lawn clippings/leaves Rece			О
What is the distance between the				$\Diamond$
Is pet waste present in this area?				t Š
C4. Is curb and gutter present? Y	☐ N If yes, check all that apply:			
	or standing water 💹 Long-term car			
Organic matter, leaves, lawn	clippings Trash, litter, or debr	is Overhead	tree canopy	$\Diamond$

^{*} INDEX: O denotes potential pollution source;  $\diamondsuit$  denotes a neighborhood restoration opportunity

CB -NSA=O\
Neighborhood Source Assessment

D. ROOFFOPS											
D1. Downspouts are directly connected to storm drains or sanita	ry sewer								$\Diamond$	0	
D2. Downspouts are directed to impervious surface			(0				<u> </u>				
D3. Downspouts discharge to pervious area			90					,	9.5	•	
D4. Downspouts discharge to a cistern, rain barrel, etc.			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,								
*Note: C1 through C4 should total 100%	~							Oleve Wild		Section of the section of	Kinggorg
D5. Lawn area present downgradient of leader for rain garden?	Ž Y □N	1							<	<b>&gt;</b>	
E. COMMON AREAS											
E1. Storm drain inlets? \( \sum Y \subseteq N \) If yes, are they stenciled?					1 🗌	Dirty	Y		<	<b>&amp;</b>	
Catch basins inspected? Y N If yes, include U									(	0	
E2. Storm water pond? Y N Is it a wet pond or What is the estimated pond area? <1 acre about	dry pond? t 1 acre	Is ] > 1 a	it overg	grown? [	] Y	□ N	T		•	<b>&gt;</b>	
E3. Open Space? Y N If yes, is pet waste present?	Y 🗌 N	dump	ing?	] Y 🔲 1	<b>J</b>				(	0	
Buffers/floodplain present:  Y N If yes, is encre	oachment e	vident	? 🔲 Y	$\square$ N							
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMM	<b>IENDATIC</b>	INS -									
Based on field observations, this neighborhood has significant in				• '	k all	that i	apply)		-	0	
Nutrients Oil and Grease Trash/Litter Bacteria	<del> </del>							¥		J	
Recommended Actions	Describe					,	22.40				
Specific Action  Oneito retrefit notantial?	better	la	hasca	peng c	~ 1	tno	reaseo				
Onsite retrofit potential?  Better lawn/landscaping practice?		per	Mio	ing 10	XV	ea	۲.				
Better management of common space?		V									
Pond retrofit?											
Multi-family Parking Lot Retrofit?											
Other action(s)											
Initial Assessment										$\top$	
										$\top$	
NSA Pollution Severity Index											
Severe (More than 10 circles checked)											
High (5 to 10 circles checked)											
Moderate (Fewer than 5 circles checked)								1	$\Box$		
None (No circles checked)								1		$\dashv$	
Neighborhood Restoration Opportunity Index								1			_
High (More than 5 diamonds checked)											
Moderate (3-5 diamonds checked)								<b> </b>			
(Fewer than 3 diamonds checked)					<del> </del>				$\Box$		
									$\Box$		

WATERSHED: TANCON SUBWATERSHED: TUCKOR	Unique Site ID: TB	-USA-01
DATE: 7/16/08   ASSESSED BY:	CAMERA ID:	PIC#:
A. NEIGHBORHOOD CHARACTERIZATION		
Neighborhood/Subdivision Name:	Neighborhood A	Area (acres) 106
If unknown, address (or streets) surveyed:  Neadow Grook Ave - & Duke, Amberst		, ,
Homeowners Association? TY N D Unknown If yes, name and cont	act information:	
Residential (circle average single family lot size):		
Single Family Attached (Duplexes, Row Homes) < 1/8 1/8 1/4 1/3 1/3 Single Family Detached < 1/4 1/4 1/2 1 > 1		Fownhomes, Condos)
	ages: 100% With Basements	
Sewer Service? Y N	2800 TO O WILL DASOMONES	O
Index of Infill, Redevelopment, and Remodeling \[ \subseteq No Evidence \subseteq <5\%	of units \( \sqrt{5-10\%} \)	
Record percent observed for each of the following indicators,		
depending on applicability and/or site complexity	Percentage Comments	/Notes:
B. YARD AND LAWN CONDITIONS  P1 % of let with immersions		20 mg
B1. % of lot with impervious cover	50	A STATE OF THE STA
B2. % of lot with grass cover	30	/ O
B3. % of lot with landscaping (e.g., mulched bed areas)	20	<u> </u>
<b>B4.</b> % of lot with bare soil	0	O
*Note: B1 through B4 must total 100%		16.11.25
<b>B5.</b> % of lot with forest canopy	20	
<b>B6.</b> Evidence of permanent irrigation or "non-target" irrigation	777.1 1/00	О
<b>B7.</b> Proportion of <i>total neighborhood</i> turf lawns with following	High: <u>100</u>	О
management status:	Med:	digiral in
	Low:	
<b>B8.</b> Outdoor swimming pools? XY N Can't Tell Estimated # 10		10 m O
B9. Junk or trash in yards?		0
C. Driveways, Sidewalks, and Curbs		
C1. % of driveways that are impervious \[ \subseteq N/A	100	
C2. Driveway Condition Clean Stained Dirty Breaking up		O
C3. Are sidewalks present? Y N If yes, are they on one side of street		
Spotless 🗋 Covered with lawn clippings/leaves 🔲 Reco	eiving 'non-target' irrigation	0
What is the distance between the sidewalk and street?ft.		$\Diamond$
Is pet waste present in this area? Y N N/A		0
C4. Is curb and gutter present?  Y  N If yes, check all that apply:  Clean and Dry  Flowing or standing water  Long-term car	norking Codiment	
	ris Overhead tree canopy	
* INDEX: O denotes potential pollution source; $\diamondsuit$ denotes		

TB-NSA -01
Neighborhood Source Assessment

**NSA** 

D. ROOFFOPS				i												
D1. Downspouts are directly connected to storm drains or sani	tary s	ewer		1						<u> </u>				$\Diamond$	C	)
<b>D2.</b> Downspouts are directed to impervious surface				İ	7	0	$\neg$				******			•		
D3. Downspouts discharge to pervious area					a	<del></del>	-									
<b>D4.</b> Downspouts discharge to a cistern, rain barrel, etc.				+			+					····				
*Note: C1 through C4 should total 100%																
<b>D5.</b> Lawn area present downgradient of leader for rain garden	ı? √Z	] Y [	JΝ	Τ			T							<	<b>&gt;</b>	
E. COMMON AREAS																
E1. Storm drain inlets? Y N If yes, are they stenciled Catch basins inspected? Y N If yes, include	Uniqu	ıe Sit	e ID	fro	m SS	SD s	heet	:							<b>О</b>	
E2. Storm water pond? XY \(\sum \text{N}\) Is it a \(\sum \text{W}\) wet pond or \(\sum \text{What is the estimated pond area? \(\sum \text{M}\) Acre \(\sum \text{A}\) about	out 13	y por	ıd? √□:	ls > 1 a	it ov icre	/ergi	own	ı? <u>[</u> *	, Y Т	I	N			Y	€.	12.
E3. Open Space? Y N If yes, is pet waste present?			9				Υ [	] N	Ī					(	Э	
Buffers/floodplain present:  Y N If yes, is end	croacl	hmen	t ev:	iden	t? 🗀	] Y		N								
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOM	IMEN	(DAT	ION	ıs -								EV.				
Based on field observations, this neighborhood has significant  Nutrients Oil and Grease Trash/Litter Bacter							- '	heci	k all	that	арр	ly)		(	Э	
Recommended Actions		escri												4 -		,
Specific Action	1	动。	~d	. 1	1	Por	nd	. 01	le.	~~	1	Yal	e (	f C	luat	High
Onsite retrofit potential?	.6	etth	000	K	to	55	Sive	ille	-(1	T	· DV	th	12	-M	tal	dry
Better lawn/landscaping practice?	7	Ha		<b>0</b>	ad			-	T/G						,/	
Better management of common space?		10.8.	-		i		-00	v VÇ	.v ~.		0		ı	ı		
Pond retrofit?	V	YVW	l p	Ř	ari	IL	QN	Nov	ah		tor	· V	he	M		
Multi-family Parking Lot Retrofit?			1	()	\ A ·		_ ا_	210	1							
Other action(s)		<del></del>	,			01		01	gh No	C				<del></del>		
Initial Assessment			<u></u>		ļ						-					
NSA Pollution Severity Index		-												$\rightarrow$		
Severe (More than 10 circles checked)	-	-												_		_
High (5 to 10 circles checked)	-	-													$\dashv$	$\dashv$
☐ Moderate (Fewer than 5 circles checked)		+			<u> </u>	<u> </u>									$\dashv$	$\dashv$
None (No circles checked)	-	<del> </del>				<u> </u>								-	-	
Neighborhood Restoration Opportunity Index	<u> </u>					<del> </del>	<u> </u>							-	-	
High (More than 5 diamonds checked)	-	-	-				ļ								-	
Moderate (3-5 diamonds checked)	-	+														
X Low (Fewer than 3 diamonds checked)		T	<del>                                     </del>											-		$\dashv$
pond could be retrafted see stream assessment form																
See Stram accessment on	1				1	I	l						1 I	- 1	1	ı
2 24 201 W	SE															

NSA

	3			
WATERSHED: WR/(B	SUBWATERSHED:	Unique S	ITEID: WIZ-	USA-01
DATE: 1/16/08	ASSESSED BY: KB/DE	CAMERA	ID: W5 (anan	PIC#:
A. NEIGHBORHOOD CHARACTERIZ			an and a company	
Neighborhood/Subdivision Name:		N	eighborhood Area	(acres) 10-36 ac
If unknown, address (or streets) surveyed	d:			(33 Acres
Homeowners Association? XY N	Unknown If yes, name and con	tact information:	Rental	L 6-15
Residential (circle average single famil				
Single Family Attached (Duplexes, F			amily (Apts, Tow	nhomes, Condos)
Single Family Detached  Estimated Age of Neighborhood: 10	$<\frac{\frac{1}{4}}{4}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{2}$ years Percent of Homes with Gar		e Home Park	0/ 1975
Sewer Service? Y N	years   1 erectit of fromes with Gar	ages:% wi	ith Basements	% INDEX*
Index of Infill, Redevelopment, and Ren	andeling W No Evidence 7 <50/	of units 5-10%	/ [] > 100/	0
Record percent observed for each	, .	5 of units [] 3-10%	° □ >10%	(s) (O
depending on applicability	and/or site complexity	Percentage	Comments/No	tes
B. YARD AND LAWN CONDITIONS		1	法国的特别基	
B1. % of lot with impervious cover		50		
B2. % of lot with grass cover		30		O
B3. % of lot with landscaping (e.g., mul	ched bed areas)	20		$\Diamond$
<b>B4.</b> % of lot with bare soil		0		0
*Note: B1 through B4 must tota	ıl 100%			476.7
<b>B5.</b> % of lot with forest canopy		ZO		<b>\Q</b>
<b>B6.</b> Evidence of permanent irrigation or	"non-target" irrigation	N		O
		High: <u>100</u>		0
<b>B7.</b> Proportion of <i>total neighborhood</i> turn management status:	f lawns with following	Med:		
management status.		Low:		
B8. Outdoor swimming pools? Y	V ☐ Can't Tell Estimated #			O
B9. Junk or trash in yards?	N Can't Tell			4 0
C. DRIVEWAYS, SIDEWALKS, AND	CURBS			
C1. % of driveways that are impervious	□ N/A	100		
C2. Driveway Condition Clean	Stained Dirty Breaking up			0
C3. Are sidewalks present? XY N		t  or along both	sides 🗌	
Spotless Covered	with lawn clippings/leaves   Rec	eiving 'non-target	' irrigation	Ö
What is the distance between th	<del></del>			$\Diamond$
Is pet waste present in this area?				O
	N If yes, check all that apply:			
Organic matter, leaves, lawn	or standing water 🔀 Long-term car clippings 🔲 Trash, litter, or deb			
	ntial pollution source; $\Diamond$ denotes			
11 12 12 12 Contours pour	imai poinghou source, V delities	a nerginominood	resionation oppo	niunity

D. ROOFTOPS							* 4				i,			
D1. Downspouts are directly connected to storm drains or sanita	ry sewer			Y	/		-1		200000.00			Ø	(	5
D2. Downspouts are directed to impervious surface														
D3. Downspouts discharge to pervious area														
D4. Downspouts discharge to a cistern, rain barrel, etc.														
*Note: C1 through C4 should total 100%	_/_		<del>-</del>								-			_
<b>D5.</b> Lawn area present downgradient of leader for rain garden?	[]YY L	]N										•	$\Diamond$	
E. COMMON AREAS		<i>, , , , , , , , , ,</i>												2
E1. Storm drain inlets? Y N If yes, are they stenciled?											.	•	<b>()</b>	
Catch basins inspected? Y N If yes, include U											-	(	<u>)</u>	
E2. Storm water pond? Y N Is it a wet pond or What is the estimated pond area? <1 acre about					ergr	own?	∐ ¥	L 1	N			•	$\Diamond$	
E3. Open Space? Y N If yes, is pet waste present?						Y 🛮	N	***************************************				(	0	
Buffers/floodplain present: Y N If yes, is encre	oachmer	t evi	dent	? [	] Y	□N								***
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMM	IENDAT	ION	S.											
Based on field observations, this neighborhood has significant in	dicators	for	the f										$\sim$	
☐ Nutrients ☑ Oil and Grease ☐ Trash/Litter ☐ Bacteria						<del></del>		im	nuv	ins	j.		O 	
Recommended Actions	Descri	be R	eco	mme	ende	d Act	ions:							
Specific Action	Es	iua	iwi	den	5	For	da	M	s a o	אני				
Onsite retrofit potential?		U	3	•	•		- 0	•	31-					
Better lawn/landscaping practice?														
☐ Better management of common space? ☐ Pond retrofit?														
The state of the s														
☐ Multi-family Parking Lot Retrofit?														
Other action(s)							1	T	1				<del></del>	
Initial Assessment								-					_	_
NSA Pollution Severity Index						-		┼	-					
Severe (More than 10 circles checked)							_	<u> </u>						
High (5 to 10 circles checked)	<u> </u>					_	_	ļ						_
Moderate (Fewer than 5 circles checked)								<u> </u>						
None (No circles checked)								<u> </u>						
11020														
Neighborhood Restoration Opportunity Index								T						
High (More than 5 diamonds checked)														
Moderate (3-5 diamonds checked)		<b> </b>												
Low (Fewer than 3 diamonds checked)														
	<u> </u>			ļ				<del> </del>						
	<u> </u>						-					$\dashv$		
					$\vdash$	_	-							
							_	<del> </del>						
								-						
	1													

N	S	Δ
I	D.	A

WATERSHED: TANKLA	SUBWATERSHED: LTC	Unique Site ID:	JSA-01
DATE: 1/16/08	ASSESSED BY:	CAMERA ID:	Pic#:
A. NEIGHBORHOOD CHARACTERIZ	ATION	The second of th	17.7 (1.00) (2.00) 17.1 (1.00) (2.00) 17.1 (1.00) (2.00) 17.1 (1.00) (2.00) 17.1 (1.00) (2.00)
Neighborhood/Subdivision Name:		Neighborhood Area (a	cres) <u>\</u> \ <u> </u>
If unknown, address (or streets) surveyed	21/1/2		
Homeowners Association? Y X N		act information:	
Residential (circle average single family	•		
Single Family Attached (Duplexes, R Single Family Detached	<1/4 (1/4) 1/2 1 >1		omes, Condos)
Estimated Age of Neighborhood:	years Percent of Homes with Gara	ages: <u>()   </u> % With Basements <u>()  </u> %	6 INDEX*
Sewer Service? Y N			0
Index of Infill, Redevelopment, and Rem		of units 5-10% >10%	0
Record percent observed for each depending on applicability		Percentage Comments/Notes	
B. YARD AND LAWN CONDITIONS		Production of the Control of the Con	
B1. % of lot with impervious cover		160	239
B2. % of lot with grass cover		40	О
B3. % of lot with landscaping (e.g., mule	ched bed areas)	10	
<b>B4.</b> % of lot with bare soil		0	XX O
*Note: B1 through B4 must tota	l 100%		
<b>B5.</b> % of lot with forest canopy		10	<b>\rightarrow</b>
<b>B6.</b> Evidence of permanent irrigation or	"non-target" irrigation		Ó
		High:	
<b>B7.</b> Proportion of <i>total neighborhood</i> turn	f lawns with following	Med: 80	1 4 4 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
management status:		Low: 10	
B8. Outdoor swimming pools? \( \subseteq Y \subseteq N	Can't Tell Estimated #		O
	N Can't Tell (AVS (1)		Ø
C. Driveways, Sidewalks, and C			
C1. % of driveways that are impervious	□N/A 1 was pervious	95	1.27
C2. Driveway Condition 🛮 Clean 🔲	Stained Dirty Breaking up		O
C3. Are sidewalks present? Y X N	If yes, are they on one side of street	t 🔲 or along both sides 🔲	
	with lawn clippings/leaves Reco		0
What is the distance between the	e sidewalk and street? ft.		
Is pet waste present in this area?	Y Y NA		
C4. Is curb and gutter present? XY	☐ N If yes, check all that apply:		
	or standing water \ Long-term car		
Organic matter, leaves, lawn	clippings Trash, litter, or deb	ris Overhead tree canopy	$\Diamond$

^{*} INDEX: O denotes potential pollution source; ♦ denotes a neighborhood restoration opportunity

D. ROOFTOPS					18 (1											
D1. Downspouts are directly connected to storm drains or sanita	ry sev	wer												$\Diamond$	C	5
D2. Downspouts are directed to impervious surface																
D3. Downspouts discharge to pervious area					9	5								1.4		
D4. Downspouts discharge to a cistern, rain barrel, etc.																
*Note: C1 through C4 should total 100%							<u></u>									\$1000000000000000000000000000000000000
D5. Lawn area present downgradient of leader for rain garden?	<u> </u>	Υ	]N											•	<u> </u>	
E. COMMON AREAS																
E1. Storm drain inlets? XY N If yes, are they stenciled?								- <del></del>							$\Diamond$	
Catch basins inspected? XY N If yes, include U															<u> </u>	101
E2. Storm water pond? Y N Is it a wet pond or What is the estimated pond area? <1 acre about						ergr	own?	? 📙	Y	∐ N	1			•	$\Diamond$	
E3. Open Space? Y N If yes, is pet waste present?							Υ[	] N				**********			O	
Buffers/floodplain present: Y N If yes, is encre													-			
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMM												E(:)				
Based on field observations, this neighborhood has significant in	**********	ex constant	OK BUSINESS		ollo	wing	g: (ch	heck	all	that	аррі	!y)	T		~	
Nutrients Oil and Grease Trash/Litter Bacteria	X s	Sed	imeı	nt [	Ot	her									0	
Recommended Actions	Des	cril	oe R	leco	mme	ende	d Ac	tion	ıs:			ŧ	•.			
Specific Action	De	ter	M	$\sim$	Po	Λď:	for	r 9	540	N	^ 1	dr	alo	<b>1</b> S		
Onsite retrofit potential?			19	00	ر ۱ کام	idi	Q									
Better lawn/landscaping practice?			•		·											
Better management of common space?																
Pond retrofit?																
Multi-family Parking Lot Retrofit?																
Other action(s)																
Initial Assessment																
NSA Pollution Severity Index															-	
Severe (More than 10 circles checked)								$\dashv$							-	
High (5 to 10 circles checked)	$\vdash$															
Moderate (Fewer than 5 circles checked)	$\vdash$							_								
None (No circles checked)																
Neighborhood Restoration Opportunity Index																
☐ High (More than 5 diamonds checked)																
☐ Moderate (3-5 diamonds checked)																
Low (Fewer than 3 diamonds checked)																
/																
1																

DATE: 7/6/08   ASSESSED BY: 26, DE   CAMERA ID:   PIC#: 444	WATERSHED: Tucker	SUBWATERSHED: Gages	Unique	SITE ID: NSA -O	<u> </u>			
A. NeIGHBORHOOD CHARACTERIZATION  Neighborhood/Subdivision Name: Valley View by John Survey Surveyed:    Homeowners Association?   Y   N   Unknown If yes, name and contact information:   Residential (circle average single family lot size):   Single Family Attached (Duplexes, Row Homes)								
Neighborhood/Subdivision Name: Valey View X / Adviews   Neighborhood Area (acres)   55 ( If unknown, address (or streets) surveyed:   Neighborhood Area (acres)   55 ( If unknown, address (or streets) surveyed:   Neighborhood Area (acres)   55 ( If unknown, address (or streets) surveyed:   Neighborhood Area (acres)   55 ( If unknown, address (or streets) surveyed:   Neighborhood   Neighborhood   Neighborhood			CHARLE		ica. Opg			
If unknown, address (or streets) surveyed:	A CONTRACTOR OF THE CONTRACTOR		lau N	Jeighborhood Area (ac	rec) 5/-/			
Residential (circle average single family lot size):  Single Family Attached (Duplexes, Row Homes)			-	reignoomood mea (ae)	(100) _95 (			
Single Family Attached (Duplexes, Row Homes)	Homeowners Association?  Y N	Unknown If yes, name and cont	act information:					
Single Family Detached		<b>,</b>						
Sewer Service?		<1/4 1/4 1/2(1)>1	acre Mobi	le Home Park	nes, Condos)			
Index of Infill, Redevelopment, and Remodeling			ages: <u>95</u> % W	ith Basements $(\mathcal{O}\%$	INDEX*			
Record percent observed for each of the following indicators; depending on applicability and/or site complexity:  B. YARD AND LAWN CONDITIONS  B1. % of lot with impervious cover  B2. % of lot with parass cover  B2. % of lot with landscaping (e.g., mulched bed areas)  B4. % of lot with landscaping (e.g., mulched bed areas)  B5. % of lot with bare soil  *Note: B1 through B4 must total 100%  B5. % of lot with forest canopy  B6. Evidence of permanent irrigation or "non-target" irrigation  B7. Proportion of total neighborhood turf lawns with following management status:  B8. Outdoor swimming pools?  \[ \text{Y} \] \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \					0 -			
B. YARDAND LAWN CONDITIONS   B1. % of lot with impervious cover   CO   B2. % of lot with impervious cover   CO   B3. % of lot with grass cover   CO   GO   GO   GO   GO   GO   GO   GO	Index of Infill, Redevelopment, and Rem	odeling No Evidence <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a></a> <a< td=""><td>of units 5-10</td><td>% ∑ &gt;10%</td><td>O</td></a<>	of units 5-10	% ∑ >10%	O			
B. YARD AND LAWN CONDITIONS B1. % of lot with impervious cover  B2. % of lot with grass cover  B3. % of lot with landscaping (e.g., mulched bed areas)  B4. % of lot with bare soil  *Note: B1 through B4 must total 100%  B5. % of lot with forest canopy  B6. Evidence of permanent irrigation or "non-target" irrigation  B7. Proportion of total neighborhood turf lawns with following management status:  B8. Outdoor swimming pools? □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □			Percentage	Comments/Notes				
B2. % of lot with grass cover  B3. % of lot with landscaping (e.g., mulched bed areas)  D4. % of lot with bare soil  *Note: B1 through B4 must total 100%  B5. % of lot with forest canopy  B6. Evidence of permanent irrigation or "non-target" irrigation  B7. Proportion of total neighborhood turf lawns with following management status:  B8. Outdoor swimming pools?		in or one complexity						
B3. % of lot with landscaping (e.g., mulched bed areas)  \$\text{Path Note: B1 through B4 must total 100%}}\$\$  \$\text{Pst. Wote: B1 through B4 must total 100%}}\$\$  \$\text{B5. % of lot with forest canopy}}\$\$  \$\text{B6. Evidence of permanent irrigation or "non-target" irrigation}}\$\$  \$\text{B7. Proportion of total neighborhood}\$\$ turf lawns with following management status:  \$\text{B8. Outdoor swimming pools? MY \n \can't Tell \can't Tell \can't Tell \can't Tell}\$\$  \$\text{B9. Junk or trash in yards?} \n \can't \can't Tell \can't	B1. % of lot with impervious cover		20					
B3. % of lot with landscaping (e.g., mulched bed areas)  \$\text{P4}\$ \$\text{Note: B1 through B4 must total 100%} \\  \text{B5. % of lot with forest canopy} \\ \text{D6. Evidence of permanent irrigation or "non-target" irrigation} \\ \text{B7. Proportion of total neighborhood} \text{turf lawns with following management status:} \\ \text{B8. Outdoor swimming pools? } \text{ Y } \text{ N } \text{ Can't Tell } \text{ Estimated } \text{ \$\frac{\pi}{\pi}\$} \\ \text{B9. Junk or trash in yards?} \text{ Y } \text{ N } \text{ Curbs} \\ \text{C1. % of driveways that are impervious } \text{ N/A } \\ \text{C2. Driveway Condition } \text{ Clean } \text{ Stained } \text{ Dirty } \text{ Breaking up} \\ \text{C3. Are sidewalks present? } \text{ Y } \text{ N } \text{ If yes, are they on one side of street } \text{ or along both sides } \\ \text{ Spotless } \text{ Covered with lawn clippings/leaves } \text{ Receiving 'non-target' irrigation } \\ \text{ What is the distance between the sidewalk and street? } \text{ ft. } \\ \text{ Is pet waste present? } \text{ Y } \text{ N } \text{ If yes, check all that apply: } \\ \text{ Clean and Dry } \text{ Flowing or standing water } \text{ Long-term car parking } \text{ Sediment} \\ \text{ Osciment} \\ \text{ Clean and Dry } \text{ Flowing or standing water } \text{ Long-term car parking } \text{ Sediment} \\ \text{ Osciment} \\ \text{ Sediment} \\ \text{ Sediment} \\ \text{ Osciment} \\ \text{ Sediment} \\ \text{ Osciment} \\ \text{ Sediment} \\  Sedime	B2. % of lot with grass cover		60		0			
B4. % of lot with bare soil	B3. % of lot with landscaping (e.g., mulc	ched bed areas)	20		2.71			
*Note: B1 through B4 must total 100%  B5. % of lot with forest canopy  B6. Evidence of permanent irrigation or "non-target" irrigation  B7. Proportion of total neighborhood turf lawns with following management status:  B8. Outdoor swimming pools?  \[ \sqrt{y} \] \] \] \[ \] Can't Tell \[ \] Estimated # \[ \sqrt{y} \] \]  B9. Junk or trash in yards?  \[ \] \[ \] \[ \] \] \[ \] \[ \] Can't Tell \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \]	<b>B4.</b> % of lot with bare soil							
B6. Evidence of permanent irrigation or "non-target" irrigation  B7. Proportion of total neighborhood turf lawns with following management status:  B8. Outdoor swimming pools?	*Note: B1 through B4 must tota	1 100%						
B6. Evidence of permanent irrigation or "non-target" irrigation  B7. Proportion of total neighborhood turf lawns with following management status:  B8. Outdoor swimming pools?	B5. % of lot with forest canopy		LID		$\wedge$			
B7. Proportion of total neighborhood turf lawns with following management status:  B8. Outdoor swimming pools?	<b>B6.</b> Evidence of permanent irrigation or '	'non-target'' irrigation	1					
management status:    B8. Outdoor swimming pools?   Y   N   Can't Tell   Estimated #			High: <u>10</u>					
B8. Outdoor swimming pools?		flawns with following	Med: [0					
B8. Outdoor swimming pools?	management status:		Low:					
B9. Junk or trash in yards?	B8. Outdoor swimming pools? XY \( \subseteq N \)	Can't Tell Estimated # 5						
C. DRIVEWAYS, SIDEWALKS, AND CURBS  C1. % of driveways that are impervious  \Boxed{\text{N/A}} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \								
C1. % of driveways that are impervious								
C3. Are sidewalks present?  Y N If yes, are they on one side of street or along both sides  Spotless Covered with lawn clippings/leaves Receiving 'non-target' irrigation  What is the distance between the sidewalk and street?  ft.  Is pet waste present in this area?  Y N N N/A  C4. Is curb and gutter present?  Y N If yes, check all that apply:    Clean and Dry   Flowing or standing water   Long-term car parking   Sediment	C1. % of driveways that are impervious	□ N/A	100		50,0025			
C3. Are sidewalks present?  Y N If yes, are they on one side of street or along both sides   Spotless Covered with lawn clippings/leaves Receiving 'non-target' irrigation What is the distance between the sidewalk and street?  ft.  Is pet waste present in this area?  Y N N N N/A  C4. Is curb and gutter present?  Y N If yes, check all that apply:    Clean and Dry   Flowing or standing water   Long-term car parking   Sediment	C2. Driveway Condition 🗵 Clean 🔲 S	Stained Dirty Breaking up			0			
What is the distance between the sidewalk and street?ft.  Is pet waste present in this area? ☐ Y ☐ N ☒ N/A  C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply:  ☐ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☐ Sediment		If yes, are they on one side of street						
Is pet waste present in this area?  \[ Y \] N \[ N/A \]  C4. Is curb and gutter present?  \[ \frac{X}{2} Y \] N If yes, check all that apply:  \[ \frac{X}{2} Clean and Dry \] Flowing or standing water  \[ \frac{1}{2} Long-term car parking \] Sediment	☐ Spotless ☐ Covered	with lawn clippings/leaves	eiving 'non-targe	t' irrigation				
C4. Is curb and gutter present?  Y N If yes, check all that apply:  Clean and Dry Flowing or standing water Long-term car parking Sediment								
☐ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☐ Sediment								
	<del></del>							
* INDEX: O denotes potential pollution source; $\diamondsuit$ denotes a neighborhood restoration opportunity								

A-3

GB-NSA-01

Neighborhood Source Assessment

**NSA** 

D. ROOFTOPS																
D1. Downspouts are directly connected to storm drains or sanita	ry se	wer												$\Diamond$	C	)
D2. Downspouts are directed to impervious surface				1	29											
D3. Downspouts discharge to pervious area				2	76	ラ								14		
D4. Downspouts discharge to a cistern, rain barrel, etc.					t											
*Note: C1 through C4 should total 100%																
D5. Lawn area present downgradient of leader for rain garden?		ΥŞ	ďΝ											4	<b>(</b>	
E. COMMON AREAS																
E1. Storm drain inlets? XY N If yes, are they stenciled?										Dirt	y				$\Diamond$	
Catch basins inspected? XY N If yes, include U													_ [3		0	
E2. Storm water pond? YN Is it a wet pond or What is the estimated pond area? <1 acre about	dry t 1 ac	pon cre	d? □ >	Is > 1 a	it ov	ergr	own	? [	] Y	1	1				$\Diamond$	
E3. Open Space? Y X N If yes, is pet waste present?	] Y	<u> </u>	V di	ımp	ing?		Υ [	JΝ							0	
Buffers/floodplain present: XY IN If yes, is encr	oachi	men	t evi	dent	? 🔀	Ϋ́		N								
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOM	1ENI	DAT	ION	S ·								£111				
Based on field observations, this neighborhood has significant is	ndica	tors	for	the f	ollo	wing	g: (c	heck	k all	that	арр	ly)			$\overline{}$	
☐ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria		Sed	imei	ıt [	] Ot	her									O .	
Recommended Actions	i						d A									
Specific Action	1	road	(WY	réV	(v	rpr	9 UC	للموا	4	5						
Onsite retrofit potential?				3		`										
Better lawn/landscaping practice?																
☐ Better management of common space? ☐ Pond retrofit?																
☐ Multi-family Parking Lot Retrofit? ☐ Other action(s)																
Initial Assessment																
initial Assessment	$\vdash$															
NSA Pollution Severity Index																
Severe (More than 10 circles checked)																
High (5 to 10 circles checked)	$\vdash$															
Moderate (Fewer than 5 circles checked)	$\vdash$															
None (No circles checked)																
	$\vdash$															
Neighborhood Restoration Opportunity Index																
High (More than 5 diamonds checked)	-															
☐ Moderate (3-5 diamonds checked) ☐ Low (Fewer than 3 diamonds checked)	$\vdash$															
Low (Fewer than 3 diamonds checked)					ļ											
												ļ				
												<u> </u>				ļ
1				ı	ı	1	1	1	i	i	i	1		1	1	ı

WATERSHED: JANK	SUBWATE	RSHED:	3	UNIQUE SIT	EID: CB-HS1-01						
DATE: 7/16/08	ASSESSED	BY: 1/2/01	3	CAMERA ID: WS Sony							
MAP GRID	RAIN IN L	AST 24 HOURS	□Y ⊠N	PIC#							
A. LOCATION											
A1. Street names or neighborhood s	surveyed:	ndusmal Pau	h West	_							
A2. Adjacent land use: Resident		nercial 🔀 Ind ransport-Related		titutional							
A3. Corresponding HSI of NSA field	ld sheet? If s	o, circle HSI or	NSA and recor	d its Unique Si	ite ID here						
B. STREET CONDITIONS		, E	7.35								
B1. Road Type: Arterial Co	ollector 🗵	Local Alle	y Other:								
<b>B2.</b> Condition of Pavement: Ne			Broken								
<b>B3.</b> Is on-street parking permitted [	<b>∀</b> Y □ N	If yes, approxim	nate number of	cars per block	: 0						
<b>B4.</b> Are large cul-de-sacs present?	N N Y										
B5. Is trash present in curb and gutt			Index Rating f	or Accumulation	on in Gutters						
use the index to the right to record a		Clean			Filthy						
	Sediment		□ 2	□ 3	☐ 4  ☐ 5						
Organ	ic Material Litter		□ 2 □ 2	☐ 3 ☐ 2	∐4 ∐5 □ 4						
C. STORM DRAIN INLETS AND (			<u> </u>	3							
C1. Type of storm drain conveyance			mixed								
C2. Percentage of inlets with catch			N/A								
Sample 1-2 catch basins per NSA/I		C3. Catch ba		C4	. Catch basin #2						
Latitude		41° 51'			051 135 "						
Longitude		72° 25'			025117 "						
LMK#					***************************************						
Picture #		101-368	7	10	1-3688						
Current Condition		X Wet	Dry		☑ Wet ☐ Dry						
Condition of Inlet		✓Clear [	Obstructed		☐ Clear ☐ Obstructed						
Litter Accumulation		ŬY X	]N		NY N						
Organics Accumulation		□Y 🔾	N		ŊY □N						
Sediment Accumulation		⊠Y □	]N		XY N						
Sediment Depth (in feet)		20.5	_ ft.		40.5 ft.						
Water Depth		_ 40.2	_ ft.		20.2 ft.						
Evidence of oil and grease		Y - ∑	N		□Y XN						
Sulfur smell		Y	N		□Y ☑N						
Accessible to vacuum truck		XY [	] N		<b>∑</b> Y □ N						
D. NON-RESIDENTIAL PARKING	GLOT (>2.	icres)									
D1. Approximate size: acres											
D2. Lot Utilization: 🔘 Full 🗌 About half full 🔲 Empty											
	D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks)  Very Rough (numerous cracks and depressions)										
D4. Is lot served by a storm water tr	eatment prac	ctice? 🛛 Y 🔲	N If yes, des	cribe: Ba5	IN						
D5. On-site retrofit potential:											

	ŧ
į	ŧ

WATERSHED: ANK	SUBWATER	RSHED: CTS	Unique Site ID:	SSD-01			
DATE: 7/16/08	ASSESSED ]	BY: KB/DB	CAMERA ID: WS	Sony			
MAP GRID	RAIN IN LA	AST 24 HOURS Y XN	Pic#				
A. LOCATION			The State of the S				
A1. Street names or neighborhood s	urveyed:	01171-1	-(8) /6				
	(	Clark Rd Jude					
A2. Adjacent land use: Resident		ercial 🔀 Industrial 🗌 Ins ansport-Related	stitutional				
A3. Corresponding HSI or NSA field	ld sheet? If so	o, circle HSI or NSA and reco	rd its Unique Site ID he	re			
B. STREET CONDITIONS							
B1. Road Type: Arterial C	ollector 💢	<del></del>					
<b>B2.</b> Condition of Pavement: Ne	w 🔲 Good	Cracked Broken					
<b>B3.</b> Is on-street parking permitted	₹Y □ N ː	If yes, approximate number of	f cars per block:				
B4. Are large cul-de-sacs present?	N D Y		***************************************				
B5. Is trash present in curb and gutt		Index Rating f	for Accumulation in Gut	tters			
use the index to the right to record a	mount.	Clean		Filthy			
	Sediment	□ 1   □ 2	3 4	<u></u> 5			
Organ	ic Material Litter		3 24	☐ 5			
C. STORM DRAIN INLETS AND		INS □ 2	3 4	5			
C1. Type of storm drain conveyance	e: open [	enclosed mixed					
C2. Percentage of inlets with catch	basin storage:	N/A					
Sample 1-2 catch basins per NSA/I	<i>ISI</i>	C3. Catch basin #1	C4. Catch l	pasin #2			
Latitude		<u>41°50'17"</u>	41°60	<u>'07</u> "			
Longitude		170 21. 17"	72° 27	<u>' 25 "</u>			
LMK #							
Picture #		101-3716	101-37	120			
Current Condition		Wet Dry	☐ Wet				
Condition of Inlet		Clear Obstructed		Obstructed			
Litter Accumulation		Y ∑(N	Z Y	□N			
Organics Accumulation		XY N	✓Y	N			
Sediment Accumulation		ŊY □N	ΣY	□N			
Sediment Depth (in feet)		ft.	6.5	ft.			
Water Depth		<u>0,5</u> ft.	0.5	ft.			
Evidence of oil and grease		□Y ⊠N		ΣN			
Sulfur smell		□Y ☑N		ZИ			
Accessible to vacuum truck		YY N	VY (	□N			
D. NON-RESIDENTIAL PARKING D1. Approximate size:	`						
	icres Vov			V-8-1			
D2. Lot Utilization:  Full At				***************************************			
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks) Very Rough (numerous cracks and depressions)							
D4. Is lot served by a storm water tr							
<b>D5.</b> On-site retrofit potential:	xcellent []	Good Poor					

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES	
	h Medium Low None
<b>E2.</b> Rate the feasibility of the following pollution prevention	•
	oderate Low
<u></u>	oderate Low
	oderate Low
Parking Lot Retrofit Potential: High M  CATCH BASIN SKETCHES	oderate Low
#1	#2
Stream J. C.B.	A STOOK
Notes:	
#1:	Water in CBE
Dry weather flow severe exosion at outfall	higher level than stream surface & not maing
Source is a wethout  area adjacent to  ind. bldg; no pipe in-	

WATERSHED: TANK	SUBWATERSHED: LTR	Unique Site ID: 17R-164-01							
DATE: 1161 08	ASSESSED BY: KZ/DT3	CAMERA ID: US Sarvy							
Map Grid	RAIN IN LAST 24 HOURS Y XN	Pic#							
A. LOCATION									
A1. Street names or neighborhood s	surveyed:								
Comphell Dr									
	ial  Commercial Industrial Ins nicipal Transport-Related	stitutional							
A3. Corresponding HSI or NSA fiel	ld sheet? If so, circle HSI or NSA and reco	rd its Unique Site ID here NGA-01							
B. STREET CONDITIONS									
	ollector Local Alley Other:								
<b>B2.</b> Condition of Pavement: Ne									
<b>B3.</b> Is on-street parking permitted [	Y N If yes, approximate number o	f cars per block: Z							
<b>B4.</b> Are large cul-de-sacs present?	□ Y 및N								
B5. Is trash present in curb and gutt	er? If so, Index Rating i	for Accumulation in Gutters							
use the index to the right to record a	amount. Clean	Filthy							
	Sediment 1 2	□ 3 □ 4 □ 5							
Organ	ic Material 2	$\square$ 3 $\square$ 4 $\square$ 5							
	Litter 1 2	345							
C. STORM DRAIN INLETS AND C									
C1. Type of storm drain conveyance									
C2. Percentage of inlets with catch		nam							
Sample 1-2 catch basins per NSA/I Latitude	451 C3. Catch basin #1	C4. Catch basin #2							
		770 70 107 "							
Longitude LMK #	<u>72° Za ' 07 "</u>	72° 79 ' 07 "							
Picture #									
Current Condition	☐ Wet ☐ Dry	☐ Wet ☑ Dry							
Condition of Inlet	Clear Obstructed	Clear Mobstructed							
Litter Accumulation	Y AN	Y N							
Organics Accumulation	□Y ⊠N	□Y N							
Sediment Accumulation	N □ N	ZY □N							
Sediment Depth (in feet)	/ ft.	l ft.							
Water Depth	O ft.								
Evidence of oil and grease	□Y ⋈N	□Y N							
Sulfur smell	□Y ØN	☐Y N							
Accessible to vacuum truck	✓Y □ N	✓Y     N							
D. Non-Residential Parking	GLOT (>2 acres)								
D1. Approximate size:a	icres								
<b>D2.</b> Lot Utilization:  Full At	D2. Lot Utilization:  Full  About half full  Empty								
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks)  Very Rough (numerous cracks and depressions)									
D4. Is lot served by a storm water tr	eatment practice? Y N If yes, des								
<b>D5.</b> On-site retrofit potential:	xcellent Good Poor								

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES	
E1. Degree of pollutant accumulation in the system:  High  Medium  Low  None	
E2. Rate the feasibility of the following pollution prevention strategies:	
Street Sweeping: High Moderate Low	
Storm Drain Stenciling: High Moderate Low Catch Basin Clean-outs: High Moderate Low	
Parking Lot Retrofit Potential: High Moderate XLow	
CATCH BASIN SKETCHES	
#1   #2     #2	
(B) +7	
d.t	
Notes:	
Tives.	

Touleer

WATERSHED: The T	SUBWATE	RSHED: (13	<b>&gt;</b>	UNIQUE SIT	EID: (B-NSA-0)
DATE: <u>71 161 08</u>	ASSESSED	BY: KB/d	BB.	CAMERA ID	: WS Sarry
MAP GRID	RAIN IN L	AST 24 HOURS	□ Y □XN	PIC#	
A. LOCATION				1	
A1. Street names or neighborhood s	surveyed:	High The	non Fo	ily Par	k
A2. Adjacent land use: Residential Commercial Industrial Institutional  Municipal Transport-Related					
A3. Corresponding HSI or NSA fie	ld sheet? If s	o, circle HSI of	NSA and recor	rd its Unique S	ite ID here <u>NSA-O</u> (
B. STREET CONDITIONS					
B1. Road Type: Arterial C	ollector 🔯	Local Alle	y Other:		
<b>B2.</b> Condition of Pavement: Ne	w Good	Cracked	Broken		
<b>B3.</b> Is on-street parking permitted [	ŊÝ□n	If yes, approxin	nate number of	f cars per block	::_ <b>3</b>
<b>B4.</b> Are large cul-de-sacs present?	□ Y □YN				
<b>B5.</b> Is trash present in curb and gutt			Index Rating f	for Accumulati	on in Gutters
use the index to the right to record a	amount.	Clean			Filthy
	Sediment	<u>≥</u> 1	2	□ 3	☐ 4  ☐ 5
Organ	ic Material		□ 2	₹3	☐ 4 ☐ 5
	Litter	<u> </u>	2		
C. STORM DRAIN INLETS AND			7		
C1. Type of storm drain conveyanc			] mixed		
C2. Percentage of inlets with catch			N/A	C	4. Catch basin #2
Sample 1-2 catch basins per NSA/I	HSI	(SI C3. Catch basin #1		41° 50' 57''	
Latitude					1° 26 '54 "
Longitude		72° 26'	1/2		1- 60 31
LMK # Picture #		101-37	//		101-3711
Current Condition		□ Wet □		,	₩et ☐ Dry
Condition of Inlet			Obstructed		Clear Obstructed
Litter Accumulation			] N		□Y ⋈ N
Organics Accumulation			N		□Y ØN
Sediment Accumulation			] N		XY N
Sediment Depth (in feet)		i	ft.		<b>p.</b> 5 ft.
Water Depth		7	 ft.		0,5 ft.
Evidence of oil and grease		□Y X	N		□Y ☑ N
Sulfur smell		Y <b>_</b> <u>v</u>	] N		□Y ⋈N
Accessible to vacuum truck		XY [	] N		⊠Y □N
D. Non-Residential Parking Lot (>2 acres)					
D1. Approximate size: acres					
D2. Lot Utilization:    Full    About half full    Empty					
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks)  Very Rough (numerous cracks and depressions)					
D4. Is lot served by a storm water treatment practice?  Y N If yes, describe:					
D5. On-site retrofit potential:  Excellent  Good  Poor					

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES
E1. Degree of pollutant accumulation in the system:  High  Medium  Low  None
E2. Rate the feasibility of the following pollution prevention strategies:
Street Sweeping:  High  Moderate  Low
Storm Drain Stenciling: High Moderate Low
Catch Basin Clean-outs:
Parking Lot Retrofit Potential: High Moderate Low
CATCH BASIN SKETCHES
#1
Notes:

Streets and Storm Drains

SSD	)
-----	---

		NSA-01
	UBWATERSHED: Walker Clud	UNIQUE SITE ID: UP-COOR
DATE: 7/6/08 A	SSESSED BY: UR DE	CAMERA ID:
MAP GRID R	AAIN IN LAST 24 HOURS Y X N	PIC# 3705
A. LOCATION		
A1. Street names or neighborhood sur- Mt. Vernon Apartments	veyed:	
	☐ Commercial ☐ Industrial ☐ Insipal ☐ Transport-Related	etitutional
A3. Corresponding HSI or NSA field s	sheet? If so, circle HSI or NSA and reco	rd its Unique Site ID here <u>NSA ールR</u> ー
B. STREET CONDITIONS		
B1. Road Type: Arterial Colle	ector Local Alley Other:	33000
B2. Condition of Pavement: New	Good Cracked Broken	
	Y N If yes, approximate number of	f cars per block: 25/building
B4. Are large cul-de-sacs present?		23/23000
B5. Is trash present in curb and gutter?		for Accumulation in Gutters
use the index to the right to record amo		Filthy
	ediment 1 2	3
Organic 1		3 4 5
	Litter 1 2	3 4 5
C. STORM DRAIN INLETS AND CA	TCH BASINS	
C1. Type of storm drain conveyance:		
C2. Percentage of inlets with catch bas		
Sample 1-2 catch basins per NSA/HS		C4. Catch basin #2
Latitude	<u>41° F0 ' 59 "</u>	<u>ul. 51.06.</u> "
Longitude	72. 16. 76."	12°26 '22"
LMK #		
Picture #		
Current Condition	☐ Wet ☐ Dry	☐ Wet ☑ Dry
Condition of Inlet	Clear Obstructed	⊠Clear □Obstructed
Litter Accumulation	LY N	□Y ☑N
Organics Accumulation	☐Y XN	□Y ☑ N
Sediment Accumulation	□Y ⊠N	□Y N
Sediment Depth (in feet)	Zin ft.	l, ft.
Water Depth	ft.	Ø ft.
Evidence of oil and grease Sulfur smell	□Y ⊠N □Y ⊠N	□Y ⊠N
Accessible to vacuum truck	☐Y ☑N ◯Y ☐N	☐Y ☑N
D. NON-RESIDENTIAL PARKING I		Y □N
D1. Approximate size: acre		
D2. Lot Utilization: Full Abou		
***************************************		
D3. Overall condition of Pavement:	☐ Smooth (no cracks) ☐ Medium (few☐ Very Rough (numerous cracks and de	
D4. Is lot served by a storm water treat	ment practice? Y N If yes, des	
D5. On-site retrofit potential: Exce	ellent Good Poor	

	E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES
	E1. Degree of pollutant accumulation in the system:  High  Medium  Low  None
	E2. Rate the feasibility of the following pollution prevention strategies:
	Street Sweeping:
	Storm Drain Stenciling:
	Catch Basin Clean-outs:
	CATCH BASIN SKETCHES
	#1 #2
	ord built
/ 🗓	
Bull	1/ 1/ CB#1
B	
	Wcs2
	Building 57,58,59
	Building   57,38,51
	pret 10(3268
	Notes:
	Building [41 50 57,3] [72 26 19.0], leaf litter & debris
	Brilding (41 50 5727 77 77 19.07 1000 1010
	L'E de l'E J'leat l'actions
	in woods.
ĺ	

WATERSHED: TAVK	SUBWATE	RSHED: GAGE	5	UNIQUE SITE ID: CR-1/54-01
DATE: 1/6/18	ASSESSED			Unique Site ID: CZ-NSA-01  CAMERA ID: NS-Conon
Map Grid	RAIN IN L	AST 24 HOURS	Y 🛛 N	PIC#
A. LOCATION				
A1. Street names or neighborhood s	urveyed: (	clley Van Dr.	/ Andr	rew Was
A2 Adjacent lend von Prider	:-1 🗆 🗸			
A2. Adjacent land use: Resident  Mur		nercial	ial [] Ins	ititutional
	d sheet? If s	o, circle HSI or NSA	A and recor	rd its Unique Site ID hereNSA -0(
B. STREET CONDITIONS				
B1. Road Type: Arterial Co			Other:	
B2. Condition of Pavement: Ne			Broken	New Rough 1010 cause
B3. Is on-street parking permitted	N TY	If yes, approximate	number of	f cars per block: O
<b>B4.</b> Are large cul-de-sacs present?	XY □ N			
<b>B5.</b> Is trash present in curb and gutte use the index to the right to record a		ex Rating f	for Accumulation in Gutters	
disc the mack to the right to record a		Clean	——————————————————————————————————————	Filthy
0	Sediment	<b>⊠</b> 1	∐ 2	$\square$ 3 $\square$ 4 $\square$ 5
Organ	ic Material Litter	区 1 区 1	$\frac{\square}{\square}$ 2	$\square$ 3 $\square$ 4 $\square$ 5 $\square$ 5
C. STORM DRAIN INLETS AND (				
C1. Type of storm drain conveyance		<b>–</b> –	xed	
C2. Percentage of inlets with catch		73		
Sample 1-2 catch basins per NSA/I		C3. Catch basin #		C4. Catch basin #2
Latitude		41051 154		41.51.59.
Longitude		17° 74 ' 36	-	120 24 1 26 "
LMK #		<u> </u>		15
Picture #		101:3694		101-3697
Current Condition		Wet Di	rv	Wet Dry
Condition of Inlet			structed	☑Clear ☐Obstructed
Litter Accumulation		Y N		□Y KN
Organics Accumulation		Y N		□Y ☑N
Sediment Accumulation		□Y □N		□Y ¥N
Sediment Depth (in feet)		7 ft.		O ft.
Water Depth		~().5 ft.		~0.5 ft.
Evidence of oil and grease		Y X N	***************************************	□Y <u>V</u> N
Sulfur smell		□Y 【N		□Y 🖪 N
Accessible to vacuum truck		□Y ¥N		□Y 및 N
D. Non-Residential Parking Lot (>2 acres)				
D1. Approximate size: acres				
D2. Lot Utilization:  Full  About half full  Empty				
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks)  Very Rough (numerous cracks and depressions)				pressions)
D4. Is lot served by a storm water treatment practice?  Y N If yes, describe:				
D5. On-site retrofit potential:				

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES
E1. Degree of pollutant accumulation in the system:  High  Medium  Low  None
E2. Rate the feasibility of the following pollution prevention strategies:
Street Sweeping: High Moderate Low
Storm Drain Stenciling: A High Moderate Low
Catch Basin Clean-outs: High Moderate Low
Parking Lot Retrofit Potential: High Moderate Low
CATCH BASIN SKETCHES #1 #2
50000
DCB DCB
ALTERIET ES PCB
ALTERIET ES
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
THOUSE !
Notes:



# APPENDIX C

Photographs on CD



## APPENDIX D

Vernon Regulatory Review Memorandum



### **MEMORANDUM**

TO: Technical Advisory Committee, Tankerhoosen River Watershed Management

Plan and Town of Vernon Land Use Commissioners

FROM: Erik Mas, P.E., Fuss & O'Neill, Inc.

DATE: June 9, 2008

RE: Stormwater and Low Impact Development (LID) Regulations in the

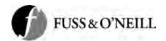
Tankerhoosen River Watershed – Vernon Regulatory Review

#### 1.0 INTRODUCTION

Fuss & O'Neill is working with the Friends of the Hockanum River Linear Park, Inc., in collaboration with its project partners (Town of Vernon Planning Department, Town of Vernon Conservation Commission, North Central Conservation District, Hockanum River Watershed Association, Rivers Alliance of Connecticut, Inc, and the Belding Wildlife Trust) to prepare a Watershed Management Plan for the Tankerhoosen River watershed. The watershed plan will identify action items that can be implemented by the watershed municipalities and private groups to protect and improve the health of the Tankerhoosen River watershed, which is a particularly valuable natural resource, demonstrated by the Class A water quality in the upper regions of the watershed that harbor the Belding Wild Trout Management Area, one of only two such Class I areas east of the Connecticut River.

A key element of the Watershed Management Plan is to identify potential land use regulatory mechanisms (i.e., new or modified land use regulations) that can be implemented by the watershed towns to better manage stormwater runoff associated with land development within the watershed. Many Connecticut communities are in the process of developing new or modified land use regulations that incorporate Low Impact Development (LID) and related stormwater management approaches to address stormwater quantity and quality objectives. Communities, including Vernon, are faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl. An opportunity exists for the Town of Vernon to develop and implement an ordinance or other regulatory mechanism to satisfy Phase II stormwater regulatory requirements, while also strengthening the existing land use controls to protect natural resources within the Tankerhoosen River watershed.

This memorandum summarizes our review of Vernon's existing land use regulations and related planning documents that pertain to stormwater management and natural resource protection issues, as well as potential approaches for developing regulatory mechanisms to incorporate improved stormwater management, including LID concepts and opportunities to reduce impervious cover, into the Town's land use regulations. The information presented in this



MEMO: Vernon Regulatory Review, Tankerhoosen River Watershed Management Plan June 9, 2008 Page 2

technical memorandum is intended to facilitate a discussion of these issues during the upcoming workshop meeting with the Tankerhoosen River Management Plan Technical Advisory Committee and the Town of Vernon land use commissioners.

#### 2.0 EXISTING REGULATORY MECHANISMS

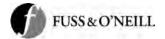
Fuss & O'Neill reviewed the following documents and information provided by the Town, which are the primary regulatory mechanisms and related planning documents that address stormwater management and related natural resource protection issues in the Town of Vernon:

- Subdivision Regulations,
- Zoning Regulations,
- Inland Wetland and Watercourses Regulations,
- Plan of Conservation and Development.

### 2.1 Subdivision Regulations

The Town's subdivision regulations (effective date: May 8, 2007) regulate the division of a tract or parcel of land with the purpose of sale or building development. The subdivision regulations address street and lot layout, water supplies, sanitary sewage facilities, stormwater drainage, utilities, open space, street widths, grades and construction, and other necessary improvements. The following is a summary of specific sections of the subdivision regulations that relate to stormwater management and natural resource protection issues.

- <u>Section 5 Standards for Maps and Plans</u>: This section specifies requirements for maps and plans submitted with subdivision applications, including Site Development Plans, Construction Plans, and Grading Plans. Existing and proposed watercourses and stormwater management systems are required to be shown on the Site Development Plan. Grading Plans are required to include notations and details on erosion and sedimentation control methods.
- <u>Section 6.1.3 General Improvements, Open Space to be Dedicated</u>: The Planning and Zoning Commission may require the set aside of Open Space as part of a subdivision where the Commission finds the existing land applicable to one or more of the following:
  - The policies and objectives of the Plan of Conservation and Development
  - Areas sensitive to development
  - o Prime and important farmland soils
  - Natural Diversity Database Areas as updated by the Connecticut Department of Environmental Protection
  - Unconsolidated Aquifers and Aquifer Protection Areas
  - o Areas indicated for future community facility needs
  - o Existing open areas and significant cultural and natural resources
  - o Potential open space system



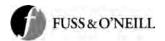
MEMO: Vernon Regulatory Review, Tankerhoosen River Watershed Management Plan June 9, 2008 Page 3

- Land Use Plan and Strategy
- o Significant natural and cultural resources inventory
- Viable vernal pools verified by the Town of Vernon Vernal Pool Study or by a qualified licensed professional
- <u>Section 6.1.3.2 General Improvements, Location of Open Space</u>: The protection and preservation of the Hockanum River, Ogden Brook, Tankerhoosen River, Gage's Brook, Railroad Brook, Walker's Reservoir East, Walker's Reservoir West, Valley's Fall's Pond, or a Vernal Pool indentified by the Town, is considered a priority when the parcel being subdivided contains portions of the aforementioned watercourses.

When the parcel being subdivided contains portions of land that would allow for the connection of the Shenipsit Trail, Hockanum River Trail, Risley Pond Trail, Land Trust Trail, Belding Path, Hockanum River Linear Park, Box Mountain Greenway, Talcottville & Tankerhoosen Trail/open space system, Ellington Trail System, Tolland Trail System, Bolton Greenways, Manchester Greenways, other potential greenway, linear park, or trail identified in the POCD or by the Department of Parks and Recreation, the provision and connection of these amenities shall be a priority in the design and or location of Open Space.

- Section 6.1.3.3 General Improvements, Size of Open Space: When Open Space is required, the minimum recommended amount of Open Space to be provided is 12% of the total area of land to be subdivided, 15% of the total area of land if the location of the subdivision is identified in the Land Use Plan and Strategy of the POCD, and 20% of the total land area if the location of the subdivision is identified as a Priority Area for Open Space Protection of the POCD.
- <u>Section 6.1.3.4.3 General Improvements, Open Space Standards:</u> Any land to be dedicated as Open Space shall be left in its natural state by the subdivider and shall not be graded, cleared, disturbed, or used as a temporary or permanent repository for stumps, brush, earth, building materials, debris, detention ponds, or basins.
- <u>Section 6.4 Lot Grading and Drainage</u>: Grading plans shall be submitted where substantial grading is required in order to provide a buildable site and shall employ standards and methods equal to or exceeding those set forth in the Erosion and Sediment Control Handbook (USDA, SCS, Storrs, Conn., 1976). Lot drainage should be coordinated with the general storm drainage patterns for the area, and drainage should be designed to avoid concentrated stormwater to adjacent lots.

Comment: Contains an outdated reference to a previous version of the State Erosion and Sedimentation Control Handbook. Revise the language to reference the current CT Erosion and Sedimentation Control Guidelines, as amended



MEMO: Vernon Regulatory Review, Tankerhoosen River Watershed Management Plan June 9, 2008 Page 4

• <u>Section 6.5.1.1 - Street Grading and Improvement</u>: Roads shall be related appropriately to the topography, and streets shall be arranged so as to obtain as many as possible of the building sites at, or above, the grades of the streets.

Comments: consistent with fitting the development to the topography. Building sites above the grade of the streets provides opportunity for use of roadside swales. Consider adding a provision to allow elimination of curbing for roads for grades less than 5% to encourage the use of vegetated swales and similar LID stormwater management systems.

 <u>Section 6.6.6 - Cul-de-sac or Dead-End</u>: Cul-de-sac pavement shall be a uniform 45 foot radius except when an island is used, in which case the outside radius shall be 50 feet with an island radius of 20 feet.

Comment: The radius of cul-de sacs should be the minimum required to accommodate emergency and maintenance vehicles. Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.

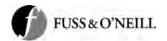
• Section 6.7.1 - Design Standards, Road Width: Table 1 contains minimum pavement width for collector (32 ft), local (28 ft), and limited local roads (28 ft).

Comment: Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance, and service vehicle access. Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.

 <u>Section 6.7.2 - Design Standards, Curbs</u>: Curbs shall be required on all new streets and shall conform to construction and design standards in the Appendix of the regulations.

Comment: The requirement for curbs on all new roads appears to preclude the use of curbless roads and open vegetated channels for stormwater management.

- <u>Section 6.9.1 Drainage and Storm Sewers, General Requirements</u>: The developer shall be fully responsible for constructing adequate facilities for the control, collection, conveyance and acceptable disposal of storm water, other surface water and subsurface water, whether originating within the sub- division area or in a tributary drainage area.
- Section 6.9.2.2 Drainage and Storm Sewers, Location of Stormwater Facilities: The applicant may be required to dedicate either in fee or by drainage or conservation easement, land on both sides of existing watercourses to a distance to be determined by the Commission.



MEMO: Vernon Regulatory Review, Tankerhoosen River Watershed Management Plan June 9, 2008 Page 5

Section 6.9.3 - Drainage and Storm Sewers, Drainage Discharge: The discharge of all storm water from a subdivision shall be into suitable streams or other acceptable and suitable storm water drainage facilities having adequate capacity to carry the additional water. Sufficient and adequate facilities shall be constructed on private lots wherever necessary to prevent the flow of surface drainage from the property on which it originates onto adjacent property in sufficient quantity, concentration or velocity to cause damage or create a nuisance on adjoining property.

Comment: The Subdivision Regulations do not include post-development peak flow, volume control, or stormwater quality requirements.

Section 6.9.3 - Drainage and Storm Sewers, Drainage Design: Designs shall be based on the maximum ultimate development of the entire watershed as permitted by the Zoning Regulations. On watersheds one square mile or over, the design of culverts, bridges and through watercourses shall be based upon not less than a 100-year storm. On watersheds of less than one square mile, the design for the through drainage system shall be for no: less than a 50-year storm. The drainage system for roads, including catch basins, inlets, pipes, underdrains and gutters within or abutting the subdivision shall be designed for not less than a 10-year storm.

Drainage ditches will, in general, not be permitted where it is feasible to install underground pipe.

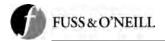
Comment: This requirements restricts the use curbless roads and roadside vegetated swales in lieu of traditional curb, gutter, and piped drainage.

• <u>Section 6.12.1 - Sidewalks</u>: Sidewalks shall be required in all subdivisions on at least one side of all new streets, unless waived by a three-quarters vote of all members of the Commission, and may be required on both sides at the discretion of the Commission.

Comment: Sidewalks required on two side of the street increase impervious cover. Where practical, consider locating sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.

 <u>Section 6.14 - Certified Erosion and Sediment Control Plan</u>: A soil erosion and sediment control plan shall be submitted with any application for development when the disturbed area of such development is cumulatively more than one-half acre. A single family dwelling that is not a part of a subdivision of land shall be exempt from these soil erosion and sediment control regulations.

Comment: Construction of single family dwellings that disturb an acre or more of land are subject to state and federal NPDES Phase II Stormwater Program requirements. Consider amending the single family exemption to indicate that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land.



Section 6.14.3 - Erosion and Sediment Control Plan: a soil erosion and sediment control
plan shall contain proper provisions to adequately control accelerated erosion and
sedimentation and reduce the danger from storm water runoff on the proposed site
based on the best available technology. Such principles, methods and practices
necessary for certification are found in the Connecticut Guidelines for Soil Erosion and
Sediment Control (1985) as amended.

Plans for soil erosion and sediment control shall be developed in accordance with these regulations using the principles as out-lined in Chapters 3 and 4 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended. Soil erosion and sediment control plans shall result in a development that minimizes erosion and sedimentation during construction; is stabilized and protected from erosion when completed; and does not cause off-site erosion and/or sedimentation.

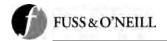
- <u>Section 6.14.6 Conditions Relating to Soil Erosion and Sediment Control</u>: A
  performance bond may be required for the estimated costs of measures required to
  control soil erosion and sedimentation, as specified in the certified plan.
- <u>Section 13 Rear Lots</u>: This section includes provisions for greater residential development flexibility, particularly where a site has an unusual lot line or natural resource configuration or where rear lot development would promote or enhance the protection of valuable natural resource features.

Comment: This concept is consistent with LID principles to protect and preserve natural features of a site.

## 2.2 Zoning Regulations

Site development in the Town of Vernon must comply with the Vernon Zoning Regulations (effective date: May 8, 2007). The following is a summary of specific zoning regulations that relate to stormwater management and natural resource protection issues.

- <u>Section 3.4 General Provisions, Collection and Disposal of Storm Drainage</u>: Proper provision shall be made for collection and disposal of storm water from roofs and parking areas through a pipe system connected to existing storm drains or carried to a natural watercourse or to an on-site area approved by the Town Engineer in compliance with the recommendations of the latest edition of the "Stormwater Quality Manual" of the Connecticut Department of Environmental Protection (DEP).
- <u>Section 3.18 General Provisions, Building Above or Below Center Line of Road</u>: Any lot or parcel of land with the top of foundation more than five (5) feet above or below the center line grade of the road opposite the midpoint of the front foundation wall requires a detailed site plan showing the existing and proposed topography, driveways, storm drainage, and other information.

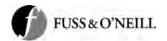


- <u>Section 3.25 General Provisions, Sidewalks</u>: Sidewalks shall be installed for all new developments in all areas, unless waived by a three-quarters vote of all members of the Commission.
- <u>Sections 4.1 through 4.25 Use Districts, Setbacks and Lot Dimensions</u>: These sections specify minimum setbacks and lot dimensions for various use districts in the Town of Vernon.

Comment: Minimum setbacks and frontage distances can increase impervious cover. Front yard setbacks, which dictate how far houses must be from the street, can extend driveway length. Large side setbacks and frontage distances influence the road length needed to serve individual lots. Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.

- <u>Section 7 Cluster Development</u>: Developers may vary the lot size requirements in Residential 40 and Residential 27 zoning districts, leaving a substantial area free of building lots (i.e., "cluster" development). The land area not allocated to building lots and streets shall be permanently reserved in open space and be readily usable for recreation or conservation.
- Section 12 Off-street Parking and Loading: Section 12.1 specifies parking ratios, which are the number of parking spaces that must be provided for particular uses. The Planning & Zoning Commission may reduce the number of off-street parking spaces which must be installed provided that the required number of spaces is reduced by no more than 20%, the number of spaces will not result in an increase of on-street parking, and the developer pays a fee of \$500 for each space eliminated (fee-in-lieu of parking). Section 12.3 specifies the minimum stall dimensions for off-street parking and truck loading spaces, which already appear to be at or near recommended minimum values.

Comment: Parking ratios typically represent the minimum number of spaces needed to accommodate the highest hourly parking rate at the site. In many cases, parking ratios far exceed parking demand, which refers to the number of spaces actually used for a particular land use. Parking ratios often result in far more spaces than are actually required because ratios are typically set as minimums and not maximums. This results in excessive impervious cover for many land uses. Existing parking ratios should be reviewed to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.



Shared parking is another strategy that reduces the number of parking spaces needed by allowing adjacent land uses to share parking lots, particularly when parking demands occur at different times during the day or week. Section 12.3 appears to allow for shared parking for non-residential uses, although it is unclear if the Town actively promotes shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Also consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Connecticut Stormwater Quality Manual, local stormwater management design manual, other sections of the Zoning regulations, or new/modified local stormwater management and LID regulations.

Model zoning regulations for parking were developed in 2003 for communities in northwestern Connecticut through a study sponsored by the Northwestern Connecticut Council of Governments (NWCCOG), the Litchfield Hills Council of Elected Officials (LHCEO), and the Connecticut DEP. This document provides a good starting point for reviewing and modifying local zoning regulations for parking to address impervious cover and stormwater management issues.

<u>Section 18 — Activities Requiring a Certified Erosion and Sediment Control Plan</u>: A soil
erosion and sediment control plan shall be submitted with any application for
development when the disturbed area of such development is cumulatively more than
one-half acre, except for a single family dwelling that is not a part of subdivision of land,
which is exempt from these soil erosion and sediment control regulations.

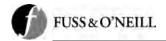
Comment: The section of the Zoning Regulations is consistent with the Erosion and Sediment Control Plan requirements (Section 6.14) of the Subdivision Regulations. Construction of single family dwellings that disturb an acre or more of land are subject to state and federal NPDES Phase II Stormwater Program requirements. Consider amending the single family exemption to indicate that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land.

• <u>Section 19 — Rear Lots</u>: This section includes provisions for greater residential development flexibility, particularly where a site has an unusual lot line or natural resource configuration or where rear lot development would promote or enhance the protection of valuable natural resource features.

Comment: This section of the Zoning Regulations is consistent with Section 13 of the Subdivision Regulations.

## 2.3 <u>Inland Wetlands & Watercourses Regulations</u>

The Town of Vernon Inland Wetlands and Watercourses Regulations (effective date: October 2, 2006) regulate the removal or deposition of materials and the construction, obstruction, alteration, or pollution of wetlands and watercourses in the Town. The regulations make provisions for the protection, preservation, maintenance and use of inland wetlands and watercourses by minimizing their disturbance and pollution, maintaining and improving water



quality in accordance with federal, state, and local authority, and preventing damage from erosion, turbidity, or siltation as well as preventing the loss of beneficial aquatic organisms.

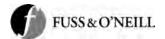
<u>Section 2 — Definitions</u>, <u>Regulated Activity</u>: Regulated activities include any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution, of such wetlands or watercourses. Any clearing, grubbing, filling, grading, paving, excavating, constructing, depositing, or removing of material and discharging of stormwater on the land within the following *upland review areas* is a regulated activity:

Resource	Upland Review Area
Wetland and Watercourse	100 ft.
Hockanum River, Ogden Brook, Tankerhoosen	200 ft.
River, Gage's Brook, Railroad Brook, Walker	
Reservoir West, Walker Reservoir East, and Valley	
Falls Pond	
Other	Agency Discretion*

^{*}The Commission may rule that any activity that alters the existing rate or quality of any stormwater discharge conveyed to a Regulated Area or is likely to impact or affect wetlands or watercourses is a Regulated Activity. The Commission may rule that any other activity whether located within or outside the Regulated Area that is likely to have an affect on the wetlands or watercourses is a Regulated Activity.

Additionally, the Commission may rule that any activity that alters the existing rate or quality of any stormwater discharge conveyed to a Regulated Area or is likely to impact or affect wetlands or watercourses is a Regulated Activity.

- Section 2 Definitions, Significant Activity: A "significant activity" includes any activity involving a deposition or removal of material which will or may have a substantial adverse effect on the Regulated Area or on another part of the inland wetland or watercourse system or an activity which substantially changes the natural channel or may inhibit the natural dynamics of a watercourse system or substantially diminishes the natural capacity of an inland wetland or watercourse to support desirable biological life, prevent flooding, supply water, assimilate waste, facilitate drainage, and/or provide recreation and open space, or any activity which would results in degrading a watercourse or the surface and/or groundwater of an inland wetland, such degradation to be measured by the standards of the Water Compliance Division of the Connecticut Department of Environmental Protection.
- <u>Section 4.3.2 Fee Schedule</u>: A technical review may be required by a consultant for certain regulated activities, including those that are within 200 feet of a watercourse of concern (including the Tankerhoosen River and its major tributaries), regulated activities proposed in a use district where the proposed activity exceeds the impervious coverage thresholds established in such districts, as well as parking space, building square footage, disturbance, and other thresholds.

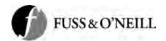


- Section 4.3.4 Application Procedure: Any person wishing to undertake a Regulated Activity must submit an application to the Commission. The application must include a map showing the location of the site, the nature and extend of the proposed activity, the location of the Regulated Areas, existing and proposed structures, two-foot elevation contours, all drainage to be engineered, areas where material may be deposited or removed, all proposed construction within Regulated Area, areas of significant vegetation. The application must also include a detailed description of the activity, a map drawn by a licensed surveyor if the proposed activity exceeds ½ acre, the names and address of property owners within 500 feet of the proposed activity, and any reasonable measures which would mitigate the impacts of the Regulated Activity.
- Section 4.5 Evaluation of Proposed Activities: This section specifies the information and criteria upon which the Commission makes its decision on an application. Section 4.5.2 includes factors related to erosion, siltation, and leaching; adverse effects on water quality and aquatic life; the likelihood of any changes in the velocity, volume, or course of water flow, or in the water table, and any consequences such changes may have for the capacity of the wetland or watercourse to help control flooding and to purify and supply water; and the existing and desired quality and use of the water in and near the affected area.

Comment: The evaluation criteria do not contain specific stormwater management standards and do not reference available design guidance such as the Connecticut Stormwater Quality Manual or local design guidance. The regulations also do not require or recommend the use of LID practices to meet stormwater management objectives.

• Watercourse Buffers: Section 4.5.2.12 states that the Commission may require the provision of a buffer along a watercourse if proposed activities and/or development may create negative impacts on a watercourse that could be prevented or mitigated by provision of a buffer, as described in "Appendix B. Design Standards Recommended for a Watercourse Protection Buffer." The watercourse buffer design standards state that in areas where vegetated buffers do not exist, or are of limited width, consideration should be given to the creation of a buffer area. Newly created buffers should include canopy or shade trees, shrubs, and herbaceous plant species suited to the local habitat in three (3) zones of plantings. The recommended minimum width of a watercourse buffer is one hundred (100) feet measured horizontally from the banks of the watercourse and fifty (50) feet measured horizontally related to intermittent watercourses.

The recommended watercourse protection area with landscape buffer may be reduced when (1) an engineered stormwater management and pollution control system employing technical best management practices (BMP) in compliance with the Connecticut Department of Environmental Protection (DEP) "Stormwater Quality Manual: is provided to treat run-off from a development site; (2) the site is served by a public sewer system; and (3) a reduction of the river protection buffer depth would not result in a significant potential adverse impact to the watercourse.



## 2.4 <u>Plan of Conservation and Development</u>

The Vernon Plan of Conservation and Development (June 2001) presents a detailed strategy for open space conservation and preservation, including increasing the amount of preserved open space as well as creating linkages between open space areas. The Plan identifies priority open space preservation areas along the Hockanum and Tankerhoosen River corridors.

A series of neighborhood meetings were held as an initial phase of the POCD. Several common themes emerged at public meetings. The themes associated with the protection of open space and watercourses included:

- Need to preserve open space for perpetuity in a positive, planned manner with adequate financial resources devoted to this program. A goal of 20% open space might be considered
- Retail development should be limited to prevent Vernon from becoming another Manchester in the Route 84 corridor or like the Berlin Turnpike along other major corridors in Town.
- The water quality of the Town's lakes and rivers as well as groundwater should be protected.

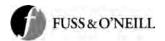
In addition to the currently-implemented Zoning Regulations, Subdivision Regulations, and Inland Wetlands and Watercourses Regulations, the Open Space section of the POCD also recommends adoption of a Hockanum River and Tankerhoosen River Protection Overlay District. Such a district would establish a contiguous and parallel buffer strip on either side of these rivers and would supplement the inland wetland and underlying zoning regulations, with the added provision that the land within the buffer areas and the river itself would remain in a natural, undisturbed state.

#### 3.0 OBSERVATIONS & PRELIMINARY RECOMMENDATIONS

Based on our review of the Town's existing land use regulations and planning documents that pertain to stormwater management and natural resource protection, we offer the following observations and preliminary recommendations for discussion during the upcoming workshop meeting with the Tankerhoosen River Management Plan Technical Advisory Committee and the Town of Vernon land use commissioners.

#### 3.1 Observations

The Town has a number of land use regulations that regulate construction and post-construction stormwater runoff from new development and redevelopment activities, and provide for protection of natural resources. The local regulations are particularly strong in terms of erosion and sediment control (as well as consistent between the various regulations), open space protection, and regulating activities that can potentially affect wetlands and watercourses, including requirements for watercourse buffers. However, there are several areas where the regulations and design standards and guidance could be strengthened through amendments or



new regulations to clarify and strengthen stormwater management requirements and better promote the use of LID principles.

#### 1. Stormwater Management Standards and Design Manual

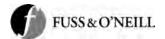
The Town land use regulations do not contain specific stormwater management standards. The Zoning Regulations reference the recommendations and design guidance contained in the Connecticut Stormwater Quality Manual, while the Subdivision Regulations indicate that stormwater systems shall be designed by methods approved by the Town Engineer. The Inland Wetlands and Watercourses Regulations do not contain specific stormwater management standards and do not reference design guidance such as the DEP Stormwater Quality Manual or local design standards, except for instances when the applicant requests reduction in the watercourse buffer width requirements.

While the Connecticut Stormwater Quality Manual contains hydrologic sizing criteria (for water quality, quantity, groundwater recharge, etc.) and detailed design guidance for specific stormwater treatment practices, it does not prescribe a set of stormwater standards due to the lack of state-wide stormwater regulations. The Connecticut Stormwater Quality Manual does contain many LID principles in addition to more traditional end-of-pipe stormwater controls. However, it does not contain more recently developed guidance on LID design methods and clear incentives for developers to use LID over traditional stormwater management methods, such as LID credit systems which have been adopted by communities in recent years. Another drawback of relying solely on the DEP manual is that the information in the manual may eventually become outdated and lacking in areas of new or emerging stormwater management issues, as DEP does not plan to revise the manual in the foreseeable future.

Although the Vernon land use commissions are encouraged to use the Connecticut Stormwater Quality Manual to review applications, an alternative approach is to develop a local stormwater and LID manual to complement the DEP stormwater manual. A local manual could reference applicable sections of the DEP manual and take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town. The Town land use regulations could also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the Town land use regulations. Several other Connecticut communities have chosen this approach, including Tolland, which has developed a LID and Stormwater Management Design Manual, in addition to amendments to the Tolland Subdivision and Zoning Regulations. The Town of Greenwich is also in the process of revising its outdated drainage manual to incorporate stormwater quality elements and LID principles. Greenwich is also considering adopting a stand-alone ordinance or modifying its local land use regulations to implement the provisions of the new manual.

#### 2. Local Regulatory Mechanism

As indicated in the introduction section, an opportunity exists for the Town of Vernon to develop and implement new or revised regulations to satisfy Phase II stormwater regulatory F:\P2005\0257\A20\Town Regulations and Data\Vernon_Regulatory_Review_Memo_20080605.doc Corres. (MA)

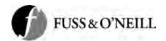


requirements, while at the same time incorporating LID principles and addressing natural resource protection issues. The Town's existing land use regulations address some of the elements of the post-construction stormwater management "regulatory mechanism" required by the DEP Phase II Stormwater program. However, none of the existing regulations, either individually or collectively, addresses post-construction stormwater management in a comprehensive manner as required by the Phase II program. Additionally, the Town may want to consider regulating stormwater runoff from projects that may not currently be subject to Town land use regulations but which are known to be a source of stormwater quality and drainage issues (such as single family residential redevelopment outside of the Upland Review Area).

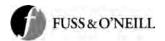
Two general approaches exist for implementing a comprehensive stormwater regulatory mechanism to meet Phase II stormwater program requirements and to incorporate LID principles and other specific community objectives. One approach involves developing a new stand-alone stormwater ordinance that could be incorporated into the Vernon Town Code and implemented by a single department or commission such as the Engineering Department. This approach has been used by Stratford and other communities throughout southern New England. An alternate approach would be to implement more comprehensive stormwater management/LID requirements in a new section of the Zoning Regulations and maintain the responsibility for administering the stormwater/LID provisions with the Planning and Zoning Commission. Such an approach has been used by Tolland and Guilford, Connecticut. Elements of both approaches are summarized as follows:

#### a. Stand-Alone Stormwater Ordinance

Adopt a new stormwater ordinance as part of the Vernon Town Code. The ordinance could be similar to the draft ordinance which is provided in Attachment A of this memorandum and is based upon a model ordinance endorsed by the DEP. Typically, a new stormwater ordinance is a more efficient and effective way to address the Phase II Stormwater program regulatory mechanism requirement than separate revisions to the individual municipal land use regulations that are currently in place. The stormwater ordinance would apply to post-construction stormwater runoff from new development and redevelopment projects that disturb greater than a threshold value that could be selected by the Town. The Phase II General Permit requires that the ordinance apply to projects that would disturb one or more acres. Vernon could consider an alternative applicability threshold to ensure that the requirements would apply to in-fill development projects and other smaller land disturbance activities with the potential for drainage or water quality impacts. The sample draft ordinance provided in Attachment A would apply to all projects that disturb 5,000 square feet or more. Other applicability thresholds could be considered as well. The ordinance should incorporate by reference the technical standards and design guidance contained in a local stormwater manual and/or the Connecticut Stormwater Quality Manual, as amended.



- The stand-alone stormwater ordinance could be administered by the Engineering Department, which would initially receive stormwater management permit applications for land disturbance activities subject to the ordinance. Stormwater Management Plans would then be reviewed by one or more of the applicable land use commissions (Planning and Zoning Commission or Inland Wetlands Regulatory Commission) with jurisdiction or expertise over the proposed project. Projects that do not fall under the jurisdiction of the Planning and Zoning Commission or the Inland Wetlands Regulatory Commission would be reviewed solely by the Engineering Department for compliance with the ordinance. This administrative structure places responsibility for stormwater management plan review on those agencies that already perform regulatory reviews (P&Z and IW), but consolidates authority for the stormwater ordinance under a single department (Engineering). A drawback to this approach is that the Engineering Department would bear the responsibility for administering the permit program and would likely require additional staff resources.
- The Town could consider creating a dedicated "stormwater inspector" position
  within the Engineering Department. The stormwater inspector would be
  responsible for conducting stormwater inspections during and after construction
  of stormwater facilities in support of the new ordinance, as well as augment the
  related inspection capabilities of Building Inspector and Zoning Enforcement
  Officer.
- Short-term funding for administration of the post-construction stormwater ordinance and other elements of the Town's Phase II program would most likely come from taxes and application fees. The Town could investigate implementation of a service charge-based system, such as user fees or a stormwater utility. However, these funding sources are often difficult to implement due to public resistance. Stormwater utilities have been established in Chicopee, Massachusetts, Burlington, Vermont, and elsewhere throughout the U.S. Stonington, Connecticut has investigated the feasibility of a stormwater utility. Several other Connecticut coastal communities are undertaking DEP-funded demonstration projects to explore the feasibility of developing and implementing a stormwater utility. Vernon may also explore the feasibility of a stormwater utility or similar stormwater service charge, although this would likely be a long-term potential funding source.
- b. Incorporation of Stormwater Management/LID Requirements in Zoning Regulations
  - Incorporate a new post-construction stormwater management and LID section into the existing Zoning Regulations. The new section could be similar to the stand-alone example ordinance in terms of applicability thresholds, exemptions, and general stormwater management standards and LID principles. Specific stormwater management standards and design guidance should not be included in the regulations, but rather in a local stormwater manual to avoid the need for



significant future amendments to the regulations when the standards or design guidance are revised. A copy of the recent amendment to the Town of Tolland Zoning Regulations, which added a new LID section, is included as <u>Attachment</u> B of this memorandum.

 In addition, the Zoning Regulations could be modified to potentially require a Stormwater Management Plan for a proposed activity that only requires a Building Permit, such as a single-family dwelling, if it results in the disturbance of one or more acres (the Phase II permit minimum requirement) or a lower threshold selected by the Town. The following sample language is an excerpt from the Guilford Zoning Regulations:

Stormwater Management Plans shall be prepared for any Site Plan, Coastal Site Plan (CAM) or Special Permit Application in accordance with 273-75.F(3) of this Code. Futhermore, for an Application for Certificate of Zoning Compliance (Building Permit) for any new single family dwelling, the Town Engineer, or the Environmental Planner may require that a Stormwater Management Plan be prepared, all or in part, as required by 273-75.F.(3) when he/she has determined that the development if the single family dwelling may have an adverse impact on stormwater quality.

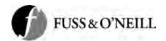
This approach consolidates stormwater management review within the Planning and Zoning Commission through the existing site plan and special permit application review process. The Subdivision and Inland Wetlands and Watercourses Regulations would also need to be modified to require a Stormwater Management Plan consistent with the Zoning Regulations.

#### 3. LID Incentives and Obstacles

Although recent studies demonstrate that LID practices can reduce project costs and improve environmental performance, the perception still exists that site development using LID is more expensive than traditional approaches to stormwater management. Initial project costs may be higher in some cases than those for conventional design. However, significant savings are typically realized due to reduced costs for site grading and preparation, stormwater infrastructure, site paving, and landscaping (USEPA, Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices, EPA publication number 841-F-07-006, December 2007).

Many states and local communities have adopted LID credit systems as an added incentive for developers to use LID, and in particular non-structural measures, to ultimately reduce the size and cost of structural stormwater management systems.

LID Site Design Credits encourage environmentally sensitive site design and LID techniques for managing stormwater that minimize impervious surfaces and preserve natural hydrologic conditions. The credits allow project proponents to reduce or eliminate the structural stormwater BMPs otherwise required to meet certain stormwater standards by implementing LID site design techniques according to a prescribed set of standards. The Tolland LID Design F:\P2005\0257\A20\Town Regulations and Data\Vernon_Regulatory_Review_Memo_20080605.doc Corres. (MA)



Manual includes such an LID credit system. <u>Attachment C</u> of this memorandum contains an example LID Site Design Credit System that is also being considered by the Town of Greenwich.

Local land use regulations often contain design standards that preclude or limit the use of certain LID practices, particularly the use of curbless roads and roadside vegetated swales. Traditional curb-and-gutter systems convey stormwater with virtually no treatment or attenuation. Open vegetated channels remove pollutants by allowing infiltration and filtering to occur, and encourage groundwater recharge, which can reduce the volume of stormwater generated from a site. Traditionally, the use of curbless roads and vegetated open channels has been discouraged and, in many instances, specifically prohibited in local land use regulations and drainage design manuals, due to concerns over maintenance problems, pavement stability, and potential nuisances such as mosquitoes. Many of these concerns can be addressed through careful design and integration of open channels along streets.

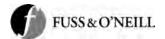
The Vernon Subdivision Regulations contain provisions that limit the use of curbless roads and roadside vegetated swales. The Subdivision Regulations require curbs on all new streets and do not permit drainage ditches where it is feasible to install underground pipe. The Town should evaluate the underlying reasons for these restrictions and determine if the Subdivision Regulations should be amended to encourage the use of curbless roads and roadside swales, consistent with LID principles.

#### 4. Local Regulations and Impervious Cover

Impervious cover in a watershed is a strong indicator of the overall quality of streams and aquatic ecosystems. The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. As impervious cover increases, overall stream health declines.

A goal of LID, which is a form of alternative site design, is to reduce impervious cover, disconnect impervious surfaces from the storm drainage system, and preserve natural site features. Local land use regulations and design requirements were typically not developed with impervious cover in mind. Rather, they evolved from perceived consumer demand, safety concerns, and land availability, often resulting in more impervious cover than is necessary due to expansive parking lots, wide streets, and large-lot subdivisions with little conserved natural areas and open space.

Communities interested in adopting LID and alternative sit design principles need to re-evaluate local land use regulations to overcome these challenges. Based on our review of the Vernon Subdivision and Zoning Regulations, some of the key design parameters that strongly influence impervious cover are already at or near optimal levels (e.g., off-street parking stall dimensions and configuration), while others should be reviewed to determine if further refinement is warranted and feasible (e.g., cul-de-sac design, road width, sidewalks, parking ratios).



## 3.2 <u>Preliminary Recommendations</u>

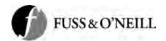
This section contains preliminary recommendations based on our review of the existing land use regulations and planning documents, as well as our observations discussed in the previous section. These recommendations are intended to facilitate a discussion with the Technical Advisory Committee and Vernon land use commissioners during the upcoming workshop meeting, and to serve as a starting point and basis for further refinement and implementation.

## 1. Town Design Manual

- Develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the Connecticut Stormwater Quality Manual to take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town (see Recommendation 2). The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.
- Include a section of the design manual that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects. Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management facilities.
- Incorporate/reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.

#### 2. Stormwater Management Standards

• Develop and incorporate into the Town stormwater design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance (see Recommendation 3). Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the Connecticut Stormwater Quality Manual and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included in Attachment D.



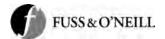
## 3. New or Modified Stormwater Regulations

- Develop and implement new or revised stormwater regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects in Vernon, and 3) address other local drainage and natural resource protection issues identified by the Town. Two potential approaches have been identified —1) a new stand-alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.
- Form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:
  - If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
  - o Which projects and activities will the new ordinance apply to (i.e., applicability)?
  - o How will applications be received and reviewed?
  - o Who will be responsible for inspections and enforcement?
  - Will additional staff be required to handle the increased workload to review and process applications?

#### 4. Other Amendments to Existing Regulations

#### **Subdivision Regulations**

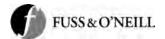
- Amend Section 6.4 to reference the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, as opposed to the outdated reference to the 1976 version of the Erosion and Sediment Control Handbook.
- Section 6.5.1.1 (Street Grading and Improvement): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.6.6 (Cul-de-sacs): Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.
- Section 6.7.1 (Design Standards, Road Width): Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.



- Section 6.7.2 (Design Standards, Curbs): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.9 (Drainage and Storm Sewers): Modify these sections to reference stormwater management standards and LID principles contained in a stand-alone stormwater ordinance or new section of the Zoning Regulations, and/or the Town stormwater design manual.
- Section 6.9.3 (Drainage Design): Amend this section to allow the use of roadside vegetated swales designed in accordance with the Town stormwater design manual.
- Section 6.12.1 (Sidewalks): Consider requiring sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.
- Section 6.14 (Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

## **Zoning Regulations**

- Section 3.4 (General Provisions): If the Town develops a local stormwater design manual, change the reference to the Connecticut Stormwater Quality Manual to the Town manual.
- Sections 4.1 through 4.25 (Use Districts, Setbacks and Lot Dimensions): Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.
- Section 12 (Off-street Parking and Loading): Review existing parking ratios to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.



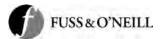
Clarify Section 12 of the regulations to encourage the use of shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.

Section 18 (Activities Requiring a Certified Erosion and Sediment Control Plan):
 Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

## Inland Wetlands and Watercourses Regulations

• Section 4.5 (Evaluation of Proposed Activities): Add language referencing the stormwater management standards and LID principles contained in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.



# ATTACHMENT A

Draft Model Stormwater Ordinance

#### **DRAFT**

# POST-CONSTRUCTION STORMWATER ORDINANCE (CITY NAME)

#### **Table of Contents**

- 1.0 PURPOSE AND AUTHORITY
- 2.0 **DEFINITIONS**
- 3.0 APPLICABILITY
- 4.0 STORMWATER MANAGEMENT CRITERIA
- 5.0 STORMWATER MANAGEMENT PLANS
- 6.0 PERMITS
- 7.0 CASH BOND
- 8.0 INSPECTION
- 9.0 MAINTENANCE
- 10.0 APPEALS
- 11.0 SEVERABILITY
- 12.0 PENALTIES
- 13.0 EFFECTIVE DATE

#### 1.0 PURPOSE AND AUTHORITY

The purpose of this ordinance is to protect, maintain and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to control the adverse impacts associated with post-construction stormwater runoff. Proper management of stormwater runoff will minimize damage to public and private property, reduce the effects of development on land and wetlands, control stream channel erosion, reduce local flooding, improve water quality, and maintain after development, as nearly as possible, the pre-development runoff characteristics.

The provisions of this ordinance are pursuant to Connecticut State Statutes 7-148 (c) (8) (A)¹, 8-2 (a)², 8-25³, and 22a-36 to 22a-45 inclusive⁴, and 8-2(b)⁵ and shall apply to all development occurring within the incorporated area of (City Name), Connecticut. The application of this ordinance and provisions expressed herein shall be the minimum stormwater management requirements and shall not be deemed a limitation or repeal of any other powers granted by State statute. The agencies defined in Section 2.0 as the

¹ Municipal Powers: The municipality has the power to "Provide for the protection and improvement of the environment including, but not limited to, coastal areas, wetlands and areas adjacent to waterways in a manner not inconsistent with the general statutes.

² Regulations: The zoning commission is authorized to adopt regulations "...to secure safety from ...flood and other dangers; to promote health and the general welfare..."

³ Subdivision of land: Authorizes the zoning commission to see "...that proper provision shall be made for... drainage..." and "that proper provision shall be made for protective flood control measures..."

⁴ The Inland Wetlands and Watercourses Act.

⁵ "In any municipality that is contiguous to Long Island Sound the regulations adopted under this section shall be made with reasonable consideration for restoration and protection of the ecosystem and habitat of Long Island Sound and shall be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. Such regulations shall provide that the zoning commission consider the environmental impact on Long Island sound of any proposal for development."

"Responsible Authority" shall be responsible for the coordination and enforcement of the provisions of this ordinance.

#### 1.1 Incorporation by Reference

For the purpose of this ordinance, the Connecticut Stormwater Quality Manual (as amended) is incorporated by reference by (City Name), Connecticut and shall serve as the official guide for stormwater principles, methods, and practices.

#### 2.0 **DEFINITIONS**

- A. For the purpose of this ordinance, the following definitions describe the meaning of the terms used in this ordinance:
  - (1) "Adverse impact" means any deleterious effect on waters or wetlands, including their quality, quantity, surface area, species composition, aesthetics or usefulness for human or natural uses which are or may potentially be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity, or stability or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation.
  - (2) "Agricultural land management practices" means those methods and procedures used in the cultivation of land in order to further crop and livestock production and conservation of related soil and water resources.
  - (3) "Applicant" means any person, firm, or governmental agency who executes the necessary forms to procure official approval of a project or a permit to carry out construction of a project.
  - (4) "Aquifer" means porous water bearing geologic formation generally restricted to materials capable of yielding an appreciable supply of water.
  - (5) "BMP (Best Management Practice)" means a structural device or nonstructural practice designed to temporarily store or treat stormwater runoff in order to mitigate flooding, reduce pollution, and provide other amenities.
  - (6) "Clearing" means the removal of trees and brush from the land (i.e., removal of vegetative cover) but shall not include the ordinary mowing of grass
  - (7) "DEP" means the Connecticut Department of Environmental Protection.
  - (8) "Design Manual" means the most current edition of the Connecticut Stormwater Quality Manual that serves as the official guide for the stormwater management principles, methods, and practices.
  - (9) "Detention structure" means a permanent structure for the temporary storage of runoff, which is designed so as not to create a permanent pool of water.
  - (10) "Develop land" means to change the runoff characteristics of a parcel of land in conjunction with residential, commercial, industrial, municipal, or institutional construction or alteration.
  - (11) "Direct discharge" means the concentrated release of stormwater to tidal waters or vegetated tidal wetlands from new development or redevelopment projects in the Critical Area.
  - (12) "Disturb" or "Disturbance" means any activity consisting of the removal of vegetation, topsoil, or overburden, or the placement of topsoil, spoil, or other material, as defined in the Guidelines.

- (13) "Drainage area" means an area that contributes runoff to a single point measured in a horizontal plane, which is enclosed by a ridgeline.
- (14) "Easement" means a grant or reservation by the owner of land for the use of such land by others for a specific purpose or purposes, and which must be included in the conveyance of land affected by such easement.
- (15) "Exemption" means those land development activities that are not subject to the stormwater management requirements contained in this ordinance.
- (16) "Extended detention" means a stormwater design feature that provides gradual release of a volume of water in order to increase settling of pollutants and protect downstream channels from frequent storm events. Methods for designing extended detention BMPs are specified in the Design Manual.
- (17) "Extreme flood volume" means the storage volume required to control those infrequent but large storm events in which overbank flows reach or exceed the boundaries of the 100-year floodplain.
- (18) "Flow attenuation" means prolonging the flow time of runoff to reduce the peak discharge.
- (19) "Grading" means any act by which soil is cleared, stripped, stockpiled, excavated, scarified, filled or any combination thereof.
- (20) "Groundwater recharge volume (GRV)" means that portion of the water quality volume used to maintain groundwater recharge rates at development sites. Methods for calculating the groundwater recharge volume are specified in the Design Manual.
- (21) "Guidelines" means the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, or as may be amended, established pursuant to Section 22a-328 of the Connecticut General Statutes.
- (22) "Infiltration" means the passage or movement of water into the soil surface.
- (23) "Off-site stormwater management" means the design and construction of a facility necessary to control stormwater from more than one development.
- "On-site stormwater management" means the design and construction of systems necessary to control stormwater within an immediate development.
- (25) "Peak runoff attenuation" means controlling by structural practices the volume to prevent an increase in the frequency of out of bank flooding generated by development.
- (26) "Primary treatment practice", as defined in the Design Manual, means a stormwater treatment practice that is capable of providing high levels of water quality treatment as a stand-alone measure.
- (27) "Redevelopment" means any construction, alteration, or improvement exceeding five thousand (5,000) square feet of land disturbance performed on sites where existing land use is commercial, industrial, municipal, institutional or multifamily residential.
- (28) "Responsible Authority" means employees, members, or designees of (City Name) (Agency Name). Other responsible agencies under this ordinance include:
  - (a) The Inland Wetlands and Watercourses Commission for stormwater runoff impacting wetlands and watercourses. (For the purposes of only this paragraph, the definition of "wetlands" and "watercourse" is the definition used in the most current version of the Inland Wetland and Watercourses regulations of (City Name).

- (b) The Engineering Division of the Department of Public Works for stormwater runoff from public roads and sidewalks.
- (c) The Planning Commission and Zoning Commission for all other stormwater runoff.
- (29) "Responsible Official" means (City Name) Director of Public Works ("Director").
- (30) "Retention structure" means a permanent structure that provides for the storage of runoff by means of a permanent pool of water.
- (31) "Retrofitting" means the construction of a structural BMP in a previously developed area, the modification of an existing structural BMP, or the implementation of a nonstructural practice to improve water quality over current conditions.
- (32) "Secondary treatment practice", as defined in the Design Manual, means a stormwater treatment practice that may not be suitable as stand-alone treatment because is not capable of meeting the water quality treatment performance criteria in the Design Manual or has not yet received the thorough evaluation needed to demonstrate the capabilities for meeting the performance criteria in the Design Manual.
- (33) "Sediment" means soils or other surficial materials transported or deposited by the action of wind, water, ice, or gravity as a product of erosion.
- (34) "Site" means:
  - (a) For "new development" any tract, lot or parcel of land or combination of tracts, lots, or parcels of land, which are in one ownership, or are contiguous and in diverse ownership where development is to be performed as part of a unit, subdivision, or project.
  - (b) For "redevelopment" the area of new construction as shown on an approved site plan or the original parcel. Final determination of the applicable area shall be made by the Responsible Authority.
- (35) "Stabilization" means the prevention of soil movement by any of various vegetative and/or structural means.
- (36) "Stormwater management" means the selective use of various management measures to effectively address the adverse water quality and quantity impacts of urban stormwater runoff.
- (37) "Stormwater Management Plan" means a set of drawings or other documents that describe the potential water quality and quantity impacts associated with a development project after construction. A stormwater management plan also identifies selected source controls and treatment practices to address those potential impacts, the engineering design of the treatment practices, and maintenance requirements for proper performance of the selected practices.
- (38) "Stormwater Treatment Practice", as defined in the Design Manual, means a measure constructed for primary treatment or secondary treatment of stormwater runoff.
- (39) "Stream Channel Protection" means restricting peak flows from storm events that result in flow conditions where the stream is flowing to the full extent of its banks so the damaging effects to the channel of increased runoff from urbanization can be reduced. Methods for calculating stream channel protection are specified in the most current edition of the Design Manual.

- (40) "Variance" means the modification of the minimum stormwater management requirements for specific circumstances such that strict adherence to the requirements would result in necessary hardship and not fulfill the intent of this ordinance.
- (41) "Waiver" means the relinquishment from stormwater management requirements by the Responsible Authority for a specific development on a case-by-case review basis.
  - (a) "Quality stormwater management waiver" includes water quality volume and groundwater recharge volume design parameters.
  - (b) "Quantity stormwater management waiver" includes stream channel protection, peak runoff attenuation, and extreme flood volume design parameters.
- (38) "Watercourse" means any natural or artificial stream, river, brook, lake, pond, marsh, swamp, bog, ditch, channel, canal, conduit, culvert, drain, waterway, gully, ravine, wash, and all other bodies of water, natural or artificial, vernal or intermittent, public or private in and including any adjacent area that is subject to inundation from overflow or flood water.
- (39) "Watershed" means the total drainage area contributing runoff to a single point.
- (40) "Water quality volume" means the volume of runoff generated by one inch of rainfall on the site.

#### 3.0 APPLICABILITY

#### 3.1 Scope

No person shall develop land for residential, commercial, industrial, municipal, or institutional uses without having provided stormwater management measures that control or manage runoff from such development, except as provided within this section. The stormwater management measures must be designed consistent with the Design Manual and constructed according to an approved plan for new development or the policies stated in Section 3.4 for redevelopment.

#### 3.2 Exemptions

The following development activities are exempt from the provisions of this ordinance and the requirements of providing stormwater management, except as noted:

- A. Development of single family residential property that results in the disturbance of less than one (1) acre of land, not including projects less than one (1) acre that are part of a larger common plan of development or sale that will ultimately disturb greater or equal to one (1) acre must conform to the requirements presented in Section 4.4.
- B. Agricultural land management practices;
- C. Any activity that will disturb an area less than five thousand (5,000) square feet over the total project;
- D. Maintenance of existing landscaping, gardens or lawn areas associated with a single family dwelling;
- E. Repair or replacement of an existing roof of a single family dwelling;
- F. Construction of utilities (gas, water, electric, telephone, sanitary sewer, etc.) other than drainage, which will not alter terrain, ground cover, or drainage patterns;

G. Emergency repairs to any stormwater management facility or practice that poses a threat to public health or safety, or as deemed necessary by the Responsible Authority.

#### 3.3 Waivers / Watershed Management Plans

- A. Stormwater management quantity control waivers may be granted by the Responsible Authority to projects when the Responsible Authority determines that circumstances exist that prevent the reasonable implementation of quantity control practices.
- B. Stormwater management quality control waivers granted by the Responsible Authority apply to:
  - (1) In-fill development projects where implementation of stormwater management quality controls is not feasible:
  - (2) Redevelopment projects if the requirements of Section 3.4 of this ordinance are satisfied; or
  - (3) Sites where the Responsible Authority determines that circumstances exist that prevent or make unnecessary the reasonable implementation of quality control practices.
- C. Waivers must be requested in writing one week in advance of the regular meeting of the (Responsible Authority Agency Name) in a manner prescribed by the Director of Public Works.
- D. Waivers granted must:
  - (1) Be on a case-by-case basis;
  - (2) Consider the cumulative effects of the waiver policy; and
  - (3) Reasonably ensure the development will not adversely impact stream quality.

#### 3.4 Redevelopment

- A. All redevelopment projects shall reduce existing site impervious area by 20%. Where site conditions prevent the reduction of impervious area, then stormwater management practices shall be implemented to provide quality control for at least 20% of the site's impervious area. The elements and principles of stormwater quality control are noted in the Design Manual.
- B. Where conditions prevent impervious area reduction or on-site stormwater management, the Responsible Authority may consider practical alternatives including:
  - (1) Watershed or stream restoration;
  - (2) Retrofitting; or
  - (3) Other practices approved by Responsible Authority.

#### 3.5 Variance

The Responsible Authority may grant a written variance from any requirement of Section 4.0 (Stormwater Management Criteria), of this ordinance if there are exceptional circumstances applicable to the site such that strict adherence will result in unnecessary hardship and not fulfill the intent of this ordinance. A written request for variance shall be provided to the Responsible Authority and shall state the specific variances sought and reasons for their granting. The Responsible Authority shall not grant a variance unless and until the person developing land provides sufficient justification.

#### 4.0 STORMWATER MANAGEMENT CRITERIA

## **4.1 Minimum Control Requirements**

A. The minimum control criteria established in this section and the Design Manual are as follows:

- (1) Shall require that the groundwater recharge volume, water quality volume, and peak runoff attenuation for the 2-year frequency storm event be used to design BMPs according to the Design Manual. Control of the 10-year frequency storm event is required according to the Design Manual. Control of larger storm events may be required at the discretion of the Responsible Authority if a flooding problem exists and downstream floodplain development and conveyance system design cannot be controlled.
- (2) Shall require that the groundwater recharge volume, water quality volume, and stream channel protection sizing criteria be used to design BMPs according to the Design Manual.
- (3) The Responsible Authority may require more than the minimum control requirements specified in this ordinance if hydrologic or topographic conditions warrant or if flooding, stream channel erosion, or water quality problems exist downstream from a proposed project.
- B. Stormwater management and development plans where applicable, shall be consistent with adopted and approved watershed management plans or flood management plans as approved by the DEP.

#### **4.2** Stormwater Management Measures

The structural and nonstructural stormwater management measures established in this ordinance shall be used, either alone or in a combination, in developing a stormwater management plan.

- A. Nonstructural Stormwater Management Measures.
  - (1) The following nonstructural stormwater management practices shall be applied according to the Design Manual to minimize increases in new development runoff:
    - (a) Natural area conservation;
    - (b) Disconnection of rooftop runoff;
    - (c) Disconnection of non-rooftop runoff;
    - (d) Sheet flow to buffers;
    - (e) Grass channels; and
    - (f) Environmentally sensitive development and Low Impact Development (LID) practices;
  - (2) The use of nonstructural stormwater management practices shall be encouraged to minimize the reliance on structural BMPs.
  - (3) The minimum control requirements listed in Section 4.1 of this ordinance may be reduced when nonstructural stormwater management practices are incorporated into site designs according to the Design Manual.
  - (4) The use of nonstructural stormwater management practices may not conflict with existing State or local laws, ordinances, or policies.
  - (5) Nonstructural stormwater management practices used to reduce the minimum control requirements must be recorded and remain unaltered by subsequent property owners. Prior approval from the Responsible Authority shall be obtained before nonstructural stormwater practices are altered.
- B. Structural Stormwater Management Measures.

- (1) The following structural stormwater management practices or "Stormwater Treatment Practices" shall be designed according to the Design Manual to satisfy the applicable minimum control requirements established in Section 4.1 of this ordinance.
  - (a) Primary Treatment Practices, including stormwater ponds, stormwater wetlands, stormwater infiltration practices, stormwater filtering practices, and water quality swales.
  - (b) Combination of primary treatment practices and secondary treatment practices.
  - (c) Multiple secondary treatment practices, at the discretion of the Responsible Authority.
- (2) The performance criteria specified in the Design Manual with regard to general feasibility, conveyance, pretreatment, treatment and geometry, environment and landscaping, and maintenance shall be considered when selecting structural stormwater management practices.
- (3) Structural stormwater management practices shall be selected to accommodate the unique hydrologic or geologic regions of the state.
- C. Alternative structural and nonstructural stormwater management practices may be used for new development water quality control if they meet the performance criteria established in the Design Manual. Practices used for redevelopment projects shall be approved by the Responsible Authority.
- D. For the purposes of modifying the minimum control requirements or design criteria, the owner/developer shall submit at the request of the Responsible Authority an analysis of the impacts of stormwater flows downstream in the watershed. The analysis shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications of the proposed development upon a dam, highway, structure, or natural point of restricted stream flow. The point of investigation is to be established with the concurrence of the Responsible Authority.

#### 4.3 Specific Design Criteria

The basic design criteria, methodologies, and construction specifications, subject to the approval of the Responsible Authority, shall be those of the Design Manual.

#### 4.4 Single Family Residence Lot Level Controls

Construction of single family residences that results in the disturbance of less than 1 acre of land must minimize or disconnect impervious area runoff from the public storm drainage system by implementing stormwater management measures designed in accordance with the Design Manual. The applicant shall submit evidence on a form prescribed by the Responsible Official that the requirements of Section 4.4 have been met prior to issuance of a building permit.

#### 5.0 STORMWATER MANAGEMENT PLANS

#### 5.1 Review and Approval of Stormwater Management Plans

A. For any proposed development, the developer shall submit a stormwater management plan or waiver application to the Responsible Authority for review and approval, unless otherwise exempted. The stormwater management plan shall contain supporting computations, drawings, and sufficient information describing the manner, location, and type of measures in which stormwater runoff will be managed from the entire development. The Responsible Authority shall

review the plan to determine compliance with the requirements of this ordinance prior to approval. The plan shall serve as the basis for all subsequent construction.

B. Notification of approval or reasons for disapproval or modification shall be given to the applicant within [time frame] after submission of the completed stormwater plan. If a decision is not made within [time frame] the applicant shall be informed of the status of the review process and the anticipated completion date. The stormwater management plan shall not be considered approved without the inclusion of the signature and date of signature of the responsible official on the plan.

#### 5.2 Contents of the Stormwater Management Plan

A. The developer is responsible for submitting a stormwater management plan that meets the design requirements of this ordinance. The plan shall be accompanied by a report that includes sufficient information to evaluate the environmental characteristics of affected areas, the potential impacts of the proposed development on water resources, and the effectiveness and acceptability of measures proposed for managing stormwater runoff. An engineer licensed in Connecticut shall certify on the drawings that all clearing, grading, drainage, construction, and development shall be conducted in strict accordance with the plan. If a stormwater management plan involves direction of some or all runoff off of the site, it is the responsibility of the developer to obtain from adjacent property owners any easements or necessary property interests concerning flowage of water. Approval of a stormwater management plan does not create or affect any right to direct runoff onto adjacent property without that property owner's permission.

The minimum information submitted for support of a stormwater management plan or application for a waiver shall be as follows:

- B. Reports submitted for stormwater management plan approval shall include:
  - (1) A brief narrative description of the project;
  - (2) Geotechnicial investigations including soil maps, borings, site-specific recommendations, and any additional information necessary for the proposed stormwater management design;
  - (3) Descriptions of all watercourses, impoundments, and wetlands on or adjacent to the site or into which stormwater directly flows;
  - (4) Hydrologic computations, including drainage area maps depicting pre development and post development runoff flow path segmentation and land use that demonstrate compliance with Section 4.0 of this ordinance;
  - (5) Hydraulic computations;
  - (6) Structural computations;
  - (7) Hydrologic sizing criteria computations according to the Design Manual; and
  - (8) Any other information required by the Responsible Authority.
- C. Construction drawings submitted for stormwater management plan approval shall include the following:
  - (1) A vicinity map;
  - (2) Topography survey showing existing and proposed contours, including the area necessary to determine downstream analysis for proposed stormwater management facilities;
  - (3) Any proposed improvements including location of buildings or other structures, impervious surfaces, storm drainage facilities, and all grading;

- (4) The location of existing and proposed structures and utilities;
- (5) Any easements and rights-of-way;
- (6) The delineation, if applicable, of the 100-year floodplain and any on-site wetlands;
- (7) Structural and construction details for all components of the proposed drainage system or systems, and stormwater management facilities.
- (8) All necessary construction specifications;
- (9) A sequence of construction;
- (10) Data for total site area, disturbed area, new impervious area, and total impervious area;
- (11) A table showing the hydrologic sizing criteria volumes described in the Design Manual;
- (12) A table of materials to be used for stormwater management facility planting;
- (13) All soil boring logs and locations;
- (14) A maintenance schedule;
- (15) Certification by a Connecticut certified engineer that all stormwater management construction will be done according to this plan;
- (16) An as-built certification signature block to be executed after project completion; and
- (17) Any other information required by the Responsible Authority.

#### 5.3 Preparation of the Stormwater Management Plan

- A. A professional engineer licensed in the State shall design and prepare a stormwater management plan as necessary to protect the public and the environment.
- B. If a stormwater treatment practice requires either a dam safety permit from DEP or approval from the Inland Wetlands and Watercourses Agency, the Responsible Authority shall require that a professional engineer licensed in the State prepare the design.

#### 6.0 PERMITS

#### 6.1 Permit Requirement

A building permit may not be issued for any parcel or lot unless a stormwater management plan has been approved or waived by the Responsible Authority as meeting all the requirements of this ordinance. Where appropriate, a building permit may not be issued without:

- A. Recorded easements for the stormwater management facility and easements to provide adequate access for inspection and maintenance from a public right-of-way;
- B. A recorded stormwater management maintenance agreement;
- C. A cash bond; and
- D. Permission from adjacent property owners as necessary.

#### 6.2 Permit Fee

A non-refundable permit fee will be collected at the time the stormwater management plan or application for waiver is submitted. The permit fee will provide for the cost of plan review, administration, and management of the permitting process, and inspections by the Responsible Authority of all projects subject

to this ordinance. A permit fee schedule shall be established by the Responsible Authority based upon the relative complexity of the project and may be amended from time to time.

#### **6.3** Permit Suspension and Revocation

Any building permit issued by the Responsible Authority may be suspended or revoked after written notice is given to the permittee for any of the following reasons:

- A. Any violation(s) of the conditions of the stormwater management plan approval.
- B. Changes in site runoff characteristics upon which an approval or waiver was granted.
- C. Construction is not in accordance with the approved plan.
- D. Noncompliance with correction notice(s) or stop work order(s) issued for the construction of the stormwater management facility.
- E. An immediate danger exists in a downstream area in the opinion of the Responsible Authority.

#### **6.4** Permit Conditions

In granting the plan approval, the Responsible Authority may impose such conditions that may be deemed necessary to ensure compliance with the provisions of this ordinance and the preservation of the public health and safety.

#### 7.0 CASH BOND

The Responsible Authority shall require from the developer a cash bond prior to the issuance of any building permit for the construction of a development requiring a stormwater management facility. The amount of the security shall not be less than the total estimated construction cost of the stormwater management facility. The bond required in this section shall include provisions relative to forfeiture for failure to complete work specified in the approved stormwater management plan, compliance with all of the provisions of this ordinance, and other applicable laws and regulations, and any time limitations. The bond shall not be fully released without a final inspection of the completed work by the Responsible Authority, submission of "as-built" plans, and certification of completion by the Responsible Authority that the stormwater management facilities comply with the approved plan and the provisions of this ordinance. A procedure may be used to release parts of the bond held by the Responsible Authority after various stages of construction have been completed and accepted by the Responsible Authority. The procedures used for partially releasing performance bonds must be specified by the Responsible Authority in writing prior to stormwater management plan approval.

[1) a cash bond posted within the Town treasury or 2) a surety bond that the town could investigate/approve. Language should be consistent with language currently under review/development by Town Counsel.]

The bond requirement under this ordinance may be waived by the Responsible Authority provided that a bond is required by another agency in the amount equal to or greater than the total estimated construction cost of the stormwater management facilities for the project.

#### 8.0 INSPECTION

#### 8.1 Inspection Schedule and Reports

- A. The developer shall notify the Responsible Official at least 48 hours before commencing any work in conjunction with the stormwater management plan and upon completion of the project when a final inspection will be conducted.
- B. The developer shall retain a professional engineer licensed in the State to conduct inspections. Written inspection reports shall be made of the periodic inspections necessary during construction of stormwater management systems to ensure compliance with the approved plans.
- C. Written inspection reports shall be provided by the developer's engineer to the Responsible Authority on a standard form provided by the Town.
- D. The owner/developer and on-site personnel shall be notified in writing when violations are observed. Written notification shall describe the nature of the violation and the required corrective action.
- E. No work shall proceed until the Responsible Authority approves the work previously completed. The inspector shall provide the developer and Responsible Authority with the results of the inspection reports as soon as possible after completion of each required inspection.

#### 8.2 Inspection Requirements During Construction

- A. At a minimum, inspections shall be made and documented at the following specified stages of construction:
  - (1) For stormwater ponds:
    - (a) Upon completion of excavation to sub-foundation and when required, installation of structural supports or reinforcement for structures, including but not limited to:

- (i) Core trenches for structural embankments
- (ii) Inlet and outlet structures, anti-seep collars or diaphragms, and watertight connectors on pipes; and
- (iii) Trenches for enclosed storm drainage facilities;
- (b) During placement of structural fill, concrete, and installation of piping and catch basins;
- (c) During backfill of foundations and trenches;
- (d) During embankment construction; and
- (e) Upon completion of final grading and establishment of permanent stabilization.
- (2) For stormwater wetlands at the stages specified for pond construction in 8.2 A (1) of this section, during and after wetland reservoir area planting, and during the second growing season to verify a vegetation survival rate of at least 50 percent.
- (3) For infiltration trenches:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems and observation wells;
  - (c) During placement of geotextiles and all filter media;
  - (d) During construction of appurtenant conveyance systems such as diversion structures, pre-filters and filters, inlets, outlets, and flow distribution structures; and
  - (e) Upon completion of final grading and establishment of permanent stabilization;
- (4) For infiltration basins at the stages specified for pond construction in 8.2 A (1) of this section and during placement and backfill of underdrain systems.
- (5) For filtering systems:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems;
  - (c) During placement of geotextiles and all filter media;
  - (d) During construction of appurtenant conveyance systems such as flow diversion structures, pre-filters and filters, inlets, outlets, orifices, and flow distribution structures; and
  - (e) Upon completion of final grading and establishment of permanent stabilization.
- (6) For open channel systems:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems for dry swales;
  - (c) During installation of diaphragms, check dams, or weirs; and
  - (d) Upon completion of final grading and establishment of permanent stabilization.
- (7) For nonstructural practices upon completion of final grading, the establishment of permanent stabilization, and before issuance of use and occupancy approval.
- (8) For secondary treatment practices, including subsurface manufactured devices:

- (a) During excavation to subgrade;
- (b) During placement and backfill of treatment unit;
- (c) During construction of appurtenant conveyance systems such as diversion structures, pre-filters and filters, inlets, outlets, and flow distribution structures; and
- (e) Upon completion of final grading and establishment of permanent stabilization;
- B. The Responsible Authority may, for enforcement purposes, use any one or a combination of the following actions:
  - (1) A notice of violation shall be issued specifying the need for a violation to be corrected if the stormwater management plan noncompliance is identified;
  - (2) A stop work order shall be issued for the site by the Responsible Authority if a violation persists;
  - (3) Bonds or securities may be withheld or the case may be referred for legal action if reasonable efforts to correct the violation have not been undertaken; or
  - (4) In addition to any other sanctions, a civil action or criminal prosecution may be brought against any person in violation of the Stormwater Management subtitle or this ordinance.
- C. Any step in the enforcement process may be taken at any time, depending on the severity of the violation.
- D. Once construction is complete, as-built plan certification shall be submitted by a professional engineer licensed in the State to ensure that constructed stormwater management practices and conveyance systems comply with the specifications contained in the approved plans. At a minimum, as-built certification shall include a set of drawings comparing the approved stormwater management plan with what was constructed the Responsible Authority may require additional information.

#### 9.0 MAINTENANCE

#### 9.1 Maintenance Inspection

- A. The owner (or the developer during construction) shall ensure that all stormwater management systems are inspected for performance of preventative maintenance. Inspection shall occur during the first year of operation and at least once every 3 years thereafter. In addition, a maintenance agreement between the owner and the Responsible Authority shall be executed for privately owned stormwater management systems as described in 9.2 of this section.
- B. The owner (or the developer during construction) shall maintain inspection reports for all stormwater management systems.
- C. Inspection reports for stormwater management systems shall include the following:
  - (1) The date of inspection;
  - (2) Name of inspector;
  - (3) The condition of:
    - (a) Vegetation or filter media;
    - (b) Fences or other safety devices;

- (c) Spillways, valves, or other control structures;
- (d) Embankments, slopes, and safety benches;
- (e) Reservoir or treatment areas;
- (f) Inlet and outlet channels or structures;
- (g) Underground drainage;
- (h) Sediment and debris accumulation in storage and forebay areas;
- (i) Any nonstructural practices to the extent practicable; and
- (j) Any other item that could affect the proper function of the stormwater management system.
- (4) Description of needed maintenance.
- D. After notification is provided to the owner of any deficiencies discovered from an inspection of a stormwater management system, the owner shall have 30 days or other time frame mutually agreed to between the Responsible Authority and the owner to correct the deficiencies. The Responsible Authority shall then conduct a subsequent inspection to ensure completion of the repairs.
- E. If repairs are not undertaken or are not done properly, then enforcement procedures following 9.2 C of this section shall be followed by the Responsible Authority
- F. If, after an inspection by the Responsible Authority, the condition of a stormwater management facility presents an immediate danger to the public health or safety, because of an unsafe condition or improper maintenance, the Responsible Authority shall take such action as may be necessary to protect the public and make the facility safe. Any cost incurred by (City Name) shall be assessed against the owner(s), as provided in Section 9.2 C.

## 9.2 Maintenance Agreement

- A. Prior to the issuance of any building permit for which stormwater management is required, the Responsible Authority shall require the applicant or owner to execute an inspection and maintenance agreement binding on all subsequent owners of land served by a private stormwater management facility. Such agreement shall provide for access to the facility at reasonable times for regular inspections by the Responsible Authority or its authorized representative to ensure that the facility is maintained in proper working condition to meet design standards.
- B. The applicant and/or owner shall record the agreement in the land records of (City Name).
- C. The agreement shall also provide that, if after notice by the Responsible Authority to correct a violation requiring maintenance work, satisfactory corrections are not made by the owner(s) within a reasonable period of time (30 days maximum), the Responsible Authority may perform all necessary work to place the facility in proper working condition. The owner(s) of the facility shall be assessed the cost of the work and any penalties. This may be accomplished by placing a lien on the property, which may be placed on the tax bill and collected as ordinary taxes by the County/Municipality.

#### 9.3 Maintenance Responsibility

A. The owner of the property on which work has been done pursuant to this ordinance for private stormwater management facilities, or any other person or agent in control of such property, shall maintain in good condition and promptly repair and restore all grade surfaces, walls, drains, dams and structures, vegetation, erosion and sediment control measures, and other protective devices. Such repairs or restoration and maintenance shall be in accordance with approved plans.

B. A maintenance schedule shall be developed for the life of any stormwater management facility and shall state the maintenance to be completed, the time period for completion, and who shall perform the maintenance. This maintenance schedule shall be printed on the approved stormwater management plan.

#### 10.0 APPEALS

Any person aggrieved by the action of any official charged with the enforcement of this ordinance, as the result of the disapproval of a properly filed application for a permit, issuance of a written notice of violation, or an alleged failure to properly enforce this ordinance in regard to a specific application, shall have the right to appeal in a manner prescribed in the regulations and procedures of the Responsible Authority and the State of Connecticut.

#### 11.0 SEVERABILITY

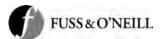
If a court of competent jurisdiction holds any portion of this ordinance invalid or unconstitutional, such portion shall not affect the validity of the remaining portions of this ordinance. It is the intent of (City Name) that this ordinance shall stand, even if a section, subsection, sentence, clause, phrase, or portion may be found invalid.

#### 12.0 PENALTIES

Any person convicted of violating the provisions of this ordinance shall be guilty of a misdemeanor, and upon conviction thereof, shall be subject to a fine of not more than Five Thousand Dollars (\$5,000.00) or imprisonment not exceeding 1 year or both for each violation with costs imposed in the discretion of the court. Each day that a violation continues shall be a separate offense. In addition, the Responsible Authority may institute or cause to be instituted injunctive, mandamus or other appropriate action or proceedings of law to correct violations of this ordinance. Any court of competent jurisdiction shall have the right to issue temporary or permanent restraining orders, injunctions or mandamus, or other appropriate forms of relief.

#### 13.0 EFFECTIVE DATE

And be it further enacted, that this ordinance shall take effect [number] days from the date it becomes adopted.



## ATTACHMENT B

Tolland Zoning Regulation Amendments Low Impact Development

## ARTICLE XXIV LOW IMPACT DEVELOPMENT

The Town of Tolland requires that Low Impact Development techniques be implemented on all development projects within the boundaries of the Town to protect high quality wetlands, watercourses, open water bodies and other sensitive areas from the impacts of point and non-point sources of storm water due to land development projects.

The concept of Low Impact Development (LID) utilizes many tools to reduce the impact of development on the environment. A primary benefit of LID is a better balance between Conservation of Natural Resources, growth, ecosystem protection and the public health.

#### A. Goals of Low Impact Development

- Preserve Open Space within developments by using Cluster and Open Space subdivision standards as found in Section 170-38 of these regulations.
- Incorporate natural site elements (ridge lines, significant trees, open meadows, suitable soils for infiltration, wetlands and streams) into the design as features.
- Minimize land clearing and disturbance and increase natural landscape buffers at the limit of development to improve storm water management.
- Incorporate decentralized storm water management systems in to the site design, treat storm water runoff at its source, disconnect impervious areas.
- Maintain pre-development Times of Concentrations for post-development runoff Maintain sheet flow to the maximum extent possible, avoid concentrating runoff, reduce runoff volumes by infiltration.
- Provide water quality treatment to remove pollutants from storm water, pollution, modify human activities to reduce the introduction of pollutants into the environment.
- Encourage public education and participation in environmental protection within the community

#### B. Benefits of Low Impact Development

There are many benefits associated with the use of Low Impact Development for all of the stakeholders in the development field. The three stakeholders in the development field are the environment, the municipality, and the developer. The benefits of LID for each stakeholder are stated below.

#### 1. Environmental Benefits:

- Preserve the biological and ecological integrity of natural systems through the preservation of trees and natural vegetation,
- Protect the water quality by reducing sediment, nutrient and toxic loads to wetland/watercourse aquatic environments and also terrestrial plants and animals.

#### 2. Municipality Benefits:

- Increase collaborative public/private partnerships on environmental protection by the protection of regional flora and fauna.
- Balance Growth needs with environmental protections.
- Reduce municipal infrastructure and utility maintenance costs (roads, and storm water drainage systems)

#### 3. Developer Benefits:

- Reduce land clearing and earth disturbance costs, reduce infrastructure costs (roads, storm water conveyance and treatment systems)
- Reduce storm water management costs by the reduction of structural components of a drainage system.
- Increase quality of building lots and community marketability.

## C. Low Impact Development Strategies

- 1. Vegetation and Soils:
  - Retain native forest cover on undeveloped sites, restore vegetated area on previously cleared sites when possible as vegetation captures rainfall, thus increasing evapotranspiration and infiltration.

#### 2. Site Design:

- Define and locate Critical Resource areas, such as wetlands/watercourses, unusual forest features, and soils with moderate to high infiltrative capacities, locate roads, driveways, parking areas, home sites and other buildings away from critical resource areas
- Minimize impervious surfaces such as roads, driveways, parking areas, and roof tops. Eliminate direct discharges of runoff from impervious areas to wetlands and watercourses

#### 3. Storm Water Management:

- Reduce reliance on the use of traditional storm water collection and conveyance systems (catch basins, pipes, and detention basins) and use small scale storm water management systems, such as bioretention, and rain gardens. Integrate source storm water controls during the design process.
- Create a site design that slows runoff from rainfall events and increases the amount of time that runoff stays on the site. Incorporate multiple Low Impact Development treatment systems in a treatment train to increase the redundancy of the system to reduce the possibility of system failure

#### 4. Education and Maintenance

 Develop reliable long-term maintenance protocols for LID systems with built in enforcement provisions.  Educate homeowners, building owners and landscape contractors on the appropriate maintenance requirements for LID systems

## D. Types of LID Storm Water Systems:

- 1. Vegetated Systems:
  - Vegetated Buffers, Rain Gardens, Bioretention Systems, Water Quality Swales (wet and dry), Grass Filter Strips, Vegetated Level Spreaders, and Vegetated Roofs
- 2. Infiltration Systems:
  - Soil Amendments, Surface Sand Filters, Underground Sand Filters, Gravel Infiltration Trenches, Underground Infiltration Systems, (large diameter perforated PVC pipes and galleries), and Tree Wells
- 3. Surface Treatment Systems:
  - Permeable Pavement, Permeable Concrete, Concrete or PVC Pavers with gravel or grass surface
- 4. Storm Water Ponds and Wetland Systems:
  - Wet Ponds, Multiple Ponds in series, Gravel Wetland Systems, Micropool extended detention pond, Shallow Wetlands, Pond/wetland system, and Extended detention ponds

Refer to Town of Tolland Design Manual for more information on individual systems.

#### References:

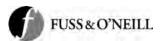
- 1. Low-Impact Development Design Strategies An Integrated Design Approach
  Prepared by: Prince George's County, Maryland; Department of Environmental
  Resources, Programs and Planning Division; June 1999
- 2. Low-Impact Development Hydrologic Analysis

Prepared by: Prince George's County, Maryland; Department of Environmental Resources, Programs and Planning Division; July 1999

3. LOW IMPACT DEVELOPMENT – Technical Guidance Manual for Puget Sound; January 2005

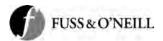
Prepared by Puget Sound Action Team * Washington State University Pierce County Extension

- 4. 2004 Connecticut Stormwater Quality Manual by the Connecticut Department of Environmental Protection
- 5. 2002 Connecticut Guidelines for Soil Erosion and Sediment Control by The Connecticut Council on Soil and Water Conservation in Cooperation with the Connecticut Department of Environmental Protection



## ATTACHMENT C

Example LID Site Design Credit System



# LOW IMPACT DEVELOPMENT (LID) SITE DESIGN CREDIT SYSTEM

#### DRAFT

The Low Impact Development (LID) Site Design Credits encourage environmentally sensitive site design and Low Impact Development techniques for managing stormwater that minimize impervious surfaces and preserve natural hydrologic conditions. The credits allow project proponents to reduce or eliminate the structural stormwater BMPs otherwise required to meet Standards 3 and 4 by directing stormwater runoff to qualifying pervious surfaces that provide recharge and treatment.

## Available LID Site Design Credits

There are five types of LID credits that can be obtained:

- Credit 1 Natural Area Conservation,
- Credit 2 Environmentally Sensitive Development,
- Credit 3 Rooftop Runoff Directed to Qualifying Pervious Area,
- Credit 4 Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area,
- Credit 5 Sheet Flow to Buffer.

The credits may be used to reduce the required Groundwater Recharge Volume (GRV) and the required Water Quality Volume (WQV) provided that any pervious surfaces used to treat and infiltrate stormwater runoff meet the requirements set forth herein. A proponent of a project that is eligible for the site design credit is required to comply with all other applicable stormwater management standards. The application of these credits does not relieve the design engineer or reviewer from the standard of engineering practice associated with safe conveyance of stormwater runoff and good drainage design.

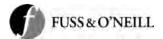
## Not Eligible for Credits

The LID Site Design Credits may <u>not</u> be applied to reduce the required Groundwater Recharge Volume and the required Water Quality Volume:

- At sites where stormwater runoff is directed to non-permeable soils, such as bedrock and soils classified as Hydrologic Soil Group D; and
- At sites with urban fill, soils classified as contaminated pursuant to the Connecticut Remediation Standards Regulations, and soils with seasonal high groundwater groundwater elevation within 2 feet of the land surface.

Sites with land uses with higher potential pollutant loads are not eligible for Credit No. 2.

Sites with land uses with higher potential pollutant loads are eligible for Credits 3 and 4, provided that no runoff from the areas or activities that may generate runoff with higher potential pollutant loads is directed to the pervious surfaces used to satisfy the credit, and provided further that the proposal satisfies all the other requirements set forth herein.



Runoff from metal roofs is only eligible for Credit 3 when the metal roof is located outside a recharge areas for public water supplies (groundwater and surface water supplies) and the building is not used for industrial purposes.

Runoff from green roofs is not eligible for Credit 3.

#### 1. Natural Area Conservation Credit

A credit is given when natural areas are conserved at development sites, thereby preserving predevelopment hydrologic and water quality characteristics. A simple WQV credit is granted for all conservation areas permanently protected under conservation easements. Under this credit, the design engineer can substract the conservation areas from the total site area when computing the water quality volume. The volumetric runoff coefficient, R, is still based upon the percent impervious cover for the entire site. As an additional incentive, the post-development curve number (CN) for all natural areas permanently protected can be assumed to be woods in good condition when calculating the total site CN.

## Minimum Criteria for Credit:

- The area shall not be disturbed during the construction process.
- The area shall be protected from having the limits of disturbance clearly shown on all construction and mitigation plans and shall be delineated in the field.
- The area shall be located within an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.
- The area shall be located on the development project site.

## 2. Environmentally Sensitive Development Credit

This credit is given for environmentally sensitive site design techniques that "cluster development" or reduce development scale, to leave a significant amount of the site undisturbed in its natural state. If a site is designed, constructed, operated and maintained in accordance with the requirements of this credit, the credit eliminates the need for structural practices to treat the WQV (Standard 4) and GRV (Standard 5) for low density or cluster residential developments.

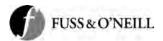
#### Minimum Criteria for Credit:

#### Single Lot Development

- Total site impervious cover is less than 15%.
- Lot size shall be at least 1 acre.
- Rooftop runoff is disconnected in accordance with the criteria listed in Credit 3 and qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems in accordance with the criteria listed in Credit 4.

#### Multiple Lot Development

- Total site impervious cover is less than 15%.
- Lot size shall be at least 1 acre if clustering techniques are not used.



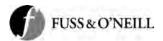
- If clustering techniques are used, the average lot shall not be less than _____ square feet, which is the minimum residential lot size as identified in the Town of _____ Building Zone Regulations.
- Rooftop runoff is disconnected in accordance with the criteria listed in Credit 3 and qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems in accordance with the criteria listed in Credit 4.
- A minimum of 25% of the site is placed in a natural conservation area maintained by an
  acceptable conservation easement or other enforceable instrument that provides
  perpetual protection of the area.

## 3. Rooftop Runoff Directed to Qualifying Pervious Area Credit

This credit is available when rooftop runoff is directed to a qualifying pervious area where it can either infiltrate into the soil or flow over it with sufficient time and reduced velocity to allow for filtering. Qualifying pervious areas are relatively flat locations, where the discharge is directed via sheet flow and not as a point source discharge. The credit may be obtained by grading the site to induce sheet flow over specially designed flat vegetated areas or bioretention areas that can treat and infiltrate rooftop runoff. If rooftop runoff is adequately directed to a qualifying pervious area, the rooftop area can be deducted from total impervious area, therefore reducing the required WQV and the size of the structural treatment practices.

#### Minimum Criteria for Credit:

- To take credit for rooftop disconnection associated with a land use with higher potential
  pollutant loads, the rooftop runoff must not commingle with runoff from any paved
  surfaces or activities or areas on the site that may generate higher pollutant loads.
- Disconnection shall cause no basement seepage.
- The contributing area of the rooftop to each disconnected discharge point (gutter pipe) shall not exceed 1,000 square feet.
- The length of the qualifying pervious area shall be 75 feet or greater.
- The width of the qualifying pervious area (in feet) shall be equal to or greater than the roof length. For example, if a roof section is 20 feet wide by 50 feet long (1,000 ft2 roof), the width of the qualifying pervious area shall be at least 50 feet.
- Dry wells, rain gardens, or other filtration/infiltration treatment practices may be utilized to compensate if the disconnection length is less than 75 feet.
- Although they may abut, there shall be no overlap between qualifying pervious areas. For example, the runoff from two 1,000 square foot sections of roof must be directed to separate qualifying pervious areas. They may not be directed to the same area.
- The lot must be greater than _____ square feet.
- The slope of the qualifying pervious area shall be less than or equal to 5%.
- Where provided, downspouts must be at least 10 feet away from the nearest impervious surface to discourage reconnection to the stormwater management system.
- Where a gutter/downspout system is not used, the rooftop runoff must be designed to sheet flow at low velocity away from the structure housing the roof.
- Qualifying pervious areas should be located on relatively permeable soils (HSG "A" and "B"). A soil evaluation by a Registered Professional Engineer or soil scientist is required to confirm the soil type. The soil evaluation shall also confirm that the depth to groundwater is 2 feet or more and that the long-term saturated hydraulic conductivity of



the soil is at least 0.17 inches/hour. The soil evaluation must identify the soil texture, Hydrologic Soil Group and depth to groundwater. For saturated hydraulic conductivity, use Rawls Rates for the actual location where the qualifying pervious area is located.

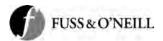
- If a qualifying pervious area is located in less permeable soils (HSG "C"), the water table depth and permeability shall be evaluated by a Registered Professional Engineer to determine if a spreading device is needed to sheet flow stormwater over vegetated surfaces.
- To prevent compaction of the soil in the qualifying pervious area, construction vehicles
  must not be allowed to drive over the area. If it becomes compacted, the soil must be
  amended, tilled and revegetated to restore its infiltrative capacity once construction is
  complete.
- The qualifying pervious area may not include any wetland areas.
- The qualifying pervious area must be owned or controlled (e.g., drainage easement) by the property owner.
- For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be taken, not both.
- 4. Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area Credit

Credit is given for practices that direct runoff from impervious roads, driveways, and parking lots to pervious areas where plants provide filtration (through sheet flow) and infiltration into the soil can occur. This credit can be obtained by grading the site to promote overland vegetative filtering and infiltration. This credit is available for paved driveways, roads, and parking lots associated with all land uses, except for high-intensity parking lots that generate 1,000 or more vehicle trips per day or runoff not segregated from land uses with higher potential pollutant loads.

Disconnected impervious areas can be subtracted from the site impervious area when computing the WQV. In addition, disconnected impervious surfaces can be used to reduce the GRV.

## Minimum Criteria for Credit:

- The maximum contributing impervious flow path length shall be 75 feet.
- The length of the qualifying pervious area must be equal to or greater than the length of the contributing impervious area.
- Dry wells, rain gardens, or other filtration/infiltration treatment practices may be utilized to compensate if the site cannot meet the required length of the qualifying pervious area.
- The width of the qualifying pervious area shall be no less than the width of the contributing impervious surface. For example, if a driveway is 15 feet wide, the qualifying pervious area width shall be no less than 15 feet.
- The entire qualifying pervious area shall be on a slope less than or equal to 5%.
- The impervious area draining to any one discharge location cannot exceed 1,000 square feet.
- Qualifying pervious areas should be located on relatively permeable soils (HSGs A and B). A soil evaluation is required to confirm the soil type. The soil evaluation shall also



confirm that the depth to groundwater is 2 feet or more, and that the long term saturated hydraulic conductivity of the soil is at least 0.17 inches/hour. For saturated hydraulic conductivity, use Rawls Rates for the actual location where the qualifying pervious area is located.

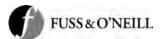
- If a qualifying pervious area is located in less permeable soils (HSG C), the water table depth and permeability shall be evaluated by a Registered Professional Engineer to determine if a spreading device is needed to sheet flow stormwater over vegetated surfaces.
- To prevent compaction, construction vehicles must not be allowed to drive over the qualifying pervious area. If compacted, the soil must be amended, tilled, and revegetated once construction is complete to restore its infiltrative capacity.
- Runoff from driveways, roadways and parking lots may be directed over soft shoulders, through curb cuts, or level spreaders to qualifying pervious areas. Measures must be employed at the discharge point to the qualifying pervious area to prevent erosion and promote sheet flow.
- The qualifying pervious area may not include any wetland areas.
- The qualifying pervious area must be owned or controlled (e.g., drainage easement) by the property owner.
- For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be taken, not both.

#### 5. Sheet Flow to Buffer Credit

This credit is given when stormwater is effectively treated by a natural buffer to a stream or forested area. Effective treatment is achieved when pervious and impervious area runoff is discharged to a grass or forested buffer via overland flow. The use of a filter strip is recommended to treat overland flow in the green space of a development site. This credit includes subtracting the area draining by sheet flow to a buffer from the total area in the WQV calculation and the area draining to the buffer contributes to the GRV requirement.

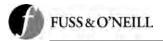
#### Minimum Criteria for Credit:

- The minimum stream buffer width (i.e., perpendicular to the stream flow path) shall be 50 feet as measured from the bank elevation of a stream or the boundary of a wetland.
- The maximum contributing path shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces.
- The average contributing overland slope to and across the stream buffer shall be less than or equal to 5%.
- Runoff shall enter the stream buffer as sheet flow. A level spreading device shall be utilized where local site conditions prevent sheet flow from being maintained.
- The credit is not applicable if rooftop or non-rooftop disconnection is already provided (i.e., no double counting).
- Stream buffers shall remain unmanaged other than routine debris removal.
- Buffers shall be protected by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.



## ATTACHMENT D

**Example Stormwater Management Standards** 



#### STORMWATER MANAGEMENT STANDARDS

#### DRAFT

The following stormwater standards establish minimum stormwater management criteria for all
development and redevelopment activities in the Town of and reflect the unique
natural resources and development characteristics of the Town of These standards
encourage groundwater recharge and reduce the potential for stormwater discharges to cause or
contribute to pollution of surface water and groundwater. The standards also promote low
impact development (LID) techniques, the removal of illicit discharges to stormwater
management systems, and improved operation and maintenance of stormwater BMPs. The
standards are also consistent with the recommended stormwater management approaches and
design guidance contained in the Connecticut Department of Environmental Protection
Connecticut Stormwater Quality Manual.

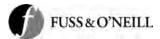
## Standard 1: Stormwater Management Practices

Stormwater Management Practices shall be used to meet the conditions below for control of peak flow and total volume of runoff, water quality protection, and maintenance of on-site groundwater recharge.

- A. Stormwater management practices shall be selected to accommodate the unique hydrologic and geologic conditions of the site.
- B. Proponents shall demonstrate how the proposed control(s) will comply with these standards, including the control of peak flow and total volume of runoff, protection of water quality, and recharge of stormwater to groundwater. The proponent must provide design calculations and other back-up materials necessary.
- C. At the discretion of the Stormwater Authority, stormwater management systems shall incorporate designs that allow for shutdown and containment in the event of an emergency spill or other unexpected contamination event.
- D. Pumping of stormwater is prohibited as part of a proposed stormwater management system design because of the significant runoff volumes, maintenance requirements, standby power requirements, and overflows associated with large storms. All other feasible approaches must be investigated to avoid the use of pumps for stormwater management. If the event the Stormwater Authority determines that pumps are necessary, the proponent must submit required backup information as described in the ______ Stormwater Drainage Manual.

#### Standard 2: Low Impact Development

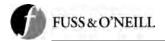
A. Project proponents must consider the use of environmentally-sensitive site design and Low Impact Development (LID) techniques to reduce runoff rates, volumes, and pollutant loads. The proponent shall demonstrate why the use of environmentally-sensitive site design and LID techniques is not possible before proposing to use traditional, structural stormwater management measures. Such environmentally-sensitive site design and LID techniques include, but are not limited to:



- Identify, map, and preserve the site's natural features and environmentally sensitive areas such as wetlands, native vegetation, mature trees, slopes, drainageways, permeable soils, flood plains, woodlands and soils to the greatest extent possible;
- b. Minimize grading and clearing;
- c. Delineate potential building envelopes, avoiding environmental resource areas and appropriate buffers by clustering buildings and reducing building footprints;
- d. Develop methods to minimize impervious surfaces, and protect and preserve open space. Reduce impervious surfaces wherever possible through alternative street design, such as omission of curbs and use of narrower streets, shared driveways and through the use of shared parking areas;
- e. Lengthen flow paths and maximize sheet flow;
- f. Use nonstructural, low-tech methods including open drainage systems, disconnection of roof runoff, and street sweeping where possible;
- g. Use native plant vegetation in buffer strips and in rain gardens (small planted depressions that can trap and filter runoff);
- h. Use drought-resistant vegetation;
- i. Manage runoff using smaller, decentralized, low-tech stormwater management techniques to treat and recharge stormwater close to the source in place of a centralized system comprised of closed pipes that direct all the drainage from the entire site into one large detention basin.
- j. Integrate management techniques into the site design to create a hydrologically functional lot or development site, including but not limited to grass swales along roads, rain gardens, buffer strips, green roofs, tree box filters, use of amended soils that will store, filter and infiltrate runoff, bioretention areas (rain gardens), rain barrels and cisterns, and permeable pavement.

[NOTE: An "LID Site Design Credit" is available to encourage proponents to incorporate LID techniques in their projects. In exchange for directing runoff from roads and driveways to vegetated open areas, preserving natural areas on development sites, or directing runoff to landscaped or undisturbed areas, the LID credit system allows developers to reduce in size or eliminate the traditional BMPs used to treat and infiltrate stormwater. By using this credit, proponents can reduce the volume of stormwater subject to the Water Quality and Groundwater Recharge Standards. The proposed LID Site Design Credits include:

- Credit 1 Natural Area Conservation
- Credit 2 Environmentally Sensitive Development
- Credit 3 Rooftop Runoff Directed to Qualifying Pervious Area
- Credit 4 Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Areal



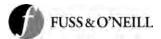
## Standard 3: Protection of Natural Hydrology

## [NOTE: These standards are further reinforced through the LID Credit System.]

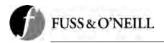
- A. Site disturbance shall be minimized. The area outside the project disturbance area shall be maintained at natural grade and retaining existing, mature vegetated cover. The project disturbance area shall be depicted on the design, construction, and mitigation plans and shall be delineated in the field prior to commencing land disturbance activities. The project disturbance area shall include only the area necessary to reasonably accommodate construction activities.
- B. Soil compaction on site shall be minimized by using the smallest (lightest) equipment possible and minimizing travel over areas that will be revegetated (e.g., lawn areas) or used to infiltrate stormwater (e.g., bioretention areas). In no case shall excavation equipment be placed in the bottom of an infiltration area during construction.
- C. Development shall follow the natural contours of the landscape. A grading plan shall be submitted as part of the site plan review process showing both existing and finished grades for the proposed development. The original, natural grade of a lot shall not be raised or lowered more than 10 feet at any point for the construction of any structure or improvements. Retaining walls must comply with the requirements of the Building Zone Regulations. Basements that reach grade should be constructed as walk-outs.
- D. No ground disturbed as a result of site construction and development shall be left as exposed bare soil at project completion. All areas exposed by construction, with the exception of finished building, structure, and pavement footprints, shall be decompacted (aerated) and covered with a minimum thickness of six inches of non-compacted topsoil, and shall be subsequently planted with a combination of living vegetation such as grass, groundcovers, trees, and shrubs, and other landscaping materials (mulch, loose rock, gravel, stone).
- E. Priority shall be given to maintaining existing surface waters and systems, including, but not limited to, perennial and intermittent streams, wetlands, vernal pools, and natural swales.
- F. Where roadway or driveway crossings of surface waters cannot be eliminated, disturbance to the surface water shall be minimized, hydrologic flows shall be maintained, there shall be no direct discharge of runoff from the roadway to the surface water, and the area shall be revegetated post-construction.
- G. Roadway and driveway crossings over streams shall comply with the Connecticut Department of Environmental Protection *Stream Crossing Guidelines* (as amended) to accommodate high flows, minimize erosion, and support aquatic habitat and wildlife passage.

## Standard 4: Post-Development Peak Discharge

A. Stream Channel Protection — The two-year, 24-hour post-development peak flow rate shall be (a) less than or equal to 50 percent of two-year, 24-hour storm pre-development



- peak flow rate and (b) less than or equal to the one-year, 24-hour storm predevelopment peak flow rate. This Standard may be waived under certain conditions, as described in the *Connecticut Stormwater Quality Manual*.
- B. Conveyance Protection —The 10-year, 24-hour post-development peak flow rate shall not exceed the pre-development peak flow rate for all flows within internal and external conveyance systems associated with stormwater treatment practices.
- C. Peak Runoff Attenuation The 10-year and 25-year, 24-hour post-development peak flow rate shall not exceed the pre-development peak flow rate for all flows off-site. This Standard may be waived for sites that discharge to a large river, lake, estuary, tidal waters, or land subject to coastal storm flows, as described in the *Connecticut Stormwater Quality Manual*.
- D. Emergency Outlet Sizing size the emergency outlet to safely pass the postdevelopment peak runoff from the 100-year storm in a controlled manner without eroding the outlet works and downstream drainages and property.
- E. Measurement of peak discharge rates shall be calculated using point of discharge or the downgradient property boundary. The topography of the site may require evaluation at more than one location if flow leaves the property in more than one direction. Calculations shall include runoff from adjacent upgradient properties. A proponent may demonstrate that a feature beyond the property boundary is more appropriate as a design point.
- F. A downstream hydrologic analysis must be performed to determine whether peak flows, velocities, and hydraulic effects are attenuated by controlling the 2-year, 10-year, 25-year and 100-year, 24-hour storms. This analysis must be performed at the outlet(s) of the site and at critical downstream locations (stream confluences, culverts, other channel constrictions, and flood-prone areas) to a confluence point where the site drainage area represents 10% of the total drainage area above that point.
- G. The proponent shall provide pre- and post-development total runoff volumes. The post-development total runoff volume shall be equal to 90 to 110 percent of the pre-development total runoff volume (based on a 2-year, 10-year, 25-year, and 50-year, 24-hour storms). Calculations shall include runoff onto the project site from adjacent upgradient properties.



#### Standard 5: Water Quality

- A. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspend Solids (TSS). This standard is met when:
  - a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained:
  - b. Stormwater management practices are sized to treat the Water Quality Volume or Water Quality Flow;
  - c. Appropriate pretreatment is provided in accordance with the _______
    Stormwater Drainage Manual; and
  - d. Stormwater treatment practices are maintained as designed.
- B. Compliance with the groundwater recharge requirements under Standard 6 shall be considered adequate to meet the treatment standards specified in 5.A above for the Groundwater Recharge Volume.

#### Standard 6: Groundwater Recharge

Loss of annual recharge to groundwater shall be eliminated or minimized to the maximum extent practicable through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater management practices, and good operation and maintenance. At a minimum the annual recharge from the post-development site shall approximate the annual recharge from the pre-development or existing site conditions. Infiltration of stormwater runoff from land uses with higher potential pollutant loads near or to a critical area is prohibited. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to a critical area, taking into account site-specific factors.

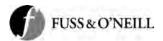
A. For all areas covered by impervious surfaces, the total volume of recharge that must be maintained shall be calculated as follows:

[NOTE: The NRCS classifies soils into four hydrologic groups A thru D indicative of the minimum infiltration obtained for a soil after prolonged wetting. Group A soils have the lowest runoff potential and the highest infiltration rates, while Group D soils have the highest runoff potential and the lowest infiltration rates. The prescribed stormwater volume that is required to be infiltrated must be determined using existing site conditions and the infiltration rates set forth below.

## Hydrologic Group Volume to Recharge (x Total Impervious Area)

<u>H</u>	<u>ydrologic Group</u> <u>V</u>	olume to Recharge x Total Impervious Area
A	gravels, sand, loamy sand or sandy loam	0.6 inches of runoff
В	silty loam	0.35 inches of runoff
C	sandy clay loam	0.25 inches of runoff
D	clay, silty clay loam, sandy clay, silty clay	0.10 inches of runoff

For each NRCS Hydrologic Group on the site, the volume that must be recharged equals the recharge volume above multiplied by the total area within that NRCS Hydrologic Group



that is impervious. Infiltration of these volumes must be accomplished using appropriate BMPs. These BMPs include bioretention areas, rain gardens, dry wells, infiltration basins, infiltration chambers and galleys, infiltration trenches, leaching catch basins, and vegetated filter strips. Roof runoff may be infiltrated without any treatment, and that infiltrated volume may be used to satisfy the total recharge volume and reduce the water quality volume.

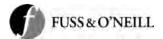
To size infiltration BMPs, proponents may use either the static method or the dynamic infiltration method. The static method assumes that the entire volume is discharged to storage instantaneously, is easy to calculate and generally results in a larger recharge volume than the dynamic method. The dynamic method assumes that that the recharge BMP is infiltrating as it fills and requires certain technical calculations that take this recharge into account when sizing the infiltration BMP.]

- B. When designing infiltration BMPs, adequate subsurface information needs to be obtained. Infiltration systems must be installed in soils capable of absorbing the recharge volume (i.e. not D soils). Surface infiltration structures must be able to drain fully within 72 hours. In addition, there must be at least a three-foot separation from the bottom of the infiltration structure and the seasonal high ground water table or bedrock/ledge. Soils under BMPs shall be scarified or tilled to improve infiltration.
- C. Pre-Treatment Requirements All runoff must be pretreated prior to its entrance into the groundwater recharge device to remove materials that would clog the soils receiving the recharge water. Pretreatment devices shall be provided for each BMP, shall be designed to accommodate a minimum of one-year's worth of sediment, shall be designed to capture anticipated pollutants, and be designed and located to be easily accessible to facilitate inspection and maintenance.
- D. Infiltration of stormwater may be prohibited or subject to additional pre-treatment requirements, at the discretion of the Stormwater Authority, for 1) land uses with higher potential pollutant loads (see Standard 7), 2) areas with soil or groundwater contamination such as brownfield sites, and 3) public drinking water aquifer recharge areas, wellhead protection areas, or water supply intake protection areas.

## Standard 7: Land Uses with Higher Potential Pollutant Loads

Stormwater discharges from land uses with higher potential pollutant loads require the use of specific source control and pollution prevention measures and specific stormwater management practices, approved by the Stormwater Authority for such use.

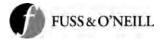
- A. The following uses or activities are considered "high-load areas," with the potential to contribute higher pollutant loads to stormwater, and must comply with the requirements set forth in this section.
  - a. Areas within an industrial site that are the location of activities subject to the DEP Industrial Stormwater General Permit (except where a No Exposure Certification for Exclusion from the General Permit has been executed)
  - b. Vehicle salvage yards and recycling facilities
  - c. Auto fueling facilities (gas stations and other facilities with on-site vehicle fueling)



- d. Exterior fleet storage areas (cars, buses, trucks, public works equipment)
- e. Exterior vehicle service, maintenance and equipment cleaning areas
- f. Commercial parking lots with high intensity use (1,000 vehicle trips per day or more). Such areas typically include fast food restaurants, convenience stores, high turnover (chain) restaurants, shopping centers and supermarkets.
- g. Road salt storage facilities (if exposed to rainfall)
- h. Commercial nurseries
- i. Non-residential facilities having uncoated metal roofs with a slope flatter than 20 percent.
- j. Outdoor storage and loading/unloading of hazardous substances or materials
- k. Facilities subject to chemical inventory reporting under Section 312 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), if materials or containers are exposed to rainfall)
- I. Marinas (service, painting and hull maintenance areas).
- m. Confined disposal facilities, disposal sites, landfills or wastewater residuals landfills if stormwater that may come into contact with the confined disposal area, disposal site, landfill or wastewater residuals landfill may cause or contribute to the discharge of pollutants to wetlands, surface waters or ground water or otherwise result in a release or threat of release
- n. Other land uses and activities as designated by the Stormwater Authority
- B. In addition to implementation of BMPs for designing site-specific stormwater management controls, high-load areas shall provide a stormwater pollution prevention plan (SWPPP) describing methods for source reduction and methods for pretreatment.
- C. If a high-load area demonstrates, through a SWPPP, the use of BMPs that result in no exposure of regulated substances to precipitation or runoff or release of regulated substances, it shall no longer be considered a high-load area.
- D. Infiltration of stormwater from high-load areas are prohibited within critical areas (see Standard 8). Infiltration of stormwater from high-load areas outside of critical areas (see Standard 8) is allowed. For such discharges, proponents should use one pretreatment BMP, one terminal treatment BMP, and one infiltration BMP.
- E. For high-load areas, the following stormwater management practices may be used for treatment only if lined or sealed: Sand Filters/Organic Filters (may also be used for pretreatment), Wet Retention Basins, Detention Basins, Constructed Wetlands, Bioretention Areas, including rain gardens (underdrain required).

#### Standard 8: Critical Areas

- A. Critical Areas are defined as:
  - a. Shellfish growing areas,
  - b. Bathing beaches,
  - c. Recharge areas for public water supplies (groundwater and surface water supplies),
  - d. Any listed water bodies and wetlands as designated by the Town of ______.



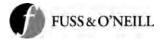
- B. The stormwater BMPs approved for discharges to or near critical areas shall be designed to treat the Water Quality Volume (WQV) for the post-development site. These practices are included in the *Connecticut Stormwater Quality Manual* and the ______ Stormwater Drainage Manual. These stormwater discharges require the use of a treatment train that provides 80% TSS removal prior to discharge. This treatment train shall include at least one pretreatment BMP, one terminal treatment BMP, and one infiltration BMP.
- C. Infiltration of stormwater from high-load areas are prohibited within critical areas.

#### Standard 9: Parking

- A. Snow may not be plowed to, dumped in, or otherwise stored within 15 feet of a wetland or waterbody, except for snow that naturally falls into this area. Snow storage areas shall be shown on the site plan to comply with these requirements.
- B. At the discretion of the Stormwater Authority, parking spaces may be required to be constructed of a pervious surface (i.e. grass, pervious asphalt, pervious pavers).
- C. Infrequently used emergency access points or routes shall be constructed with pervious surfaces (i.e. grass, pervious asphalt, pervious pavers).

## Standard 10: Redevelopment

- A. Redevelopment projects are defined to include the following:
  - Maintenance and improvement of existing roadways including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving;
  - b. Development, rehabilitation, expansion and phased projects on previously developed sites; and
  - c. Remedial projects specifically designed to provide improved stormwater management.
- B. Redevelopment of previously developed sites must meet Standards 3, 4, 5, and 6 to the maximum extent practicable as determined by the Stormwater Authority. To make this determination the Stormwater Authority shall consider the benefits of redevelopment as compared to development of raw land with respect to stormwater. All projects involving redevelopment or reuse activities shall also improve existing conditions.
- C. For all redevelopment projects, new stormwater controls (retrofitted or expanded) must be incorporated into the design and result in a reduction in annual stormwater pollutant loads from the site. Proponents of redevelopment projects shall make full use of all opportunities for controlling the sources of pollution and to incorporate environmentally sensitive site design and low impact development techniques. This is particularly important for constrained redevelopment sites where it is not possible to install BMPs that treat the entire water quality volume. All redevelopment projects shall also incorporate measures that will address water quantity issues by reducing the peak and total runoff from the site and by increasing groundwater recharge. Actions to improve existing conditions should address known water quality and water quantity



- problems such as documented failures to meet the Surface Water Quality Standards, low stream flow, or repeated flood events.
- D. Redevelopment activities shall not infiltrate stormwater through materials or soils containing regulated or hazardous substances or areas with soil or groundwater contamination
- E. The portion of a property that is currently undeveloped is not a redevelopment and thus does not fall under Standard 10. Any development on previously undeveloped portions of a property must comply fully with all of the other Stormwater Management Standards.

#### Standard 11: Construction Erosion and Sediment Control

- A. A plan to control construction related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) must be developed and implemented in accordance with the *Connecticut Guidelines for Soil Erosion and Sediment Control* (as amended).
- B. All development, regardless of the area of disturbance, must implement erosion and sedimentation controls prior to and during construction.

#### Standard 12: Easements

- A. Where a site is traversed by or requires construction of a watercourse or drainageway, an easement of adequate width may be required for such purpose.
- B. There shall be at least a 10-foot wide permanent maintenance easement corridor on each side of any stormwater management system element, as well as at least a 10-foot wide temporary construction easement corridor contiguous with the boundaries of the permanent easement. For systems using underground pipes, the maintenance easement may need to be wider, depending on the depth of the pipe.

## Standard 13: Operation and Maintenance

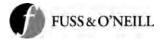
A. A long-term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed. This plan shall be reviewed and approved as part of the review of the proposed permanent (post-construction) stormwater management system and incorporated in the Stormwater Management Plan. Execution of the O&M Plan shall be considered a condition of approval of a stormwater management permit application. If the stormwater management system is not dedicated to the town pursuant to a perpetual offer of dedication, the Stormwater Authority may require a project proponent to establish a homeowners association or similar entity to maintain the stormwater management system. For high-load areas or activities under Standard 7, the O&M Plan shall include implementation of a SWPPP.



- B. The O&M Plan shall at a minimum identify:
  - a. Stormwater management system(s) owners;
  - b. The party or parties responsible for operation and maintenance including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;
  - c. The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;
  - d. Plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;
  - e. Description and delineation of public safety features; and
  - f. Estimated operations and maintenance budget.
- C. The stormwater management system owner is generally considered to be the landowner of the property, unless other legally binding agreements are established.
- D. The proponent shall include with the stormwater management permit application a mechanism for implementing and enforcing the O&M Plan. The proponent shall identify the lots or units that will be serviced by the proposed stormwater BMPs. The proponent shall also provide a copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of stormwater BMPs. In the event that the stormwater BMPs will be operated and maintained by an entity, municipality, state agency or person other than the sole owner of the lot upon which the stormwater management facilities are placed, the proponent shall provide a plan and easement deed that provides a right of access for the legal entity to be able to perform said operation and maintenance functions, including inspections.

[NOTE: It is recommended that the stormwater management permit include a condition requiring that the responsible party provide a copy of the permit approval and the legal instrument to each unit or lot owner at or before the purchase of each unit or lot to be serviced by the stormwater BMPs.]

- E. The owner shall keep the O&M Plan current, including making modifications to the O&M Plan as necessary to ensure that BMPs continue to operate as designed and approved. Proposed modifications of O&M Plans including, but not limited to, changes in inspection frequency, maintenance schedule, or maintenance activity along with appropriate documentation, shall be submitted to the Stormwater Authority for review and approval within thirty days of change.
- F. Parties responsible for the operation and maintenance of a stormwater management system shall keep records of the installation, maintenance and repairs to the system, and shall retain records for at least five years.
- G. Parties responsible for the operation and maintenance of a stormwater management system shall provide records of all maintenance and repairs during inspections and/or upon request.
- H. When the responsible party fails to implement the O&M Plan, including, where applicable, the SWPPP, the municipality is authorized to assume responsibility for their



implementation and to secure reimbursement for associated expenses from the responsible party, including, if necessary, placing a lien on the subject property.

## Standard 14: Stormwater Management Plan

A. All stormwater management permit applications must include a Stormwater Management Plan. This plan shall document how the proposed project complies with the stormwater standards and must be submitted with the stamp and signature of a Professional Engineer (PE) licensed in the State of Connecticut.

## Standard 15: Illicit Discharges

A. All illicit discharges to the stormwater management system are prohibited.

[NOTE: The stormwater management system is the system for conveying, treating, and infiltrating stormwater on site including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities:

- Landscape irrigation,
- Uncontaminated groundwater discharges such as pumped groundwater, foundation drains, water from crawl space pumps, and footing drains,
- Irrigation water,
- Lawn watering runoff,
- Residual street wash water,
- Discharges of uncontaminated air conditioner condensate,
- Discharges of flows from fire fighting activities,
- Discharges containing no chemical additives (including chlorine) from the flushing of fire protection systems, and
- Naturally occurring discharges such as rising groundwater, uncontaminated groundwater infiltration, springs, and flows from riparian habitats and wetlands.]



# **Appendix B**

Vernon Regulatory Review Memorandum



#### **MEMORANDUM**

TO: Technical Advisory Committee, Tankerhoosen River Watershed Management

Plan and Town of Vernon Land Use Commissioners

FROM: Erik Mas, P.E., Fuss & O'Neill, Inc.

DATE: June 9, 2008

RE: Stormwater and Low Impact Development (LID) Regulations in the

Tankerhoosen River Watershed – Vernon Regulatory Review

#### 1.0 INTRODUCTION

Fuss & O'Neill is working with the Friends of the Hockanum River Linear Park, Inc., in collaboration with its project partners (Town of Vernon Planning Department, Town of Vernon Conservation Commission, North Central Conservation District, Hockanum River Watershed Association, Rivers Alliance of Connecticut, Inc, and the Belding Wildlife Trust) to prepare a Watershed Management Plan for the Tankerhoosen River watershed. The watershed plan will identify action items that can be implemented by the watershed municipalities and private groups to protect and improve the health of the Tankerhoosen River watershed, which is a particularly valuable natural resource, demonstrated by the Class A water quality in the upper regions of the watershed that harbor the Belding Wild Trout Management Area, one of only two such Class I areas east of the Connecticut River.

A key element of the Watershed Management Plan is to identify potential land use regulatory mechanisms (i.e., new or modified land use regulations) that can be implemented by the watershed towns to better manage stormwater runoff associated with land development within the watershed. Many Connecticut communities are in the process of developing new or modified land use regulations that incorporate Low Impact Development (LID) and related stormwater management approaches to address stormwater quantity and quality objectives. Communities, including Vernon, are faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl. An opportunity exists for the Town of Vernon to develop and implement an ordinance or other regulatory mechanism to satisfy Phase II stormwater regulatory requirements, while also strengthening the existing land use controls to protect natural resources within the Tankerhoosen River watershed.

This memorandum summarizes our review of Vernon's existing land use regulations and related planning documents that pertain to stormwater management and natural resource protection issues, as well as potential approaches for developing regulatory mechanisms to incorporate improved stormwater management, including LID concepts and opportunities to reduce impervious cover, into the Town's land use regulations. The information presented in this



technical memorandum is intended to facilitate a discussion of these issues during the upcoming workshop meeting with the Tankerhoosen River Management Plan Technical Advisory Committee and the Town of Vernon land use commissioners.

#### 2.0 EXISTING REGULATORY MECHANISMS

Fuss & O'Neill reviewed the following documents and information provided by the Town, which are the primary regulatory mechanisms and related planning documents that address stormwater management and related natural resource protection issues in the Town of Vernon:

- Subdivision Regulations,
- Zoning Regulations,
- Inland Wetland and Watercourses Regulations,
- Plan of Conservation and Development.

#### 2.1 Subdivision Regulations

The Town's subdivision regulations (effective date: May 8, 2007) regulate the division of a tract or parcel of land with the purpose of sale or building development. The subdivision regulations address street and lot layout, water supplies, sanitary sewage facilities, stormwater drainage, utilities, open space, street widths, grades and construction, and other necessary improvements. The following is a summary of specific sections of the subdivision regulations that relate to stormwater management and natural resource protection issues.

- <u>Section 5 Standards for Maps and Plans</u>: This section specifies requirements for maps and plans submitted with subdivision applications, including Site Development Plans, Construction Plans, and Grading Plans. Existing and proposed watercourses and stormwater management systems are required to be shown on the Site Development Plan. Grading Plans are required to include notations and details on erosion and sedimentation control methods.
- <u>Section 6.1.3 General Improvements, Open Space to be Dedicated</u>: The Planning and Zoning Commission may require the set aside of Open Space as part of a subdivision where the Commission finds the existing land applicable to one or more of the following:
  - o The policies and objectives of the Plan of Conservation and Development
  - Areas sensitive to development
  - o Prime and important farmland soils
  - Natural Diversity Database Areas as updated by the Connecticut Department of Environmental Protection
  - Unconsolidated Aquifers and Aquifer Protection Areas
  - o Areas indicated for future community facility needs
  - o Existing open areas and significant cultural and natural resources
  - o Potential open space system

- Land Use Plan and Strategy
- Significant natural and cultural resources inventory
- Viable vernal pools verified by the Town of Vernon Vernal Pool Study or by a qualified licensed professional
- <u>Section 6.1.3.2 General Improvements, Location of Open Space</u>: The protection and preservation of the Hockanum River, Ogden Brook, Tankerhoosen River, Gage's Brook, Railroad Brook, Walker's Reservoir East, Walker's Reservoir West, Valley's Fall's Pond, or a Vernal Pool indentified by the Town, is considered a priority when the parcel being subdivided contains portions of the aforementioned watercourses.

When the parcel being subdivided contains portions of land that would allow for the connection of the Shenipsit Trail, Hockanum River Trail, Risley Pond Trail, Land Trust Trail, Belding Path, Hockanum River Linear Park, Box Mountain Greenway, Talcottville & Tankerhoosen Trail/open space system, Ellington Trail System, Tolland Trail System, Bolton Greenways, Manchester Greenways, other potential greenway, linear park, or trail identified in the POCD or by the Department of Parks and Recreation, the provision and connection of these amenities shall be a priority in the design and or location of Open Space.

- Section 6.1.3.3 General Improvements, Size of Open Space: When Open Space is required, the minimum recommended amount of Open Space to be provided is 12% of the total area of land to be subdivided, 15% of the total area of land if the location of the subdivision is identified in the Land Use Plan and Strategy of the POCD, and 20% of the total land area if the location of the subdivision is identified as a Priority Area for Open Space Protection of the POCD.
- <u>Section 6.1.3.4.3 General Improvements, Open Space Standards:</u> Any land to be dedicated as Open Space shall be left in its natural state by the subdivider and shall not be graded, cleared, disturbed, or used as a temporary or permanent repository for stumps, brush, earth, building materials, debris, detention ponds, or basins.
- Section 6.4 Lot Grading and Drainage: Grading plans shall be submitted where substantial grading is required in order to provide a buildable site and shall employ standards and methods equal to or exceeding those set forth in the Erosion and Sediment Control Handbook (USDA, SCS, Storrs, Conn., 1976). Lot drainage should be coordinated with the general storm drainage patterns for the area, and drainage should be designed to avoid concentrated stormwater to adjacent lots.

Comment: Contains an outdated reference to a previous version of the State Erosion and Sedimentation Control Handbook. Revise the language to reference the current CT Erosion and Sedimentation Control Guidelines, as amended

<u>Section 6.5.1.1 - Street Grading and Improvement</u>: Roads shall be related appropriately
to the topography, and streets shall be arranged so as to obtain as many as possible of
the building sites at, or above, the grades of the streets.

Comments: consistent with fitting the development to the topography. Building sites above the grade of the streets provides opportunity for use of roadside swales. Consider adding a provision to allow elimination of curbing for roads for grades less than 5% to encourage the use of vegetated swales and similar LID stormwater management systems.

 <u>Section 6.6.6 - Cul-de-sac or Dead-End</u>: Cul-de-sac pavement shall be a uniform 45 foot radius except when an island is used, in which case the outside radius shall be 50 feet with an island radius of 20 feet.

Comment: The radius of cul-de sacs should be the minimum required to accommodate emergency and maintenance vehicles. Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.

• Section 6.7.1 - Design Standards, Road Width: Table 1 contains minimum pavement width for collector (32 ft), local (28 ft), and limited local roads (28 ft).

Comment: Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance, and service vehicle access. Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.

 <u>Section 6.7.2 - Design Standards, Curbs</u>: Curbs shall be required on all new streets and shall conform to construction and design standards in the Appendix of the regulations.

Comment: The requirement for curbs on all new roads appears to preclude the use of curbless roads and open vegetated channels for stormwater management.

- <u>Section 6.9.1 Drainage and Storm Sewers, General Requirements</u>: The developer shall be fully responsible for constructing adequate facilities for the control, collection, conveyance and acceptable disposal of storm water, other surface water and subsurface water, whether originating within the sub- division area or in a tributary drainage area.
- Section 6.9.2.2 Drainage and Storm Sewers, Location of Stormwater Facilities: The applicant may be required to dedicate either in fee or by drainage or conservation easement, land on both sides of existing watercourses to a distance to be determined by the Commission.



Section 6.9.3 - Drainage and Storm Sewers, Drainage Discharge: The discharge of all storm water from a subdivision shall be into suitable streams or other acceptable and suitable storm water drainage facilities having adequate capacity to carry the additional water. Sufficient and adequate facilities shall be constructed on private lots wherever necessary to prevent the flow of surface drainage from the property on which it originates onto adjacent property in sufficient quantity, concentration or velocity to cause damage or create a nuisance on adjoining property.

Comment: The Subdivision Regulations do not include post-development peak flow, volume control, or stormwater quality requirements.

• Section 6.9.3 - Drainage and Storm Sewers, Drainage Design: Designs shall be based on the maximum ultimate development of the entire watershed as permitted by the Zoning Regulations. On watersheds one square mile or over, the design of culverts, bridges and through watercourses shall be based upon not less than a 100-year storm. On watersheds of less than one square mile, the design for the through drainage system shall be for no: less than a 50-year storm. The drainage system for roads, including catch basins, inlets, pipes, underdrains and gutters within or abutting the subdivision shall be designed for not less than a 10-year storm.

Drainage ditches will, in general, not be permitted where it is feasible to install underground pipe.

Comment: This requirements restricts the use curbless roads and roadside vegetated swales in lieu of traditional curb, gutter, and piped drainage.

• <u>Section 6.12.1 - Sidewalks</u>: Sidewalks shall be required in all subdivisions on at least one side of all new streets, unless waived by a three-quarters vote of all members of the Commission, and may be required on both sides at the discretion of the Commission.

Comment: Sidewalks required on two side of the street increase impervious cover. Where practical, consider locating sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.

 <u>Section 6.14 - Certified Erosion and Sediment Control Plan</u>: A soil erosion and sediment control plan shall be submitted with any application for development when the disturbed area of such development is cumulatively more than one-half acre. A single family dwelling that is not a part of a subdivision of land shall be exempt from these soil erosion and sediment control regulations.

Comment: Construction of single family dwellings that disturb an acre or more of land are subject to state and federal NPDES Phase II Stormwater Program requirements. Consider amending the single family exemption to indicate that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land.



Section 6.14.3 - Erosion and Sediment Control Plan: a soil erosion and sediment control
plan shall contain proper provisions to adequately control accelerated erosion and
sedimentation and reduce the danger from storm water runoff on the proposed site
based on the best available technology. Such principles, methods and practices
necessary for certification are found in the Connecticut Guidelines for Soil Erosion and
Sediment Control (1985) as amended.

Plans for soil erosion and sediment control shall be developed in accordance with these regulations using the principles as out-lined in Chapters 3 and 4 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended. Soil erosion and sediment control plans shall result in a development that minimizes erosion and sedimentation during construction; is stabilized and protected from erosion when completed; and does not cause off-site erosion and/or sedimentation.

- <u>Section 6.14.6 Conditions Relating to Soil Erosion and Sediment Control</u>: A
  performance bond may be required for the estimated costs of measures required to
  control soil erosion and sedimentation, as specified in the certified plan.
- <u>Section 13 Rear Lots</u>: This section includes provisions for greater residential development flexibility, particularly where a site has an unusual lot line or natural resource configuration or where rear lot development would promote or enhance the protection of valuable natural resource features.

Comment: This concept is consistent with LID principles to protect and preserve natural features of a site.

## 2.2 Zoning Regulations

Site development in the Town of Vernon must comply with the Vernon Zoning Regulations (effective date: May 8, 2007). The following is a summary of specific zoning regulations that relate to stormwater management and natural resource protection issues.

- <u>Section 3.4 General Provisions, Collection and Disposal of Storm Drainage</u>: Proper provision shall be made for collection and disposal of storm water from roofs and parking areas through a pipe system connected to existing storm drains or carried to a natural watercourse or to an on-site area approved by the Town Engineer in compliance with the recommendations of the latest edition of the "Stormwater Quality Manual" of the Connecticut Department of Environmental Protection (DEP).
- <u>Section 3.18 General Provisions, Building Above or Below Center Line of Road</u>: Any lot or parcel of land with the top of foundation more than five (5) feet above or below the center line grade of the road opposite the midpoint of the front foundation wall requires a detailed site plan showing the existing and proposed topography, driveways, storm drainage, and other information.

- <u>Section 3.25 General Provisions, Sidewalks</u>: Sidewalks shall be installed for all new developments in all areas, unless waived by a three-quarters vote of all members of the Commission.
- <u>Sections 4.1 through 4.25 Use Districts, Setbacks and Lot Dimensions</u>: These sections specify minimum setbacks and lot dimensions for various use districts in the Town of Vernon.

Comment: Minimum setbacks and frontage distances can increase impervious cover. Front yard setbacks, which dictate how far houses must be from the street, can extend driveway length. Large side setbacks and frontage distances influence the road length needed to serve individual lots. Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.

- <u>Section 7 Cluster Development</u>: Developers may vary the lot size requirements in Residential 40 and Residential 27 zoning districts, leaving a substantial area free of building lots (i.e., "cluster" development). The land area not allocated to building lots and streets shall be permanently reserved in open space and be readily usable for recreation or conservation.
- Section 12 Off-street Parking and Loading: Section 12.1 specifies parking ratios, which are the number of parking spaces that must be provided for particular uses. The Planning & Zoning Commission may reduce the number of off-street parking spaces which must be installed provided that the required number of spaces is reduced by no more than 20%, the number of spaces will not result in an increase of on-street parking, and the developer pays a fee of \$500 for each space eliminated (fee-in-lieu of parking). Section 12.3 specifies the minimum stall dimensions for off-street parking and truck loading spaces, which already appear to be at or near recommended minimum values.

Comment: Parking ratios typically represent the minimum number of spaces needed to accommodate the highest hourly parking rate at the site. In many cases, parking ratios far exceed parking demand, which refers to the number of spaces actually used for a particular land use. Parking ratios often result in far more spaces than are actually required because ratios are typically set as minimums and not maximums. This results in excessive impervious cover for many land uses. Existing parking ratios should be reviewed to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.



Shared parking is another strategy that reduces the number of parking spaces needed by allowing adjacent land uses to share parking lots, particularly when parking demands occur at different times during the day or week. Section 12.3 appears to allow for shared parking for non-residential uses, although it is unclear if the Town actively promotes shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Also consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Connecticut Stormwater Quality Manual, local stormwater management design manual, other sections of the Zoning regulations, or new/modified local stormwater management and LID regulations.

Model zoning regulations for parking were developed in 2003 for communities in northwestern Connecticut through a study sponsored by the Northwestern Connecticut Council of Governments (NWCCOG), the Litchfield Hills Council of Elected Officials (LHCEO), and the Connecticut DEP. This document provides a good starting point for reviewing and modifying local zoning regulations for parking to address impervious cover and stormwater management issues.

<u>Section 18 — Activities Requiring a Certified Erosion and Sediment Control Plan</u>: A soil
erosion and sediment control plan shall be submitted with any application for
development when the disturbed area of such development is cumulatively more than
one-half acre, except for a single family dwelling that is not a part of subdivision of land,
which is exempt from these soil erosion and sediment control regulations.

Comment: The section of the Zoning Regulations is consistent with the Erosion and Sediment Control Plan requirements (Section 6.14) of the Subdivision Regulations. Construction of single family dwellings that disturb an acre or more of land are subject to state and federal NPDES Phase II Stormwater Program requirements. Consider amending the single family exemption to indicate that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land.

• <u>Section 19 — Rear Lots</u>: This section includes provisions for greater residential development flexibility, particularly where a site has an unusual lot line or natural resource configuration or where rear lot development would promote or enhance the protection of valuable natural resource features.

Comment: This section of the Zoning Regulations is consistent with Section 13 of the Subdivision Regulations.

#### 2.3 <u>Inland Wetlands & Watercourses Regulations</u>

The Town of Vernon Inland Wetlands and Watercourses Regulations (effective date: October 2, 2006) regulate the removal or deposition of materials and the construction, obstruction, alteration, or pollution of wetlands and watercourses in the Town. The regulations make provisions for the protection, preservation, maintenance and use of inland wetlands and watercourses by minimizing their disturbance and pollution, maintaining and improving water

quality in accordance with federal, state, and local authority, and preventing damage from erosion, turbidity, or siltation as well as preventing the loss of beneficial aquatic organisms.

<u>Section 2 — Definitions</u>, <u>Regulated Activity</u>: Regulated activities include any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution, of such wetlands or watercourses. Any clearing, grubbing, filling, grading, paving, excavating, constructing, depositing, or removing of material and discharging of stormwater on the land within the following *upland review areas* is a regulated activity:

Resource	Upland Review Area
Wetland and Watercourse	100 ft.
Hockanum River, Ogden Brook, Tankerhoosen	200 ft.
River, Gage's Brook, Railroad Brook, Walker	
Reservoir West, Walker Reservoir East, and Valley	
Falls Pond	
Other	Agency Discretion*

^{*}The Commission may rule that any activity that alters the existing rate or quality of any stormwater discharge conveyed to a Regulated Area or is likely to impact or affect wetlands or watercourses is a Regulated Activity. The Commission may rule that any other activity whether located within or outside the Regulated Area that is likely to have an affect on the wetlands or watercourses is a Regulated Activity.

Additionally, the Commission may rule that any activity that alters the existing rate or quality of any stormwater discharge conveyed to a Regulated Area or is likely to impact or affect wetlands or watercourses is a Regulated Activity.

- Section 2 Definitions, Significant Activity: A "significant activity" includes any activity involving a deposition or removal of material which will or may have a substantial adverse effect on the Regulated Area or on another part of the inland wetland or watercourse system or an activity which substantially changes the natural channel or may inhibit the natural dynamics of a watercourse system or substantially diminishes the natural capacity of an inland wetland or watercourse to support desirable biological life, prevent flooding, supply water, assimilate waste, facilitate drainage, and/or provide recreation and open space, or any activity which would results in degrading a watercourse or the surface and/or groundwater of an inland wetland, such degradation to be measured by the standards of the Water Compliance Division of the Connecticut Department of Environmental Protection.
- Section 4.3.2 Fee Schedule: A technical review may be required by a consultant for certain regulated activities, including those that are within 200 feet of a watercourse of concern (including the Tankerhoosen River and its major tributaries), regulated activities proposed in a use district where the proposed activity exceeds the impervious coverage thresholds established in such districts, as well as parking space, building square footage, disturbance, and other thresholds.

- Section 4.3.4 Application Procedure: Any person wishing to undertake a Regulated Activity must submit an application to the Commission. The application must include a map showing the location of the site, the nature and extend of the proposed activity, the location of the Regulated Areas, existing and proposed structures, two-foot elevation contours, all drainage to be engineered, areas where material may be deposited or removed, all proposed construction within Regulated Area, areas of significant vegetation. The application must also include a detailed description of the activity, a map drawn by a licensed surveyor if the proposed activity exceeds ½ acre, the names and address of property owners within 500 feet of the proposed activity, and any reasonable measures which would mitigate the impacts of the Regulated Activity.
- Section 4.5 Evaluation of Proposed Activities: This section specifies the information and criteria upon which the Commission makes its decision on an application. Section 4.5.2 includes factors related to erosion, siltation, and leaching; adverse effects on water quality and aquatic life; the likelihood of any changes in the velocity, volume, or course of water flow, or in the water table, and any consequences such changes may have for the capacity of the wetland or watercourse to help control flooding and to purify and supply water; and the existing and desired quality and use of the water in and near the affected area.

Comment: The evaluation criteria do not contain specific stormwater management standards and do not reference available design guidance such as the Connecticut Stormwater Quality Manual or local design guidance. The regulations also do not require or recommend the use of LID practices to meet stormwater management objectives.

• Watercourse Buffers: Section 4.5.2.12 states that the Commission may require the provision of a buffer along a watercourse if proposed activities and/or development may create negative impacts on a watercourse that could be prevented or mitigated by provision of a buffer, as described in "Appendix B. Design Standards Recommended for a Watercourse Protection Buffer." The watercourse buffer design standards state that in areas where vegetated buffers do not exist, or are of limited width, consideration should be given to the creation of a buffer area. Newly created buffers should include canopy or shade trees, shrubs, and herbaceous plant species suited to the local habitat in three (3) zones of plantings. The recommended minimum width of a watercourse buffer is one hundred (100) feet measured horizontally from the banks of the watercourse and fifty (50) feet measured horizontally related to intermittent watercourses.

The recommended watercourse protection area with landscape buffer may be reduced when (1) an engineered stormwater management and pollution control system employing technical best management practices (BMP) in compliance with the Connecticut Department of Environmental Protection (DEP) "Stormwater Quality Manual: is provided to treat run-off from a development site; (2) the site is served by a public sewer system; and (3) a reduction of the river protection buffer depth would not result in a significant potential adverse impact to the watercourse.



## 2.4 <u>Plan of Conservation and Development</u>

The Vernon Plan of Conservation and Development (June 2001) presents a detailed strategy for open space conservation and preservation, including increasing the amount of preserved open space as well as creating linkages between open space areas. The Plan identifies priority open space preservation areas along the Hockanum and Tankerhoosen River corridors.

A series of neighborhood meetings were held as an initial phase of the POCD. Several common themes emerged at public meetings. The themes associated with the protection of open space and watercourses included:

- Need to preserve open space for perpetuity in a positive, planned manner with adequate financial resources devoted to this program. A goal of 20% open space might be considered
- Retail development should be limited to prevent Vernon from becoming another Manchester in the Route 84 corridor or like the Berlin Turnpike along other major corridors in Town.
- The water quality of the Town's lakes and rivers as well as groundwater should be protected.

In addition to the currently-implemented Zoning Regulations, Subdivision Regulations, and Inland Wetlands and Watercourses Regulations, the Open Space section of the POCD also recommends adoption of a Hockanum River and Tankerhoosen River Protection Overlay District. Such a district would establish a contiguous and parallel buffer strip on either side of these rivers and would supplement the inland wetland and underlying zoning regulations, with the added provision that the land within the buffer areas and the river itself would remain in a natural, undisturbed state.

#### 3.0 OBSERVATIONS & PRELIMINARY RECOMMENDATIONS

Based on our review of the Town's existing land use regulations and planning documents that pertain to stormwater management and natural resource protection, we offer the following observations and preliminary recommendations for discussion during the upcoming workshop meeting with the Tankerhoosen River Management Plan Technical Advisory Committee and the Town of Vernon land use commissioners.

#### 3.1 Observations

The Town has a number of land use regulations that regulate construction and post-construction stormwater runoff from new development and redevelopment activities, and provide for protection of natural resources. The local regulations are particularly strong in terms of erosion and sediment control (as well as consistent between the various regulations), open space protection, and regulating activities that can potentially affect wetlands and watercourses, including requirements for watercourse buffers. However, there are several areas where the regulations and design standards and guidance could be strengthened through amendments or



new regulations to clarify and strengthen stormwater management requirements and better promote the use of LID principles.

#### 1. Stormwater Management Standards and Design Manual

The Town land use regulations do not contain specific stormwater management standards. The Zoning Regulations reference the recommendations and design guidance contained in the Connecticut Stormwater Quality Manual, while the Subdivision Regulations indicate that stormwater systems shall be designed by methods approved by the Town Engineer. The Inland Wetlands and Watercourses Regulations do not contain specific stormwater management standards and do not reference design guidance such as the DEP Stormwater Quality Manual or local design standards, except for instances when the applicant requests reduction in the watercourse buffer width requirements.

While the Connecticut Stormwater Quality Manual contains hydrologic sizing criteria (for water quality, quantity, groundwater recharge, etc.) and detailed design guidance for specific stormwater treatment practices, it does not prescribe a set of stormwater standards due to the lack of state-wide stormwater regulations. The Connecticut Stormwater Quality Manual does contain many LID principles in addition to more traditional end-of-pipe stormwater controls. However, it does not contain more recently developed guidance on LID design methods and clear incentives for developers to use LID over traditional stormwater management methods, such as LID credit systems which have been adopted by communities in recent years. Another drawback of relying solely on the DEP manual is that the information in the manual may eventually become outdated and lacking in areas of new or emerging stormwater management issues, as DEP does not plan to revise the manual in the foreseeable future.

Although the Vernon land use commissions are encouraged to use the Connecticut Stormwater Quality Manual to review applications, an alternative approach is to develop a local stormwater and LID manual to complement the DEP stormwater manual. A local manual could reference applicable sections of the DEP manual and take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town. The Town land use regulations could also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the Town land use regulations. Several other Connecticut communities have chosen this approach, including Tolland, which has developed a LID and Stormwater Management Design Manual, in addition to amendments to the Tolland Subdivision and Zoning Regulations. The Town of Greenwich is also in the process of revising its outdated drainage manual to incorporate stormwater quality elements and LID principles. Greenwich is also considering adopting a stand-alone ordinance or modifying its local land use regulations to implement the provisions of the new manual.

#### 2. Local Regulatory Mechanism

As indicated in the introduction section, an opportunity exists for the Town of Vernon to develop and implement new or revised regulations to satisfy Phase II stormwater regulatory F:\P2005\0257\A20\Town Regulations and Data\Vernon_Regulatory_Review_Memo_20080605.doc Corres. (MA)



requirements, while at the same time incorporating LID principles and addressing natural resource protection issues. The Town's existing land use regulations address some of the elements of the post-construction stormwater management "regulatory mechanism" required by the DEP Phase II Stormwater program. However, none of the existing regulations, either individually or collectively, addresses post-construction stormwater management in a comprehensive manner as required by the Phase II program. Additionally, the Town may want to consider regulating stormwater runoff from projects that may not currently be subject to Town land use regulations but which are known to be a source of stormwater quality and drainage issues (such as single family residential redevelopment outside of the Upland Review Area).

Two general approaches exist for implementing a comprehensive stormwater regulatory mechanism to meet Phase II stormwater program requirements and to incorporate LID principles and other specific community objectives. One approach involves developing a new stand-alone stormwater ordinance that could be incorporated into the Vernon Town Code and implemented by a single department or commission such as the Engineering Department. This approach has been used by Stratford and other communities throughout southern New England. An alternate approach would be to implement more comprehensive stormwater management/LID requirements in a new section of the Zoning Regulations and maintain the responsibility for administering the stormwater/LID provisions with the Planning and Zoning Commission. Such an approach has been used by Tolland and Guilford, Connecticut. Elements of both approaches are summarized as follows:

#### a. Stand-Alone Stormwater Ordinance

Adopt a new stormwater ordinance as part of the Vernon Town Code. The ordinance could be similar to the draft ordinance which is provided in Attachment A of this memorandum and is based upon a model ordinance endorsed by the DEP. Typically, a new stormwater ordinance is a more efficient and effective way to address the Phase II Stormwater program regulatory mechanism requirement than separate revisions to the individual municipal land use regulations that are currently in place. The stormwater ordinance would apply to post-construction stormwater runoff from new development and redevelopment projects that disturb greater than a threshold value that could be selected by the Town. The Phase II General Permit requires that the ordinance apply to projects that would disturb one or more acres. Vernon could consider an alternative applicability threshold to ensure that the requirements would apply to in-fill development projects and other smaller land disturbance activities with the potential for drainage or water quality impacts. The sample draft ordinance provided in Attachment A would apply to all projects that disturb 5,000 square feet or more. Other applicability thresholds could be considered as well. The ordinance should incorporate by reference the technical standards and design guidance contained in a local stormwater manual and/or the Connecticut Stormwater Quality Manual, as amended.



- The stand-alone stormwater ordinance could be administered by the Engineering Department, which would initially receive stormwater management permit applications for land disturbance activities subject to the ordinance. Stormwater Management Plans would then be reviewed by one or more of the applicable land use commissions (Planning and Zoning Commission or Inland Wetlands Regulatory Commission) with jurisdiction or expertise over the proposed project. Projects that do not fall under the jurisdiction of the Planning and Zoning Commission or the Inland Wetlands Regulatory Commission would be reviewed solely by the Engineering Department for compliance with the ordinance. This administrative structure places responsibility for stormwater management plan review on those agencies that already perform regulatory reviews (P&Z and IW), but consolidates authority for the stormwater ordinance under a single department (Engineering). A drawback to this approach is that the Engineering Department would bear the responsibility for administering the permit program and would likely require additional staff resources.
- The Town could consider creating a dedicated "stormwater inspector" position
  within the Engineering Department. The stormwater inspector would be
  responsible for conducting stormwater inspections during and after construction
  of stormwater facilities in support of the new ordinance, as well as augment the
  related inspection capabilities of Building Inspector and Zoning Enforcement
  Officer.
- Short-term funding for administration of the post-construction stormwater ordinance and other elements of the Town's Phase II program would most likely come from taxes and application fees. The Town could investigate implementation of a service charge-based system, such as user fees or a stormwater utility. However, these funding sources are often difficult to implement due to public resistance. Stormwater utilities have been established in Chicopee, Massachusetts, Burlington, Vermont, and elsewhere throughout the U.S. Stonington, Connecticut has investigated the feasibility of a stormwater utility. Several other Connecticut coastal communities are undertaking DEP-funded demonstration projects to explore the feasibility of developing and implementing a stormwater utility. Vernon may also explore the feasibility of a stormwater utility or similar stormwater service charge, although this would likely be a long-term potential funding source.
- b. Incorporation of Stormwater Management/LID Requirements in Zoning Regulations
  - Incorporate a new post-construction stormwater management and LID section into the existing Zoning Regulations. The new section could be similar to the stand-alone example ordinance in terms of applicability thresholds, exemptions, and general stormwater management standards and LID principles. Specific stormwater management standards and design guidance should not be included in the regulations, but rather in a local stormwater manual to avoid the need for



significant future amendments to the regulations when the standards or design guidance are revised. A copy of the recent amendment to the Town of Tolland Zoning Regulations, which added a new LID section, is included as <u>Attachment</u> B of this memorandum.

 In addition, the Zoning Regulations could be modified to potentially require a Stormwater Management Plan for a proposed activity that only requires a Building Permit, such as a single-family dwelling, if it results in the disturbance of one or more acres (the Phase II permit minimum requirement) or a lower threshold selected by the Town. The following sample language is an excerpt from the Guilford Zoning Regulations:

Stormwater Management Plans shall be prepared for any Site Plan, Coastal Site Plan (CAM) or Special Permit Application in accordance with 273-75.F(3) of this Code. Futhermore, for an Application for Certificate of Zoning Compliance (Building Permit) for any new single family dwelling, the Town Engineer, or the Environmental Planner may require that a Stormwater Management Plan be prepared, all or in part, as required by 273-75.F.(3) when he/she has determined that the development if the single family dwelling may have an adverse impact on stormwater quality.

This approach consolidates stormwater management review within the Planning and Zoning Commission through the existing site plan and special permit application review process. The Subdivision and Inland Wetlands and Watercourses Regulations would also need to be modified to require a Stormwater Management Plan consistent with the Zoning Regulations.

#### 3. LID Incentives and Obstacles

Although recent studies demonstrate that LID practices can reduce project costs and improve environmental performance, the perception still exists that site development using LID is more expensive than traditional approaches to stormwater management. Initial project costs may be higher in some cases than those for conventional design. However, significant savings are typically realized due to reduced costs for site grading and preparation, stormwater infrastructure, site paving, and landscaping (USEPA, Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices, EPA publication number 841-F-07-006, December 2007).

Many states and local communities have adopted LID credit systems as an added incentive for developers to use LID, and in particular non-structural measures, to ultimately reduce the size and cost of structural stormwater management systems.

LID Site Design Credits encourage environmentally sensitive site design and LID techniques for managing stormwater that minimize impervious surfaces and preserve natural hydrologic conditions. The credits allow project proponents to reduce or eliminate the structural stormwater BMPs otherwise required to meet certain stormwater standards by implementing LID site design techniques according to a prescribed set of standards. The Tolland LID Design F:\P2005\0257\A20\Town Regulations and Data\Vernon_Regulatory_Review_Memo_20080605.doc Corres. (MA)



Manual includes such an LID credit system. <u>Attachment C</u> of this memorandum contains an example LID Site Design Credit System that is also being considered by the Town of Greenwich.

Local land use regulations often contain design standards that preclude or limit the use of certain LID practices, particularly the use of curbless roads and roadside vegetated swales. Traditional curb-and-gutter systems convey stormwater with virtually no treatment or attenuation. Open vegetated channels remove pollutants by allowing infiltration and filtering to occur, and encourage groundwater recharge, which can reduce the volume of stormwater generated from a site. Traditionally, the use of curbless roads and vegetated open channels has been discouraged and, in many instances, specifically prohibited in local land use regulations and drainage design manuals, due to concerns over maintenance problems, pavement stability, and potential nuisances such as mosquitoes. Many of these concerns can be addressed through careful design and integration of open channels along streets.

The Vernon Subdivision Regulations contain provisions that limit the use of curbless roads and roadside vegetated swales. The Subdivision Regulations require curbs on all new streets and do not permit drainage ditches where it is feasible to install underground pipe. The Town should evaluate the underlying reasons for these restrictions and determine if the Subdivision Regulations should be amended to encourage the use of curbless roads and roadside swales, consistent with LID principles.

#### 4. Local Regulations and Impervious Cover

Impervious cover in a watershed is a strong indicator of the overall quality of streams and aquatic ecosystems. The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. As impervious cover increases, overall stream health declines.

A goal of LID, which is a form of alternative site design, is to reduce impervious cover, disconnect impervious surfaces from the storm drainage system, and preserve natural site features. Local land use regulations and design requirements were typically not developed with impervious cover in mind. Rather, they evolved from perceived consumer demand, safety concerns, and land availability, often resulting in more impervious cover than is necessary due to expansive parking lots, wide streets, and large-lot subdivisions with little conserved natural areas and open space.

Communities interested in adopting LID and alternative sit design principles need to re-evaluate local land use regulations to overcome these challenges. Based on our review of the Vernon Subdivision and Zoning Regulations, some of the key design parameters that strongly influence impervious cover are already at or near optimal levels (e.g., off-street parking stall dimensions and configuration), while others should be reviewed to determine if further refinement is warranted and feasible (e.g., cul-de-sac design, road width, sidewalks, parking ratios).



MEMO: Vernon Regulatory Review, Tankerhoosen River Watershed Management Plan June 9, 2008 Page 17

# 3.2 <u>Preliminary Recommendations</u>

This section contains preliminary recommendations based on our review of the existing land use regulations and planning documents, as well as our observations discussed in the previous section. These recommendations are intended to facilitate a discussion with the Technical Advisory Committee and Vernon land use commissioners during the upcoming workshop meeting, and to serve as a starting point and basis for further refinement and implementation.

## 1. Town Design Manual

- Develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the Connecticut Stormwater Quality Manual to take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town (see Recommendation 2). The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.
- Include a section of the design manual that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects. Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management facilities.
- Incorporate/reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.

### 2. Stormwater Management Standards

• Develop and incorporate into the Town stormwater design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance (see Recommendation 3). Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the Connecticut Stormwater Quality Manual and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included in <a href="https://example.com/Attachment_D">Attachment_D</a>.

MEMO: Vernon Regulatory Review, Tankerhoosen River Watershed Management Plan June 9, 2008 Page 18

# 3. New or Modified Stormwater Regulations

- Develop and implement new or revised stormwater regulations to 1) satisfy Phase II
  Stormwater Program regulatory requirements, 2) encourage or require LID principles to
  be implemented for development projects in Vernon, and 3) address other local
  drainage and natural resource protection issues identified by the Town. Two potential
  approaches have been identified —1) a new stand-alone stormwater ordinance, or 2)
  addition/amendments to the existing Zoning Regulations.
- Form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:
  - o If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
  - Which projects and activities will the new ordinance apply to (i.e., applicability)?
  - o How will applications be received and reviewed?
  - o Who will be responsible for inspections and enforcement?
  - Will additional staff be required to handle the increased workload to review and process applications?

#### 4. Other Amendments to Existing Regulations

#### **Subdivision Regulations**

- Amend Section 6.4 to reference the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, as opposed to the outdated reference to the 1976 version of the Erosion and Sediment Control Handbook.
- Section 6.5.1.1 (Street Grading and Improvement): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.6.6 (Cul-de-sacs): Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.
- Section 6.7.1 (Design Standards, Road Width): Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.

MEMO: Vernon Regulatory Review, Tankerhoosen River Watershed Management Plan June 9, 2008 Page 19

- Section 6.7.2 (Design Standards, Curbs): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.9 (Drainage and Storm Sewers): Modify these sections to reference stormwater management standards and LID principles contained in a stand-alone stormwater ordinance or new section of the Zoning Regulations, and/or the Town stormwater design manual.
- Section 6.9.3 (Drainage Design): Amend this section to allow the use of roadside vegetated swales designed in accordance with the Town stormwater design manual.
- Section 6.12.1 (Sidewalks): Consider requiring sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.
- Section 6.14 (Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

# **Zoning Regulations**

- Section 3.4 (General Provisions): If the Town develops a local stormwater design manual, change the reference to the Connecticut Stormwater Quality Manual to the Town manual.
- Sections 4.1 through 4.25 (Use Districts, Setbacks and Lot Dimensions): Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.
- Section 12 (Off-street Parking and Loading): Review existing parking ratios to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.



MEMO: Vernon Regulatory Review, Tankerhoosen River Watershed Management Plan June 9, 2008 Page 20

Clarify Section 12 of the regulations to encourage the use of shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.

Section 18 (Activities Requiring a Certified Erosion and Sediment Control Plan):
 Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

## Inland Wetlands and Watercourses Regulations

 Section 4.5 (Evaluation of Proposed Activities): Add language referencing the stormwater management standards and LID principles contained in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.



# ATTACHMENT A

Draft Model Stormwater Ordinance

#### **DRAFT**

# POST-CONSTRUCTION STORMWATER ORDINANCE (CITY NAME)

#### **Table of Contents**

- 1.0 PURPOSE AND AUTHORITY
- 2.0 **DEFINITIONS**
- 3.0 APPLICABILITY
- 4.0 STORMWATER MANAGEMENT CRITERIA
- 5.0 STORMWATER MANAGEMENT PLANS
- 6.0 PERMITS
- 7.0 CASH BOND
- 8.0 INSPECTION
- 9.0 MAINTENANCE
- 10.0 APPEALS
- 11.0 SEVERABILITY
- 12.0 PENALTIES
- 13.0 EFFECTIVE DATE

#### 1.0 PURPOSE AND AUTHORITY

The purpose of this ordinance is to protect, maintain and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to control the adverse impacts associated with post-construction stormwater runoff. Proper management of stormwater runoff will minimize damage to public and private property, reduce the effects of development on land and wetlands, control stream channel erosion, reduce local flooding, improve water quality, and maintain after development, as nearly as possible, the pre-development runoff characteristics.

The provisions of this ordinance are pursuant to Connecticut State Statutes 7-148 (c) (8) (A)¹, 8-2 (a)², 8-25³, and 22a-36 to 22a-45 inclusive⁴, and 8-2(b)⁵ and shall apply to all development occurring within the incorporated area of (City Name), Connecticut. The application of this ordinance and provisions expressed herein shall be the minimum stormwater management requirements and shall not be deemed a limitation or repeal of any other powers granted by State statute. The agencies defined in Section 2.0 as the

¹ Municipal Powers: The municipality has the power to "Provide for the protection and improvement of the environment including, but not limited to, coastal areas, wetlands and areas adjacent to waterways in a manner not inconsistent with the general statutes.

² Regulations: The zoning commission is authorized to adopt regulations "...to secure safety from ...flood and other dangers; to promote health and the general welfare..."

³ Subdivision of land: Authorizes the zoning commission to see "...that proper provision shall be made for... drainage..." and "that proper provision shall be made for protective flood control measures..."

⁴ The Inland Wetlands and Watercourses Act.

⁵ "In any municipality that is contiguous to Long Island Sound the regulations adopted under this section shall be made with reasonable consideration for restoration and protection of the ecosystem and habitat of Long Island Sound and shall be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. Such regulations shall provide that the zoning commission consider the environmental impact on Long Island sound of any proposal for development."

"Responsible Authority" shall be responsible for the coordination and enforcement of the provisions of this ordinance.

#### 1.1 Incorporation by Reference

For the purpose of this ordinance, the Connecticut Stormwater Quality Manual (as amended) is incorporated by reference by (City Name), Connecticut and shall serve as the official guide for stormwater principles, methods, and practices.

#### 2.0 **DEFINITIONS**

- A. For the purpose of this ordinance, the following definitions describe the meaning of the terms used in this ordinance:
  - (1) "Adverse impact" means any deleterious effect on waters or wetlands, including their quality, quantity, surface area, species composition, aesthetics or usefulness for human or natural uses which are or may potentially be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity, or stability or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation.
  - (2) "Agricultural land management practices" means those methods and procedures used in the cultivation of land in order to further crop and livestock production and conservation of related soil and water resources.
  - (3) "Applicant" means any person, firm, or governmental agency who executes the necessary forms to procure official approval of a project or a permit to carry out construction of a project.
  - (4) "Aquifer" means porous water bearing geologic formation generally restricted to materials capable of yielding an appreciable supply of water.
  - (5) "BMP (Best Management Practice)" means a structural device or nonstructural practice designed to temporarily store or treat stormwater runoff in order to mitigate flooding, reduce pollution, and provide other amenities.
  - (6) "Clearing" means the removal of trees and brush from the land (i.e., removal of vegetative cover) but shall not include the ordinary mowing of grass
  - (7) "DEP" means the Connecticut Department of Environmental Protection.
  - (8) "Design Manual" means the most current edition of the Connecticut Stormwater Quality Manual that serves as the official guide for the stormwater management principles, methods, and practices.
  - (9) "Detention structure" means a permanent structure for the temporary storage of runoff, which is designed so as not to create a permanent pool of water.
  - (10) "Develop land" means to change the runoff characteristics of a parcel of land in conjunction with residential, commercial, industrial, municipal, or institutional construction or alteration.
  - (11) "Direct discharge" means the concentrated release of stormwater to tidal waters or vegetated tidal wetlands from new development or redevelopment projects in the Critical Area.
  - (12) "Disturb" or "Disturbance" means any activity consisting of the removal of vegetation, topsoil, or overburden, or the placement of topsoil, spoil, or other material, as defined in the Guidelines.

- (13) "Drainage area" means an area that contributes runoff to a single point measured in a horizontal plane, which is enclosed by a ridgeline.
- (14) "Easement" means a grant or reservation by the owner of land for the use of such land by others for a specific purpose or purposes, and which must be included in the conveyance of land affected by such easement.
- (15) "Exemption" means those land development activities that are not subject to the stormwater management requirements contained in this ordinance.
- (16) "Extended detention" means a stormwater design feature that provides gradual release of a volume of water in order to increase settling of pollutants and protect downstream channels from frequent storm events. Methods for designing extended detention BMPs are specified in the Design Manual.
- (17) "Extreme flood volume" means the storage volume required to control those infrequent but large storm events in which overbank flows reach or exceed the boundaries of the 100-year floodplain.
- (18) "Flow attenuation" means prolonging the flow time of runoff to reduce the peak discharge.
- (19) "Grading" means any act by which soil is cleared, stripped, stockpiled, excavated, scarified, filled or any combination thereof.
- (20) "Groundwater recharge volume (GRV)" means that portion of the water quality volume used to maintain groundwater recharge rates at development sites. Methods for calculating the groundwater recharge volume are specified in the Design Manual.
- (21) "Guidelines" means the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, or as may be amended, established pursuant to Section 22a-328 of the Connecticut General Statutes.
- (22) "Infiltration" means the passage or movement of water into the soil surface.
- (23) "Off-site stormwater management" means the design and construction of a facility necessary to control stormwater from more than one development.
- "On-site stormwater management" means the design and construction of systems necessary to control stormwater within an immediate development.
- (25) "Peak runoff attenuation" means controlling by structural practices the volume to prevent an increase in the frequency of out of bank flooding generated by development.
- (26) "Primary treatment practice", as defined in the Design Manual, means a stormwater treatment practice that is capable of providing high levels of water quality treatment as a stand-alone measure.
- (27) "Redevelopment" means any construction, alteration, or improvement exceeding five thousand (5,000) square feet of land disturbance performed on sites where existing land use is commercial, industrial, municipal, institutional or multifamily residential.
- (28) "Responsible Authority" means employees, members, or designees of (City Name) (Agency Name). Other responsible agencies under this ordinance include:
  - (a) The Inland Wetlands and Watercourses Commission for stormwater runoff impacting wetlands and watercourses. (For the purposes of only this paragraph, the definition of "wetlands" and "watercourse" is the definition used in the most current version of the Inland Wetland and Watercourses regulations of (City Name).

- (b) The Engineering Division of the Department of Public Works for stormwater runoff from public roads and sidewalks.
- (c) The Planning Commission and Zoning Commission for all other stormwater runoff.
- (29) "Responsible Official" means (City Name) Director of Public Works ("Director").
- (30) "Retention structure" means a permanent structure that provides for the storage of runoff by means of a permanent pool of water.
- (31) "Retrofitting" means the construction of a structural BMP in a previously developed area, the modification of an existing structural BMP, or the implementation of a nonstructural practice to improve water quality over current conditions.
- (32) "Secondary treatment practice", as defined in the Design Manual, means a stormwater treatment practice that may not be suitable as stand-alone treatment because is not capable of meeting the water quality treatment performance criteria in the Design Manual or has not yet received the thorough evaluation needed to demonstrate the capabilities for meeting the performance criteria in the Design Manual.
- (33) "Sediment" means soils or other surficial materials transported or deposited by the action of wind, water, ice, or gravity as a product of erosion.
- (34) "Site" means:
  - (a) For "new development" any tract, lot or parcel of land or combination of tracts, lots, or parcels of land, which are in one ownership, or are contiguous and in diverse ownership where development is to be performed as part of a unit, subdivision, or project.
  - (b) For "redevelopment" the area of new construction as shown on an approved site plan or the original parcel. Final determination of the applicable area shall be made by the Responsible Authority.
- (35) "Stabilization" means the prevention of soil movement by any of various vegetative and/or structural means.
- (36) "Stormwater management" means the selective use of various management measures to effectively address the adverse water quality and quantity impacts of urban stormwater runoff.
- (37) "Stormwater Management Plan" means a set of drawings or other documents that describe the potential water quality and quantity impacts associated with a development project after construction. A stormwater management plan also identifies selected source controls and treatment practices to address those potential impacts, the engineering design of the treatment practices, and maintenance requirements for proper performance of the selected practices.
- (38) "Stormwater Treatment Practice", as defined in the Design Manual, means a measure constructed for primary treatment or secondary treatment of stormwater runoff.
- (39) "Stream Channel Protection" means restricting peak flows from storm events that result in flow conditions where the stream is flowing to the full extent of its banks so the damaging effects to the channel of increased runoff from urbanization can be reduced. Methods for calculating stream channel protection are specified in the most current edition of the Design Manual.

- (40) "Variance" means the modification of the minimum stormwater management requirements for specific circumstances such that strict adherence to the requirements would result in necessary hardship and not fulfill the intent of this ordinance.
- (41) "Waiver" means the relinquishment from stormwater management requirements by the Responsible Authority for a specific development on a case-by-case review basis.
  - (a) "Quality stormwater management waiver" includes water quality volume and groundwater recharge volume design parameters.
  - (b) "Quantity stormwater management waiver" includes stream channel protection, peak runoff attenuation, and extreme flood volume design parameters.
- (38) "Watercourse" means any natural or artificial stream, river, brook, lake, pond, marsh, swamp, bog, ditch, channel, canal, conduit, culvert, drain, waterway, gully, ravine, wash, and all other bodies of water, natural or artificial, vernal or intermittent, public or private in and including any adjacent area that is subject to inundation from overflow or flood water.
- (39) "Watershed" means the total drainage area contributing runoff to a single point.
- (40) "Water quality volume" means the volume of runoff generated by one inch of rainfall on the site.

#### 3.0 APPLICABILITY

#### 3.1 Scope

No person shall develop land for residential, commercial, industrial, municipal, or institutional uses without having provided stormwater management measures that control or manage runoff from such development, except as provided within this section. The stormwater management measures must be designed consistent with the Design Manual and constructed according to an approved plan for new development or the policies stated in Section 3.4 for redevelopment.

#### 3.2 Exemptions

The following development activities are exempt from the provisions of this ordinance and the requirements of providing stormwater management, except as noted:

- A. Development of single family residential property that results in the disturbance of less than one (1) acre of land, not including projects less than one (1) acre that are part of a larger common plan of development or sale that will ultimately disturb greater or equal to one (1) acre must conform to the requirements presented in Section 4.4.
- B. Agricultural land management practices;
- C. Any activity that will disturb an area less than five thousand (5,000) square feet over the total project;
- D. Maintenance of existing landscaping, gardens or lawn areas associated with a single family dwelling;
- E. Repair or replacement of an existing roof of a single family dwelling;
- F. Construction of utilities (gas, water, electric, telephone, sanitary sewer, etc.) other than drainage, which will not alter terrain, ground cover, or drainage patterns;

G. Emergency repairs to any stormwater management facility or practice that poses a threat to public health or safety, or as deemed necessary by the Responsible Authority.

#### 3.3 Waivers / Watershed Management Plans

- A. Stormwater management quantity control waivers may be granted by the Responsible Authority to projects when the Responsible Authority determines that circumstances exist that prevent the reasonable implementation of quantity control practices.
- B. Stormwater management quality control waivers granted by the Responsible Authority apply to:
  - (1) In-fill development projects where implementation of stormwater management quality controls is not feasible:
  - (2) Redevelopment projects if the requirements of Section 3.4 of this ordinance are satisfied; or
  - (3) Sites where the Responsible Authority determines that circumstances exist that prevent or make unnecessary the reasonable implementation of quality control practices.
- C. Waivers must be requested in writing one week in advance of the regular meeting of the (Responsible Authority Agency Name) in a manner prescribed by the Director of Public Works.
- D. Waivers granted must:
  - (1) Be on a case-by-case basis;
  - (2) Consider the cumulative effects of the waiver policy; and
  - (3) Reasonably ensure the development will not adversely impact stream quality.

#### 3.4 Redevelopment

- A. All redevelopment projects shall reduce existing site impervious area by 20%. Where site conditions prevent the reduction of impervious area, then stormwater management practices shall be implemented to provide quality control for at least 20% of the site's impervious area. The elements and principles of stormwater quality control are noted in the Design Manual.
- B. Where conditions prevent impervious area reduction or on-site stormwater management, the Responsible Authority may consider practical alternatives including:
  - (1) Watershed or stream restoration;
  - (2) Retrofitting; or
  - (3) Other practices approved by Responsible Authority.

#### 3.5 Variance

The Responsible Authority may grant a written variance from any requirement of Section 4.0 (Stormwater Management Criteria), of this ordinance if there are exceptional circumstances applicable to the site such that strict adherence will result in unnecessary hardship and not fulfill the intent of this ordinance. A written request for variance shall be provided to the Responsible Authority and shall state the specific variances sought and reasons for their granting. The Responsible Authority shall not grant a variance unless and until the person developing land provides sufficient justification.

#### 4.0 STORMWATER MANAGEMENT CRITERIA

# **4.1 Minimum Control Requirements**

A. The minimum control criteria established in this section and the Design Manual are as follows:

- (1) Shall require that the groundwater recharge volume, water quality volume, and peak runoff attenuation for the 2-year frequency storm event be used to design BMPs according to the Design Manual. Control of the 10-year frequency storm event is required according to the Design Manual. Control of larger storm events may be required at the discretion of the Responsible Authority if a flooding problem exists and downstream floodplain development and conveyance system design cannot be controlled.
- (2) Shall require that the groundwater recharge volume, water quality volume, and stream channel protection sizing criteria be used to design BMPs according to the Design Manual.
- (3) The Responsible Authority may require more than the minimum control requirements specified in this ordinance if hydrologic or topographic conditions warrant or if flooding, stream channel erosion, or water quality problems exist downstream from a proposed project.
- B. Stormwater management and development plans where applicable, shall be consistent with adopted and approved watershed management plans or flood management plans as approved by the DEP.

#### **4.2** Stormwater Management Measures

The structural and nonstructural stormwater management measures established in this ordinance shall be used, either alone or in a combination, in developing a stormwater management plan.

- A. Nonstructural Stormwater Management Measures.
  - (1) The following nonstructural stormwater management practices shall be applied according to the Design Manual to minimize increases in new development runoff:
    - (a) Natural area conservation;
    - (b) Disconnection of rooftop runoff;
    - (c) Disconnection of non-rooftop runoff;
    - (d) Sheet flow to buffers;
    - (e) Grass channels; and
    - (f) Environmentally sensitive development and Low Impact Development (LID) practices;
  - (2) The use of nonstructural stormwater management practices shall be encouraged to minimize the reliance on structural BMPs.
  - (3) The minimum control requirements listed in Section 4.1 of this ordinance may be reduced when nonstructural stormwater management practices are incorporated into site designs according to the Design Manual.
  - (4) The use of nonstructural stormwater management practices may not conflict with existing State or local laws, ordinances, or policies.
  - (5) Nonstructural stormwater management practices used to reduce the minimum control requirements must be recorded and remain unaltered by subsequent property owners. Prior approval from the Responsible Authority shall be obtained before nonstructural stormwater practices are altered.
- B. Structural Stormwater Management Measures.

- (1) The following structural stormwater management practices or "Stormwater Treatment Practices" shall be designed according to the Design Manual to satisfy the applicable minimum control requirements established in Section 4.1 of this ordinance.
  - (a) Primary Treatment Practices, including stormwater ponds, stormwater wetlands, stormwater infiltration practices, stormwater filtering practices, and water quality swales.
  - (b) Combination of primary treatment practices and secondary treatment practices.
  - (c) Multiple secondary treatment practices, at the discretion of the Responsible Authority.
- (2) The performance criteria specified in the Design Manual with regard to general feasibility, conveyance, pretreatment, treatment and geometry, environment and landscaping, and maintenance shall be considered when selecting structural stormwater management practices.
- (3) Structural stormwater management practices shall be selected to accommodate the unique hydrologic or geologic regions of the state.
- C. Alternative structural and nonstructural stormwater management practices may be used for new development water quality control if they meet the performance criteria established in the Design Manual. Practices used for redevelopment projects shall be approved by the Responsible Authority.
- D. For the purposes of modifying the minimum control requirements or design criteria, the owner/developer shall submit at the request of the Responsible Authority an analysis of the impacts of stormwater flows downstream in the watershed. The analysis shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications of the proposed development upon a dam, highway, structure, or natural point of restricted stream flow. The point of investigation is to be established with the concurrence of the Responsible Authority.

#### 4.3 Specific Design Criteria

The basic design criteria, methodologies, and construction specifications, subject to the approval of the Responsible Authority, shall be those of the Design Manual.

#### 4.4 Single Family Residence Lot Level Controls

Construction of single family residences that results in the disturbance of less than 1 acre of land must minimize or disconnect impervious area runoff from the public storm drainage system by implementing stormwater management measures designed in accordance with the Design Manual. The applicant shall submit evidence on a form prescribed by the Responsible Official that the requirements of Section 4.4 have been met prior to issuance of a building permit.

#### 5.0 STORMWATER MANAGEMENT PLANS

#### 5.1 Review and Approval of Stormwater Management Plans

A. For any proposed development, the developer shall submit a stormwater management plan or waiver application to the Responsible Authority for review and approval, unless otherwise exempted. The stormwater management plan shall contain supporting computations, drawings, and sufficient information describing the manner, location, and type of measures in which stormwater runoff will be managed from the entire development. The Responsible Authority shall

review the plan to determine compliance with the requirements of this ordinance prior to approval. The plan shall serve as the basis for all subsequent construction.

B. Notification of approval or reasons for disapproval or modification shall be given to the applicant within [time frame] after submission of the completed stormwater plan. If a decision is not made within [time frame] the applicant shall be informed of the status of the review process and the anticipated completion date. The stormwater management plan shall not be considered approved without the inclusion of the signature and date of signature of the responsible official on the plan.

#### 5.2 Contents of the Stormwater Management Plan

A. The developer is responsible for submitting a stormwater management plan that meets the design requirements of this ordinance. The plan shall be accompanied by a report that includes sufficient information to evaluate the environmental characteristics of affected areas, the potential impacts of the proposed development on water resources, and the effectiveness and acceptability of measures proposed for managing stormwater runoff. An engineer licensed in Connecticut shall certify on the drawings that all clearing, grading, drainage, construction, and development shall be conducted in strict accordance with the plan. If a stormwater management plan involves direction of some or all runoff off of the site, it is the responsibility of the developer to obtain from adjacent property owners any easements or necessary property interests concerning flowage of water. Approval of a stormwater management plan does not create or affect any right to direct runoff onto adjacent property without that property owner's permission.

The minimum information submitted for support of a stormwater management plan or application for a waiver shall be as follows:

- B. Reports submitted for stormwater management plan approval shall include:
  - (1) A brief narrative description of the project;
  - (2) Geotechnicial investigations including soil maps, borings, site-specific recommendations, and any additional information necessary for the proposed stormwater management design;
  - (3) Descriptions of all watercourses, impoundments, and wetlands on or adjacent to the site or into which stormwater directly flows;
  - (4) Hydrologic computations, including drainage area maps depicting pre development and post development runoff flow path segmentation and land use that demonstrate compliance with Section 4.0 of this ordinance;
  - (5) Hydraulic computations;
  - (6) Structural computations;
  - (7) Hydrologic sizing criteria computations according to the Design Manual; and
  - (8) Any other information required by the Responsible Authority.
- C. Construction drawings submitted for stormwater management plan approval shall include the following:
  - (1) A vicinity map;
  - (2) Topography survey showing existing and proposed contours, including the area necessary to determine downstream analysis for proposed stormwater management facilities;
  - (3) Any proposed improvements including location of buildings or other structures, impervious surfaces, storm drainage facilities, and all grading;

- (4) The location of existing and proposed structures and utilities;
- (5) Any easements and rights-of-way;
- (6) The delineation, if applicable, of the 100-year floodplain and any on-site wetlands;
- (7) Structural and construction details for all components of the proposed drainage system or systems, and stormwater management facilities.
- (8) All necessary construction specifications;
- (9) A sequence of construction;
- (10) Data for total site area, disturbed area, new impervious area, and total impervious area;
- (11) A table showing the hydrologic sizing criteria volumes described in the Design Manual;
- (12) A table of materials to be used for stormwater management facility planting;
- (13) All soil boring logs and locations;
- (14) A maintenance schedule;
- (15) Certification by a Connecticut certified engineer that all stormwater management construction will be done according to this plan;
- (16) An as-built certification signature block to be executed after project completion; and
- (17) Any other information required by the Responsible Authority.

#### 5.3 Preparation of the Stormwater Management Plan

- A. A professional engineer licensed in the State shall design and prepare a stormwater management plan as necessary to protect the public and the environment.
- B. If a stormwater treatment practice requires either a dam safety permit from DEP or approval from the Inland Wetlands and Watercourses Agency, the Responsible Authority shall require that a professional engineer licensed in the State prepare the design.

#### 6.0 PERMITS

#### 6.1 Permit Requirement

A building permit may not be issued for any parcel or lot unless a stormwater management plan has been approved or waived by the Responsible Authority as meeting all the requirements of this ordinance. Where appropriate, a building permit may not be issued without:

- A. Recorded easements for the stormwater management facility and easements to provide adequate access for inspection and maintenance from a public right-of-way;
- B. A recorded stormwater management maintenance agreement;
- C. A cash bond; and
- D. Permission from adjacent property owners as necessary.

#### 6.2 Permit Fee

A non-refundable permit fee will be collected at the time the stormwater management plan or application for waiver is submitted. The permit fee will provide for the cost of plan review, administration, and management of the permitting process, and inspections by the Responsible Authority of all projects subject

to this ordinance. A permit fee schedule shall be established by the Responsible Authority based upon the relative complexity of the project and may be amended from time to time.

#### **6.3** Permit Suspension and Revocation

Any building permit issued by the Responsible Authority may be suspended or revoked after written notice is given to the permittee for any of the following reasons:

- A. Any violation(s) of the conditions of the stormwater management plan approval.
- B. Changes in site runoff characteristics upon which an approval or waiver was granted.
- C. Construction is not in accordance with the approved plan.
- D. Noncompliance with correction notice(s) or stop work order(s) issued for the construction of the stormwater management facility.
- E. An immediate danger exists in a downstream area in the opinion of the Responsible Authority.

#### **6.4** Permit Conditions

In granting the plan approval, the Responsible Authority may impose such conditions that may be deemed necessary to ensure compliance with the provisions of this ordinance and the preservation of the public health and safety.

#### 7.0 CASH BOND

The Responsible Authority shall require from the developer a cash bond prior to the issuance of any building permit for the construction of a development requiring a stormwater management facility. The amount of the security shall not be less than the total estimated construction cost of the stormwater management facility. The bond required in this section shall include provisions relative to forfeiture for failure to complete work specified in the approved stormwater management plan, compliance with all of the provisions of this ordinance, and other applicable laws and regulations, and any time limitations. The bond shall not be fully released without a final inspection of the completed work by the Responsible Authority, submission of "as-built" plans, and certification of completion by the Responsible Authority that the stormwater management facilities comply with the approved plan and the provisions of this ordinance. A procedure may be used to release parts of the bond held by the Responsible Authority after various stages of construction have been completed and accepted by the Responsible Authority. The procedures used for partially releasing performance bonds must be specified by the Responsible Authority in writing prior to stormwater management plan approval.

[1) a cash bond posted within the Town treasury or 2) a surety bond that the town could investigate/approve. Language should be consistent with language currently under review/development by Town Counsel.]

The bond requirement under this ordinance may be waived by the Responsible Authority provided that a bond is required by another agency in the amount equal to or greater than the total estimated construction cost of the stormwater management facilities for the project.

#### 8.0 INSPECTION

#### 8.1 Inspection Schedule and Reports

- A. The developer shall notify the Responsible Official at least 48 hours before commencing any work in conjunction with the stormwater management plan and upon completion of the project when a final inspection will be conducted.
- B. The developer shall retain a professional engineer licensed in the State to conduct inspections. Written inspection reports shall be made of the periodic inspections necessary during construction of stormwater management systems to ensure compliance with the approved plans.
- C. Written inspection reports shall be provided by the developer's engineer to the Responsible Authority on a standard form provided by the Town.
- D. The owner/developer and on-site personnel shall be notified in writing when violations are observed. Written notification shall describe the nature of the violation and the required corrective action.
- E. No work shall proceed until the Responsible Authority approves the work previously completed. The inspector shall provide the developer and Responsible Authority with the results of the inspection reports as soon as possible after completion of each required inspection.

#### 8.2 Inspection Requirements During Construction

- A. At a minimum, inspections shall be made and documented at the following specified stages of construction:
  - (1) For stormwater ponds:
    - (a) Upon completion of excavation to sub-foundation and when required, installation of structural supports or reinforcement for structures, including but not limited to:

- (i) Core trenches for structural embankments
- (ii) Inlet and outlet structures, anti-seep collars or diaphragms, and watertight connectors on pipes; and
- (iii) Trenches for enclosed storm drainage facilities;
- (b) During placement of structural fill, concrete, and installation of piping and catch basins;
- (c) During backfill of foundations and trenches;
- (d) During embankment construction; and
- (e) Upon completion of final grading and establishment of permanent stabilization.
- (2) For stormwater wetlands at the stages specified for pond construction in 8.2 A (1) of this section, during and after wetland reservoir area planting, and during the second growing season to verify a vegetation survival rate of at least 50 percent.
- (3) For infiltration trenches:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems and observation wells;
  - (c) During placement of geotextiles and all filter media;
  - (d) During construction of appurtenant conveyance systems such as diversion structures, pre-filters and filters, inlets, outlets, and flow distribution structures; and
  - (e) Upon completion of final grading and establishment of permanent stabilization;
- (4) For infiltration basins at the stages specified for pond construction in 8.2 A (1) of this section and during placement and backfill of underdrain systems.
- (5) For filtering systems:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems;
  - (c) During placement of geotextiles and all filter media;
  - (d) During construction of appurtenant conveyance systems such as flow diversion structures, pre-filters and filters, inlets, outlets, orifices, and flow distribution structures; and
  - (e) Upon completion of final grading and establishment of permanent stabilization.
- (6) For open channel systems:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems for dry swales;
  - (c) During installation of diaphragms, check dams, or weirs; and
  - (d) Upon completion of final grading and establishment of permanent stabilization.
- (7) For nonstructural practices upon completion of final grading, the establishment of permanent stabilization, and before issuance of use and occupancy approval.
- (8) For secondary treatment practices, including subsurface manufactured devices:

- (a) During excavation to subgrade;
- (b) During placement and backfill of treatment unit;
- (c) During construction of appurtenant conveyance systems such as diversion structures, pre-filters and filters, inlets, outlets, and flow distribution structures; and
- (e) Upon completion of final grading and establishment of permanent stabilization;
- B. The Responsible Authority may, for enforcement purposes, use any one or a combination of the following actions:
  - (1) A notice of violation shall be issued specifying the need for a violation to be corrected if the stormwater management plan noncompliance is identified;
  - (2) A stop work order shall be issued for the site by the Responsible Authority if a violation persists;
  - (3) Bonds or securities may be withheld or the case may be referred for legal action if reasonable efforts to correct the violation have not been undertaken; or
  - (4) In addition to any other sanctions, a civil action or criminal prosecution may be brought against any person in violation of the Stormwater Management subtitle or this ordinance.
- C. Any step in the enforcement process may be taken at any time, depending on the severity of the violation.
- D. Once construction is complete, as-built plan certification shall be submitted by a professional engineer licensed in the State to ensure that constructed stormwater management practices and conveyance systems comply with the specifications contained in the approved plans. At a minimum, as-built certification shall include a set of drawings comparing the approved stormwater management plan with what was constructed the Responsible Authority may require additional information.

#### 9.0 MAINTENANCE

#### 9.1 Maintenance Inspection

- A. The owner (or the developer during construction) shall ensure that all stormwater management systems are inspected for performance of preventative maintenance. Inspection shall occur during the first year of operation and at least once every 3 years thereafter. In addition, a maintenance agreement between the owner and the Responsible Authority shall be executed for privately owned stormwater management systems as described in 9.2 of this section.
- B. The owner (or the developer during construction) shall maintain inspection reports for all stormwater management systems.
- C. Inspection reports for stormwater management systems shall include the following:
  - (1) The date of inspection;
  - (2) Name of inspector;
  - (3) The condition of:
    - (a) Vegetation or filter media;
    - (b) Fences or other safety devices;

- (c) Spillways, valves, or other control structures;
- (d) Embankments, slopes, and safety benches;
- (e) Reservoir or treatment areas;
- (f) Inlet and outlet channels or structures;
- (g) Underground drainage;
- (h) Sediment and debris accumulation in storage and forebay areas;
- (i) Any nonstructural practices to the extent practicable; and
- (j) Any other item that could affect the proper function of the stormwater management system.
- (4) Description of needed maintenance.
- D. After notification is provided to the owner of any deficiencies discovered from an inspection of a stormwater management system, the owner shall have 30 days or other time frame mutually agreed to between the Responsible Authority and the owner to correct the deficiencies. The Responsible Authority shall then conduct a subsequent inspection to ensure completion of the repairs.
- E. If repairs are not undertaken or are not done properly, then enforcement procedures following 9.2 C of this section shall be followed by the Responsible Authority
- F. If, after an inspection by the Responsible Authority, the condition of a stormwater management facility presents an immediate danger to the public health or safety, because of an unsafe condition or improper maintenance, the Responsible Authority shall take such action as may be necessary to protect the public and make the facility safe. Any cost incurred by (City Name) shall be assessed against the owner(s), as provided in Section 9.2 C.

# 9.2 Maintenance Agreement

- A. Prior to the issuance of any building permit for which stormwater management is required, the Responsible Authority shall require the applicant or owner to execute an inspection and maintenance agreement binding on all subsequent owners of land served by a private stormwater management facility. Such agreement shall provide for access to the facility at reasonable times for regular inspections by the Responsible Authority or its authorized representative to ensure that the facility is maintained in proper working condition to meet design standards.
- B. The applicant and/or owner shall record the agreement in the land records of (City Name).
- C. The agreement shall also provide that, if after notice by the Responsible Authority to correct a violation requiring maintenance work, satisfactory corrections are not made by the owner(s) within a reasonable period of time (30 days maximum), the Responsible Authority may perform all necessary work to place the facility in proper working condition. The owner(s) of the facility shall be assessed the cost of the work and any penalties. This may be accomplished by placing a lien on the property, which may be placed on the tax bill and collected as ordinary taxes by the County/Municipality.

#### 9.3 Maintenance Responsibility

A. The owner of the property on which work has been done pursuant to this ordinance for private stormwater management facilities, or any other person or agent in control of such property, shall maintain in good condition and promptly repair and restore all grade surfaces, walls, drains, dams and structures, vegetation, erosion and sediment control measures, and other protective devices. Such repairs or restoration and maintenance shall be in accordance with approved plans.

B. A maintenance schedule shall be developed for the life of any stormwater management facility and shall state the maintenance to be completed, the time period for completion, and who shall perform the maintenance. This maintenance schedule shall be printed on the approved stormwater management plan.

#### 10.0 APPEALS

Any person aggrieved by the action of any official charged with the enforcement of this ordinance, as the result of the disapproval of a properly filed application for a permit, issuance of a written notice of violation, or an alleged failure to properly enforce this ordinance in regard to a specific application, shall have the right to appeal in a manner prescribed in the regulations and procedures of the Responsible Authority and the State of Connecticut.

#### 11.0 SEVERABILITY

If a court of competent jurisdiction holds any portion of this ordinance invalid or unconstitutional, such portion shall not affect the validity of the remaining portions of this ordinance. It is the intent of (City Name) that this ordinance shall stand, even if a section, subsection, sentence, clause, phrase, or portion may be found invalid.

#### 12.0 PENALTIES

Any person convicted of violating the provisions of this ordinance shall be guilty of a misdemeanor, and upon conviction thereof, shall be subject to a fine of not more than Five Thousand Dollars (\$5,000.00) or imprisonment not exceeding 1 year or both for each violation with costs imposed in the discretion of the court. Each day that a violation continues shall be a separate offense. In addition, the Responsible Authority may institute or cause to be instituted injunctive, mandamus or other appropriate action or proceedings of law to correct violations of this ordinance. Any court of competent jurisdiction shall have the right to issue temporary or permanent restraining orders, injunctions or mandamus, or other appropriate forms of relief.

#### 13.0 EFFECTIVE DATE

And be it further enacted, that this ordinance shall take effect [number] days from the date it becomes adopted.



# ATTACHMENT B

Tolland Zoning Regulation Amendments Low Impact Development

# ARTICLE XXIV LOW IMPACT DEVELOPMENT

The Town of Tolland requires that Low Impact Development techniques be implemented on all development projects within the boundaries of the Town to protect high quality wetlands, watercourses, open water bodies and other sensitive areas from the impacts of point and non-point sources of storm water due to land development projects.

The concept of Low Impact Development (LID) utilizes many tools to reduce the impact of development on the environment. A primary benefit of LID is a better balance between Conservation of Natural Resources, growth, ecosystem protection and the public health.

#### A. Goals of Low Impact Development

- Preserve Open Space within developments by using Cluster and Open Space subdivision standards as found in Section 170-38 of these regulations.
- Incorporate natural site elements (ridge lines, significant trees, open meadows, suitable soils for infiltration, wetlands and streams) into the design as features.
- Minimize land clearing and disturbance and increase natural landscape buffers at the limit of development to improve storm water management.
- Incorporate decentralized storm water management systems in to the site design, treat storm water runoff at its source, disconnect impervious areas.
- Maintain pre-development Times of Concentrations for post-development runoff Maintain sheet flow to the maximum extent possible, avoid concentrating runoff, reduce runoff volumes by infiltration.
- Provide water quality treatment to remove pollutants from storm water, pollution, modify human activities to reduce the introduction of pollutants into the environment.
- Encourage public education and participation in environmental protection within the community

#### B. Benefits of Low Impact Development

There are many benefits associated with the use of Low Impact Development for all of the stakeholders in the development field. The three stakeholders in the development field are the environment, the municipality, and the developer. The benefits of LID for each stakeholder are stated below.

#### 1. Environmental Benefits:

- Preserve the biological and ecological integrity of natural systems through the preservation of trees and natural vegetation,
- Protect the water quality by reducing sediment, nutrient and toxic loads to wetland/watercourse aquatic environments and also terrestrial plants and animals.

#### 2. Municipality Benefits:

- Increase collaborative public/private partnerships on environmental protection by the protection of regional flora and fauna.
- Balance Growth needs with environmental protections.
- Reduce municipal infrastructure and utility maintenance costs (roads, and storm water drainage systems)

#### 3. Developer Benefits:

- Reduce land clearing and earth disturbance costs, reduce infrastructure costs (roads, storm water conveyance and treatment systems)
- Reduce storm water management costs by the reduction of structural components of a drainage system.
- Increase quality of building lots and community marketability.

# C. Low Impact Development Strategies

- 1. Vegetation and Soils:
  - Retain native forest cover on undeveloped sites, restore vegetated area on previously cleared sites when possible as vegetation captures rainfall, thus increasing evapotranspiration and infiltration.

#### 2. Site Design:

- Define and locate Critical Resource areas, such as wetlands/watercourses, unusual forest features, and soils with moderate to high infiltrative capacities, locate roads, driveways, parking areas, home sites and other buildings away from critical resource areas
- Minimize impervious surfaces such as roads, driveways, parking areas, and roof tops. Eliminate direct discharges of runoff from impervious areas to wetlands and watercourses

#### 3. Storm Water Management:

- Reduce reliance on the use of traditional storm water collection and conveyance systems (catch basins, pipes, and detention basins) and use small scale storm water management systems, such as bioretention, and rain gardens. Integrate source storm water controls during the design process.
- Create a site design that slows runoff from rainfall events and increases the
  amount of time that runoff stays on the site. Incorporate multiple Low Impact
  Development treatment systems in a treatment train to increase the
  redundancy of the system to reduce the possibility of system failure

#### 4. Education and Maintenance

 Develop reliable long-term maintenance protocols for LID systems with built in enforcement provisions.  Educate homeowners, building owners and landscape contractors on the appropriate maintenance requirements for LID systems

# D. Types of LID Storm Water Systems:

- 1. Vegetated Systems:
  - Vegetated Buffers, Rain Gardens, Bioretention Systems, Water Quality Swales (wet and dry), Grass Filter Strips, Vegetated Level Spreaders, and Vegetated Roofs
- 2. Infiltration Systems:
  - Soil Amendments, Surface Sand Filters, Underground Sand Filters, Gravel Infiltration Trenches, Underground Infiltration Systems, (large diameter perforated PVC pipes and galleries), and Tree Wells
- 3. Surface Treatment Systems:
  - Permeable Pavement, Permeable Concrete, Concrete or PVC Pavers with gravel or grass surface
- 4. Storm Water Ponds and Wetland Systems:
  - Wet Ponds, Multiple Ponds in series, Gravel Wetland Systems, Micropool extended detention pond, Shallow Wetlands, Pond/wetland system, and Extended detention ponds

Refer to Town of Tolland Design Manual for more information on individual systems.

## References:

- 1. Low-Impact Development Design Strategies An Integrated Design Approach
  Prepared by: Prince George's County, Maryland; Department of Environmental
  Resources, Programs and Planning Division; June 1999
- 2. Low-Impact Development Hydrologic Analysis

Prepared by: Prince George's County, Maryland; Department of Environmental Resources, Programs and Planning Division; July 1999

3. LOW IMPACT DEVELOPMENT – Technical Guidance Manual for Puget Sound; January 2005

Prepared by Puget Sound Action Team * Washington State University Pierce County Extension

- 4. 2004 Connecticut Stormwater Quality Manual by the Connecticut Department of Environmental Protection
- 5. 2002 Connecticut Guidelines for Soil Erosion and Sediment Control by The Connecticut Council on Soil and Water Conservation in Cooperation with the Connecticut Department of Environmental Protection



# ATTACHMENT C

Example LID Site Design Credit System



# LOW IMPACT DEVELOPMENT (LID) SITE DESIGN CREDIT SYSTEM

#### DRAFT

The Low Impact Development (LID) Site Design Credits encourage environmentally sensitive site design and Low Impact Development techniques for managing stormwater that minimize impervious surfaces and preserve natural hydrologic conditions. The credits allow project proponents to reduce or eliminate the structural stormwater BMPs otherwise required to meet Standards 3 and 4 by directing stormwater runoff to qualifying pervious surfaces that provide recharge and treatment.

# Available LID Site Design Credits

There are five types of LID credits that can be obtained:

- Credit 1 Natural Area Conservation,
- Credit 2 Environmentally Sensitive Development,
- Credit 3 Rooftop Runoff Directed to Qualifying Pervious Area,
- Credit 4 Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area,
- Credit 5 Sheet Flow to Buffer.

The credits may be used to reduce the required Groundwater Recharge Volume (GRV) and the required Water Quality Volume (WQV) provided that any pervious surfaces used to treat and infiltrate stormwater runoff meet the requirements set forth herein. A proponent of a project that is eligible for the site design credit is required to comply with all other applicable stormwater management standards. The application of these credits does not relieve the design engineer or reviewer from the standard of engineering practice associated with safe conveyance of stormwater runoff and good drainage design.

# Not Eligible for Credits

The LID Site Design Credits may <u>not</u> be applied to reduce the required Groundwater Recharge Volume and the required Water Quality Volume:

- At sites where stormwater runoff is directed to non-permeable soils, such as bedrock and soils classified as Hydrologic Soil Group D; and
- At sites with urban fill, soils classified as contaminated pursuant to the Connecticut Remediation Standards Regulations, and soils with seasonal high groundwater groundwater elevation within 2 feet of the land surface.

Sites with land uses with higher potential pollutant loads are not eligible for Credit No. 2.

Sites with land uses with higher potential pollutant loads are eligible for Credits 3 and 4, provided that no runoff from the areas or activities that may generate runoff with higher potential pollutant loads is directed to the pervious surfaces used to satisfy the credit, and provided further that the proposal satisfies all the other requirements set forth herein.



Runoff from metal roofs is only eligible for Credit 3 when the metal roof is located outside a recharge areas for public water supplies (groundwater and surface water supplies) and the building is not used for industrial purposes.

Runoff from green roofs is not eligible for Credit 3.

#### 1. Natural Area Conservation Credit

A credit is given when natural areas are conserved at development sites, thereby preserving predevelopment hydrologic and water quality characteristics. A simple WQV credit is granted for all conservation areas permanently protected under conservation easements. Under this credit, the design engineer can substract the conservation areas from the total site area when computing the water quality volume. The volumetric runoff coefficient, R, is still based upon the percent impervious cover for the entire site. As an additional incentive, the post-development curve number (CN) for all natural areas permanently protected can be assumed to be woods in good condition when calculating the total site CN.

# Minimum Criteria for Credit:

- The area shall not be disturbed during the construction process.
- The area shall be protected from having the limits of disturbance clearly shown on all construction and mitigation plans and shall be delineated in the field.
- The area shall be located within an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.
- The area shall be located on the development project site.

#### 2. Environmentally Sensitive Development Credit

This credit is given for environmentally sensitive site design techniques that "cluster development" or reduce development scale, to leave a significant amount of the site undisturbed in its natural state. If a site is designed, constructed, operated and maintained in accordance with the requirements of this credit, the credit eliminates the need for structural practices to treat the WQV (Standard 4) and GRV (Standard 5) for low density or cluster residential developments.

#### Minimum Criteria for Credit:

#### Single Lot Development

- Total site impervious cover is less than 15%.
- Lot size shall be at least 1 acre.
- Rooftop runoff is disconnected in accordance with the criteria listed in Credit 3 and qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems in accordance with the criteria listed in Credit 4.

#### Multiple Lot Development

- Total site impervious cover is less than 15%.
- Lot size shall be at least 1 acre if clustering techniques are not used.



- If clustering techniques are used, the average lot shall not be less than _____ square feet, which is the minimum residential lot size as identified in the Town of _____ Building Zone Regulations.
- Rooftop runoff is disconnected in accordance with the criteria listed in Credit 3 and qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems in accordance with the criteria listed in Credit 4.
- A minimum of 25% of the site is placed in a natural conservation area maintained by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.

# 3. Rooftop Runoff Directed to Qualifying Pervious Area Credit

This credit is available when rooftop runoff is directed to a qualifying pervious area where it can either infiltrate into the soil or flow over it with sufficient time and reduced velocity to allow for filtering. Qualifying pervious areas are relatively flat locations, where the discharge is directed via sheet flow and not as a point source discharge. The credit may be obtained by grading the site to induce sheet flow over specially designed flat vegetated areas or bioretention areas that can treat and infiltrate rooftop runoff. If rooftop runoff is adequately directed to a qualifying pervious area, the rooftop area can be deducted from total impervious area, therefore reducing the required WQV and the size of the structural treatment practices.

#### Minimum Criteria for Credit:

- To take credit for rooftop disconnection associated with a land use with higher potential pollutant loads, the rooftop runoff must not commingle with runoff from any paved surfaces or activities or areas on the site that may generate higher pollutant loads.
- Disconnection shall cause no basement seepage.
- The contributing area of the rooftop to each disconnected discharge point (gutter pipe) shall not exceed 1,000 square feet.
- The length of the qualifying pervious area shall be 75 feet or greater.
- The width of the qualifying pervious area (in feet) shall be equal to or greater than the roof length. For example, if a roof section is 20 feet wide by 50 feet long (1,000 ft2 roof), the width of the qualifying pervious area shall be at least 50 feet.
- Dry wells, rain gardens, or other filtration/infiltration treatment practices may be utilized to compensate if the disconnection length is less than 75 feet.
- Although they may abut, there shall be no overlap between qualifying pervious areas. For example, the runoff from two 1,000 square foot sections of roof must be directed to separate qualifying pervious areas. They may not be directed to the same area.
- The lot must be greater than _____ square feet.
- The slope of the qualifying pervious area shall be less than or equal to 5%.
- Where provided, downspouts must be at least 10 feet away from the nearest impervious surface to discourage reconnection to the stormwater management system.
- Where a gutter/downspout system is not used, the rooftop runoff must be designed to sheet flow at low velocity away from the structure housing the roof.
- Qualifying pervious areas should be located on relatively permeable soils (HSG "A" and "B"). A soil evaluation by a Registered Professional Engineer or soil scientist is required to confirm the soil type. The soil evaluation shall also confirm that the depth to groundwater is 2 feet or more and that the long-term saturated hydraulic conductivity of



the soil is at least 0.17 inches/hour. The soil evaluation must identify the soil texture, Hydrologic Soil Group and depth to groundwater. For saturated hydraulic conductivity, use Rawls Rates for the actual location where the qualifying pervious area is located.

- If a qualifying pervious area is located in less permeable soils (HSG "C"), the water table depth and permeability shall be evaluated by a Registered Professional Engineer to determine if a spreading device is needed to sheet flow stormwater over vegetated surfaces.
- To prevent compaction of the soil in the qualifying pervious area, construction vehicles
  must not be allowed to drive over the area. If it becomes compacted, the soil must be
  amended, tilled and revegetated to restore its infiltrative capacity once construction is
  complete.
- The qualifying pervious area may not include any wetland areas.
- The qualifying pervious area must be owned or controlled (e.g., drainage easement) by the property owner.
- For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be taken, not both.
- 4. Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area Credit

Credit is given for practices that direct runoff from impervious roads, driveways, and parking lots to pervious areas where plants provide filtration (through sheet flow) and infiltration into the soil can occur. This credit can be obtained by grading the site to promote overland vegetative filtering and infiltration. This credit is available for paved driveways, roads, and parking lots associated with all land uses, except for high-intensity parking lots that generate 1,000 or more vehicle trips per day or runoff not segregated from land uses with higher potential pollutant loads.

Disconnected impervious areas can be subtracted from the site impervious area when computing the WQV. In addition, disconnected impervious surfaces can be used to reduce the GRV.

# Minimum Criteria for Credit:

- The maximum contributing impervious flow path length shall be 75 feet.
- The length of the qualifying pervious area must be equal to or greater than the length of the contributing impervious area.
- Dry wells, rain gardens, or other filtration/infiltration treatment practices may be utilized to compensate if the site cannot meet the required length of the qualifying pervious area.
- The width of the qualifying pervious area shall be no less than the width of the contributing impervious surface. For example, if a driveway is 15 feet wide, the qualifying pervious area width shall be no less than 15 feet.
- The entire qualifying pervious area shall be on a slope less than or equal to 5%.
- The impervious area draining to any one discharge location cannot exceed 1,000 square feet.
- Qualifying pervious areas should be located on relatively permeable soils (HSGs A and B). A soil evaluation is required to confirm the soil type. The soil evaluation shall also



confirm that the depth to groundwater is 2 feet or more, and that the long term saturated hydraulic conductivity of the soil is at least 0.17 inches/hour. For saturated hydraulic conductivity, use Rawls Rates for the actual location where the qualifying pervious area is located.

- If a qualifying pervious area is located in less permeable soils (HSG C), the water table depth and permeability shall be evaluated by a Registered Professional Engineer to determine if a spreading device is needed to sheet flow stormwater over vegetated surfaces.
- To prevent compaction, construction vehicles must not be allowed to drive over the qualifying pervious area. If compacted, the soil must be amended, tilled, and revegetated once construction is complete to restore its infiltrative capacity.
- Runoff from driveways, roadways and parking lots may be directed over soft shoulders, through curb cuts, or level spreaders to qualifying pervious areas. Measures must be employed at the discharge point to the qualifying pervious area to prevent erosion and promote sheet flow.
- The qualifying pervious area may not include any wetland areas.
- The qualifying pervious area must be owned or controlled (e.g., drainage easement) by the property owner.
- For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be taken, not both.

#### 5. Sheet Flow to Buffer Credit

This credit is given when stormwater is effectively treated by a natural buffer to a stream or forested area. Effective treatment is achieved when pervious and impervious area runoff is discharged to a grass or forested buffer via overland flow. The use of a filter strip is recommended to treat overland flow in the green space of a development site. This credit includes subtracting the area draining by sheet flow to a buffer from the total area in the WQV calculation and the area draining to the buffer contributes to the GRV requirement.

#### Minimum Criteria for Credit:

- The minimum stream buffer width (i.e., perpendicular to the stream flow path) shall be 50 feet as measured from the bank elevation of a stream or the boundary of a wetland.
- The maximum contributing path shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces.
- The average contributing overland slope to and across the stream buffer shall be less than or equal to 5%.
- Runoff shall enter the stream buffer as sheet flow. A level spreading device shall be utilized where local site conditions prevent sheet flow from being maintained.
- The credit is not applicable if rooftop or non-rooftop disconnection is already provided (i.e., no double counting).
- Stream buffers shall remain unmanaged other than routine debris removal.
- Buffers shall be protected by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.



# ATTACHMENT D

**Example Stormwater Management Standards** 



#### STORMWATER MANAGEMENT STANDARDS

#### DRAFT

The following stormwater standards establish minimum stormwater management criteria for all
development and redevelopment activities in the Town of and reflect the unique
natural resources and development characteristics of the Town of These standards
encourage groundwater recharge and reduce the potential for stormwater discharges to cause or
contribute to pollution of surface water and groundwater. The standards also promote low
impact development (LID) techniques, the removal of illicit discharges to stormwater
management systems, and improved operation and maintenance of stormwater BMPs. The
standards are also consistent with the recommended stormwater management approaches and
design guidance contained in the Connecticut Department of Environmental Protection
Connecticut Stormwater Quality Manual.

# Standard 1: Stormwater Management Practices

Stormwater Management Practices shall be used to meet the conditions below for control of peak flow and total volume of runoff, water quality protection, and maintenance of on-site groundwater recharge.

- A. Stormwater management practices shall be selected to accommodate the unique hydrologic and geologic conditions of the site.
- B. Proponents shall demonstrate how the proposed control(s) will comply with these standards, including the control of peak flow and total volume of runoff, protection of water quality, and recharge of stormwater to groundwater. The proponent must provide design calculations and other back-up materials necessary.
- C. At the discretion of the Stormwater Authority, stormwater management systems shall incorporate designs that allow for shutdown and containment in the event of an emergency spill or other unexpected contamination event.
- D. Pumping of stormwater is prohibited as part of a proposed stormwater management system design because of the significant runoff volumes, maintenance requirements, standby power requirements, and overflows associated with large storms. All other feasible approaches must be investigated to avoid the use of pumps for stormwater management. If the event the Stormwater Authority determines that pumps are necessary, the proponent must submit required backup information as described in the ______ Stormwater Drainage Manual.

#### Standard 2: Low Impact Development

A. Project proponents must consider the use of environmentally-sensitive site design and Low Impact Development (LID) techniques to reduce runoff rates, volumes, and pollutant loads. The proponent shall demonstrate why the use of environmentally-sensitive site design and LID techniques is not possible before proposing to use traditional, structural stormwater management measures. Such environmentally-sensitive site design and LID techniques include, but are not limited to:



- a. Identify, map, and preserve the site's natural features and environmentally sensitive areas such as wetlands, native vegetation, mature trees, slopes, drainageways, permeable soils, flood plains, woodlands and soils to the greatest extent possible;
- b. Minimize grading and clearing;
- c. Delineate potential building envelopes, avoiding environmental resource areas and appropriate buffers by clustering buildings and reducing building footprints;
- d. Develop methods to minimize impervious surfaces, and protect and preserve open space. Reduce impervious surfaces wherever possible through alternative street design, such as omission of curbs and use of narrower streets, shared driveways and through the use of shared parking areas;
- e. Lengthen flow paths and maximize sheet flow;
- f. Use nonstructural, low-tech methods including open drainage systems, disconnection of roof runoff, and street sweeping where possible;
- g. Use native plant vegetation in buffer strips and in rain gardens (small planted depressions that can trap and filter runoff);
- h. Use drought-resistant vegetation;
- i. Manage runoff using smaller, decentralized, low-tech stormwater management techniques to treat and recharge stormwater close to the source in place of a centralized system comprised of closed pipes that direct all the drainage from the entire site into one large detention basin.
- j. Integrate management techniques into the site design to create a hydrologically functional lot or development site, including but not limited to grass swales along roads, rain gardens, buffer strips, green roofs, tree box filters, use of amended soils that will store, filter and infiltrate runoff, bioretention areas (rain gardens), rain barrels and cisterns, and permeable pavement.

[NOTE: An "LID Site Design Credit" is available to encourage proponents to incorporate LID techniques in their projects. In exchange for directing runoff from roads and driveways to vegetated open areas, preserving natural areas on development sites, or directing runoff to landscaped or undisturbed areas, the LID credit system allows developers to reduce in size or eliminate the traditional BMPs used to treat and infiltrate stormwater. By using this credit, proponents can reduce the volume of stormwater subject to the Water Quality and Groundwater Recharge Standards. The proposed LID Site Design Credits include:

- Credit 1 Natural Area Conservation
- Credit 2 Environmentally Sensitive Development
- Credit 3 Rooftop Runoff Directed to Qualifying Pervious Area
- Credit 4 Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area]



# Standard 3: Protection of Natural Hydrology

# [NOTE: These standards are further reinforced through the LID Credit System.]

- A. Site disturbance shall be minimized. The area outside the project disturbance area shall be maintained at natural grade and retaining existing, mature vegetated cover. The project disturbance area shall be depicted on the design, construction, and mitigation plans and shall be delineated in the field prior to commencing land disturbance activities. The project disturbance area shall include only the area necessary to reasonably accommodate construction activities.
- B. Soil compaction on site shall be minimized by using the smallest (lightest) equipment possible and minimizing travel over areas that will be revegetated (e.g., lawn areas) or used to infiltrate stormwater (e.g., bioretention areas). In no case shall excavation equipment be placed in the bottom of an infiltration area during construction.
- C. Development shall follow the natural contours of the landscape. A grading plan shall be submitted as part of the site plan review process showing both existing and finished grades for the proposed development. The original, natural grade of a lot shall not be raised or lowered more than 10 feet at any point for the construction of any structure or improvements. Retaining walls must comply with the requirements of the Building Zone Regulations. Basements that reach grade should be constructed as walk-outs.
- D. No ground disturbed as a result of site construction and development shall be left as exposed bare soil at project completion. All areas exposed by construction, with the exception of finished building, structure, and pavement footprints, shall be decompacted (aerated) and covered with a minimum thickness of six inches of non-compacted topsoil, and shall be subsequently planted with a combination of living vegetation such as grass, groundcovers, trees, and shrubs, and other landscaping materials (mulch, loose rock, gravel, stone).
- E. Priority shall be given to maintaining existing surface waters and systems, including, but not limited to, perennial and intermittent streams, wetlands, vernal pools, and natural swales.
- F. Where roadway or driveway crossings of surface waters cannot be eliminated, disturbance to the surface water shall be minimized, hydrologic flows shall be maintained, there shall be no direct discharge of runoff from the roadway to the surface water, and the area shall be revegetated post-construction.
- G. Roadway and driveway crossings over streams shall comply with the Connecticut Department of Environmental Protection *Stream Crossing Guidelines* (as amended) to accommodate high flows, minimize erosion, and support aquatic habitat and wildlife passage.

# Standard 4: Post-Development Peak Discharge

A. Stream Channel Protection — The two-year, 24-hour post-development peak flow rate shall be (a) less than or equal to 50 percent of two-year, 24-hour storm pre-development



- peak flow rate and (b) less than or equal to the one-year, 24-hour storm predevelopment peak flow rate. This Standard may be waived under certain conditions, as described in the *Connecticut Stormwater Quality Manual*.
- B. Conveyance Protection —The 10-year, 24-hour post-development peak flow rate shall not exceed the pre-development peak flow rate for all flows within internal and external conveyance systems associated with stormwater treatment practices.
- C. Peak Runoff Attenuation The 10-year and 25-year, 24-hour post-development peak flow rate shall not exceed the pre-development peak flow rate for all flows off-site. This Standard may be waived for sites that discharge to a large river, lake, estuary, tidal waters, or land subject to coastal storm flows, as described in the *Connecticut Stormwater Quality Manual*.
- D. Emergency Outlet Sizing size the emergency outlet to safely pass the postdevelopment peak runoff from the 100-year storm in a controlled manner without eroding the outlet works and downstream drainages and property.
- E. Measurement of peak discharge rates shall be calculated using point of discharge or the downgradient property boundary. The topography of the site may require evaluation at more than one location if flow leaves the property in more than one direction. Calculations shall include runoff from adjacent upgradient properties. A proponent may demonstrate that a feature beyond the property boundary is more appropriate as a design point.
- F. A downstream hydrologic analysis must be performed to determine whether peak flows, velocities, and hydraulic effects are attenuated by controlling the 2-year, 10-year, 25-year and 100-year, 24-hour storms. This analysis must be performed at the outlet(s) of the site and at critical downstream locations (stream confluences, culverts, other channel constrictions, and flood-prone areas) to a confluence point where the site drainage area represents 10% of the total drainage area above that point.
- G. The proponent shall provide pre- and post-development total runoff volumes. The post-development total runoff volume shall be equal to 90 to 110 percent of the pre-development total runoff volume (based on a 2-year, 10-year, 25-year, and 50-year, 24-hour storms). Calculations shall include runoff onto the project site from adjacent upgradient properties.



## Standard 5: Water Quality

- A. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspend Solids (TSS). This standard is met when:
  - a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained:
  - b. Stormwater management practices are sized to treat the Water Quality Volume or Water Quality Flow;
  - c. Appropriate pretreatment is provided in accordance with the _______
    Stormwater Drainage Manual; and
  - d. Stormwater treatment practices are maintained as designed.
- B. Compliance with the groundwater recharge requirements under Standard 6 shall be considered adequate to meet the treatment standards specified in 5.A above for the Groundwater Recharge Volume.

### Standard 6: Groundwater Recharge

Loss of annual recharge to groundwater shall be eliminated or minimized to the maximum extent practicable through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater management practices, and good operation and maintenance. At a minimum the annual recharge from the post-development site shall approximate the annual recharge from the pre-development or existing site conditions. Infiltration of stormwater runoff from land uses with higher potential pollutant loads near or to a critical area is prohibited. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to a critical area, taking into account site-specific factors.

A. For all areas covered by impervious surfaces, the total volume of recharge that must be maintained shall be calculated as follows:

[NOTE: The NRCS classifies soils into four hydrologic groups A thru D indicative of the minimum infiltration obtained for a soil after prolonged wetting. Group A soils have the lowest runoff potential and the highest infiltration rates, while Group D soils have the highest runoff potential and the lowest infiltration rates. The prescribed stormwater volume that is required to be infiltrated must be determined using existing site conditions and the infiltration rates set forth below.

## Hydrologic Group Volume to Recharge (x Total Impervious Area)

Hydrologic Group		Volume to Recharge x Total Impervious Are							
A	gravels, sand, loamy sand or sandy loam	0.6 inches of runoff							
В	silty loam	0.35 inches of runoff							
C	sandy clay loam	0.25 inches of runoff							
D	clay, silty clay loam, sandy clay, silty clay	0.10 inches of runoff							

For each NRCS Hydrologic Group on the site, the volume that must be recharged equals the recharge volume above multiplied by the total area within that NRCS Hydrologic Group



that is impervious. Infiltration of these volumes must be accomplished using appropriate BMPs. These BMPs include bioretention areas, rain gardens, dry wells, infiltration basins, infiltration chambers and galleys, infiltration trenches, leaching catch basins, and vegetated filter strips. Roof runoff may be infiltrated without any treatment, and that infiltrated volume may be used to satisfy the total recharge volume and reduce the water quality volume.

To size infiltration BMPs, proponents may use either the static method or the dynamic infiltration method. The static method assumes that the entire volume is discharged to storage instantaneously, is easy to calculate and generally results in a larger recharge volume than the dynamic method. The dynamic method assumes that that the recharge BMP is infiltrating as it fills and requires certain technical calculations that take this recharge into account when sizing the infiltration BMP.]

- B. When designing infiltration BMPs, adequate subsurface information needs to be obtained. Infiltration systems must be installed in soils capable of absorbing the recharge volume (i.e. not D soils). Surface infiltration structures must be able to drain fully within 72 hours. In addition, there must be at least a three-foot separation from the bottom of the infiltration structure and the seasonal high ground water table or bedrock/ledge. Soils under BMPs shall be scarified or tilled to improve infiltration.
- C. Pre-Treatment Requirements All runoff must be pretreated prior to its entrance into the groundwater recharge device to remove materials that would clog the soils receiving the recharge water. Pretreatment devices shall be provided for each BMP, shall be designed to accommodate a minimum of one-year's worth of sediment, shall be designed to capture anticipated pollutants, and be designed and located to be easily accessible to facilitate inspection and maintenance.
- D. Infiltration of stormwater may be prohibited or subject to additional pre-treatment requirements, at the discretion of the Stormwater Authority, for 1) land uses with higher potential pollutant loads (see Standard 7), 2) areas with soil or groundwater contamination such as brownfield sites, and 3) public drinking water aquifer recharge areas, wellhead protection areas, or water supply intake protection areas.

## Standard 7: Land Uses with Higher Potential Pollutant Loads

Stormwater discharges from land uses with higher potential pollutant loads require the use of specific source control and pollution prevention measures and specific stormwater management practices, approved by the Stormwater Authority for such use.

- A. The following uses or activities are considered "high-load areas," with the potential to contribute higher pollutant loads to stormwater, and must comply with the requirements set forth in this section.
  - a. Areas within an industrial site that are the location of activities subject to the DEP Industrial Stormwater General Permit (except where a No Exposure Certification for Exclusion from the General Permit has been executed)
  - b. Vehicle salvage yards and recycling facilities
  - c. Auto fueling facilities (gas stations and other facilities with on-site vehicle fueling)



- d. Exterior fleet storage areas (cars, buses, trucks, public works equipment)
- e. Exterior vehicle service, maintenance and equipment cleaning areas
- f. Commercial parking lots with high intensity use (1,000 vehicle trips per day or more). Such areas typically include fast food restaurants, convenience stores, high turnover (chain) restaurants, shopping centers and supermarkets.
- g. Road salt storage facilities (if exposed to rainfall)
- h. Commercial nurseries
- i. Non-residential facilities having uncoated metal roofs with a slope flatter than 20 percent.
- j. Outdoor storage and loading/unloading of hazardous substances or materials
- k. Facilities subject to chemical inventory reporting under Section 312 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), if materials or containers are exposed to rainfall)
- I. Marinas (service, painting and hull maintenance areas).
- m. Confined disposal facilities, disposal sites, landfills or wastewater residuals landfills if stormwater that may come into contact with the confined disposal area, disposal site, landfill or wastewater residuals landfill may cause or contribute to the discharge of pollutants to wetlands, surface waters or ground water or otherwise result in a release or threat of release
- n. Other land uses and activities as designated by the Stormwater Authority
- B. In addition to implementation of BMPs for designing site-specific stormwater management controls, high-load areas shall provide a stormwater pollution prevention plan (SWPPP) describing methods for source reduction and methods for pretreatment.
- C. If a high-load area demonstrates, through a SWPPP, the use of BMPs that result in no exposure of regulated substances to precipitation or runoff or release of regulated substances, it shall no longer be considered a high-load area.
- D. Infiltration of stormwater from high-load areas are prohibited within critical areas (see Standard 8). Infiltration of stormwater from high-load areas outside of critical areas (see Standard 8) is allowed. For such discharges, proponents should use one pretreatment BMP, one terminal treatment BMP, and one infiltration BMP.
- E. For high-load areas, the following stormwater management practices may be used for treatment only if lined or sealed: Sand Filters/Organic Filters (may also be used for pretreatment), Wet Retention Basins, Detention Basins, Constructed Wetlands, Bioretention Areas, including rain gardens (underdrain required).

### Standard 8: Critical Areas

- A. Critical Areas are defined as:
  - a. Shellfish growing areas,
  - b. Bathing beaches,
  - c. Recharge areas for public water supplies (groundwater and surface water supplies),
  - d. Any listed water bodies and wetlands as designated by the Town of ______.



- B. The stormwater BMPs approved for discharges to or near critical areas shall be designed to treat the Water Quality Volume (WQV) for the post-development site. These practices are included in the *Connecticut Stormwater Quality Manual* and the ______ Stormwater Drainage Manual. These stormwater discharges require the use of a treatment train that provides 80% TSS removal prior to discharge. This treatment train shall include at least one pretreatment BMP, one terminal treatment BMP, and one infiltration BMP.
- C. Infiltration of stormwater from high-load areas are prohibited within critical areas.

### Standard 9: Parking

- A. Snow may not be plowed to, dumped in, or otherwise stored within 15 feet of a wetland or waterbody, except for snow that naturally falls into this area. Snow storage areas shall be shown on the site plan to comply with these requirements.
- B. At the discretion of the Stormwater Authority, parking spaces may be required to be constructed of a pervious surface (i.e. grass, pervious asphalt, pervious pavers).
- C. Infrequently used emergency access points or routes shall be constructed with pervious surfaces (i.e. grass, pervious asphalt, pervious pavers).

## Standard 10: Redevelopment

- A. Redevelopment projects are defined to include the following:
  - a. Maintenance and improvement of existing roadways including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving;
  - b. Development, rehabilitation, expansion and phased projects on previously developed sites; and
  - c. Remedial projects specifically designed to provide improved stormwater management.
- B. Redevelopment of previously developed sites must meet Standards 3, 4, 5, and 6 to the maximum extent practicable as determined by the Stormwater Authority. To make this determination the Stormwater Authority shall consider the benefits of redevelopment as compared to development of raw land with respect to stormwater. All projects involving redevelopment or reuse activities shall also improve existing conditions.
- C. For all redevelopment projects, new stormwater controls (retrofitted or expanded) must be incorporated into the design and result in a reduction in annual stormwater pollutant loads from the site. Proponents of redevelopment projects shall make full use of all opportunities for controlling the sources of pollution and to incorporate environmentally sensitive site design and low impact development techniques. This is particularly important for constrained redevelopment sites where it is not possible to install BMPs that treat the entire water quality volume. All redevelopment projects shall also incorporate measures that will address water quantity issues by reducing the peak and total runoff from the site and by increasing groundwater recharge. Actions to improve existing conditions should address known water quality and water quantity



- problems such as documented failures to meet the Surface Water Quality Standards, low stream flow, or repeated flood events.
- D. Redevelopment activities shall not infiltrate stormwater through materials or soils containing regulated or hazardous substances or areas with soil or groundwater contamination.
- E. The portion of a property that is currently undeveloped is not a redevelopment and thus does not fall under Standard 10. Any development on previously undeveloped portions of a property must comply fully with all of the other Stormwater Management Standards.

### Standard 11: Construction Erosion and Sediment Control

- A. A plan to control construction related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) must be developed and implemented in accordance with the *Connecticut Guidelines for Soil Erosion and Sediment Control* (as amended).
- B. All development, regardless of the area of disturbance, must implement erosion and sedimentation controls prior to and during construction.

### Standard 12: Easements

- A. Where a site is traversed by or requires construction of a watercourse or drainageway, an easement of adequate width may be required for such purpose.
- B. There shall be at least a 10-foot wide permanent maintenance easement corridor on each side of any stormwater management system element, as well as at least a 10-foot wide temporary construction easement corridor contiguous with the boundaries of the permanent easement. For systems using underground pipes, the maintenance easement may need to be wider, depending on the depth of the pipe.

## Standard 13: Operation and Maintenance

A. A long-term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed. This plan shall be reviewed and approved as part of the review of the proposed permanent (post-construction) stormwater management system and incorporated in the Stormwater Management Plan. Execution of the O&M Plan shall be considered a condition of approval of a stormwater management permit application. If the stormwater management system is not dedicated to the town pursuant to a perpetual offer of dedication, the Stormwater Authority may require a project proponent to establish a homeowners association or similar entity to maintain the stormwater management system. For high-load areas or activities under Standard 7, the O&M Plan shall include implementation of a SWPPP.



- B. The O&M Plan shall at a minimum identify:
  - a. Stormwater management system(s) owners;
  - b. The party or parties responsible for operation and maintenance including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;
  - c. The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;
  - d. Plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;
  - e. Description and delineation of public safety features; and
  - f. Estimated operations and maintenance budget.
- C. The stormwater management system owner is generally considered to be the landowner of the property, unless other legally binding agreements are established.
- D. The proponent shall include with the stormwater management permit application a mechanism for implementing and enforcing the O&M Plan. The proponent shall identify the lots or units that will be serviced by the proposed stormwater BMPs. The proponent shall also provide a copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of stormwater BMPs. In the event that the stormwater BMPs will be operated and maintained by an entity, municipality, state agency or person other than the sole owner of the lot upon which the stormwater management facilities are placed, the proponent shall provide a plan and easement deed that provides a right of access for the legal entity to be able to perform said operation and maintenance functions, including inspections.

[NOTE: It is recommended that the stormwater management permit include a condition requiring that the responsible party provide a copy of the permit approval and the legal instrument to each unit or lot owner at or before the purchase of each unit or lot to be serviced by the stormwater BMPs.]

- E. The owner shall keep the O&M Plan current, including making modifications to the O&M Plan as necessary to ensure that BMPs continue to operate as designed and approved. Proposed modifications of O&M Plans including, but not limited to, changes in inspection frequency, maintenance schedule, or maintenance activity along with appropriate documentation, shall be submitted to the Stormwater Authority for review and approval within thirty days of change.
- F. Parties responsible for the operation and maintenance of a stormwater management system shall keep records of the installation, maintenance and repairs to the system, and shall retain records for at least five years.
- G. Parties responsible for the operation and maintenance of a stormwater management system shall provide records of all maintenance and repairs during inspections and/or upon request.
- H. When the responsible party fails to implement the O&M Plan, including, where applicable, the SWPPP, the municipality is authorized to assume responsibility for their



implementation and to secure reimbursement for associated expenses from the responsible party, including, if necessary, placing a lien on the subject property.

## Standard 14: Stormwater Management Plan

A. All stormwater management permit applications must include a Stormwater Management Plan. This plan shall document how the proposed project complies with the stormwater standards and must be submitted with the stamp and signature of a Professional Engineer (PE) licensed in the State of Connecticut.

## Standard 15: Illicit Discharges

A. All illicit discharges to the stormwater management system are prohibited.

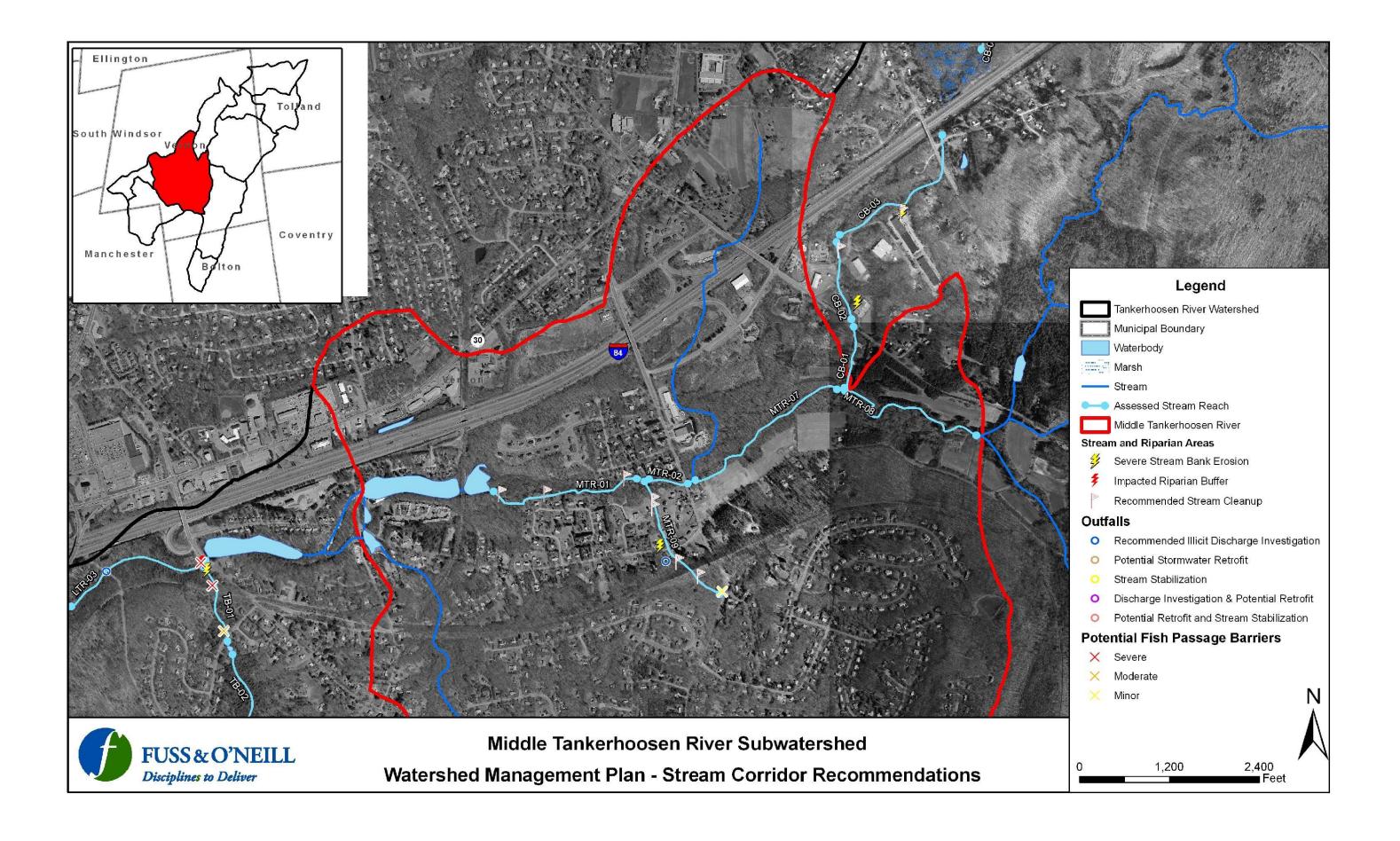
[NOTE: The stormwater management system is the system for conveying, treating, and infiltrating stormwater on site including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities:

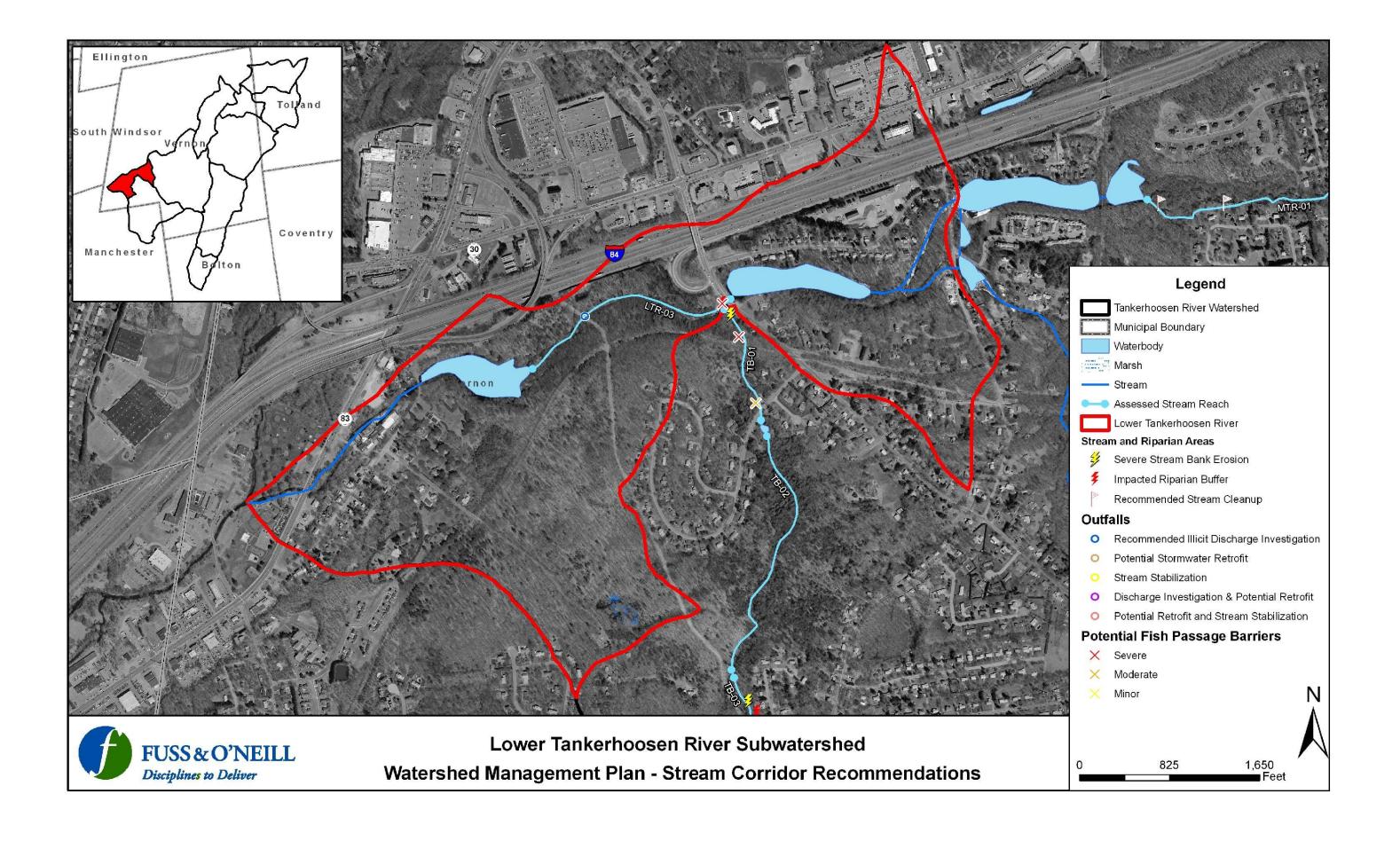
- Landscape irrigation,
- Uncontaminated groundwater discharges such as pumped groundwater, foundation drains, water from crawl space pumps, and footing drains,
- Irrigation water,
- Lawn watering runoff,
- Residual street wash water,
- Discharges of uncontaminated air conditioner condensate,
- Discharges of flows from fire fighting activities,
- Discharges containing no chemical additives (including chlorine) from the flushing of fire protection systems, and
- Naturally occurring discharges such as rising groundwater, uncontaminated groundwater infiltration, springs, and flows from riparian habitats and wetlands.]

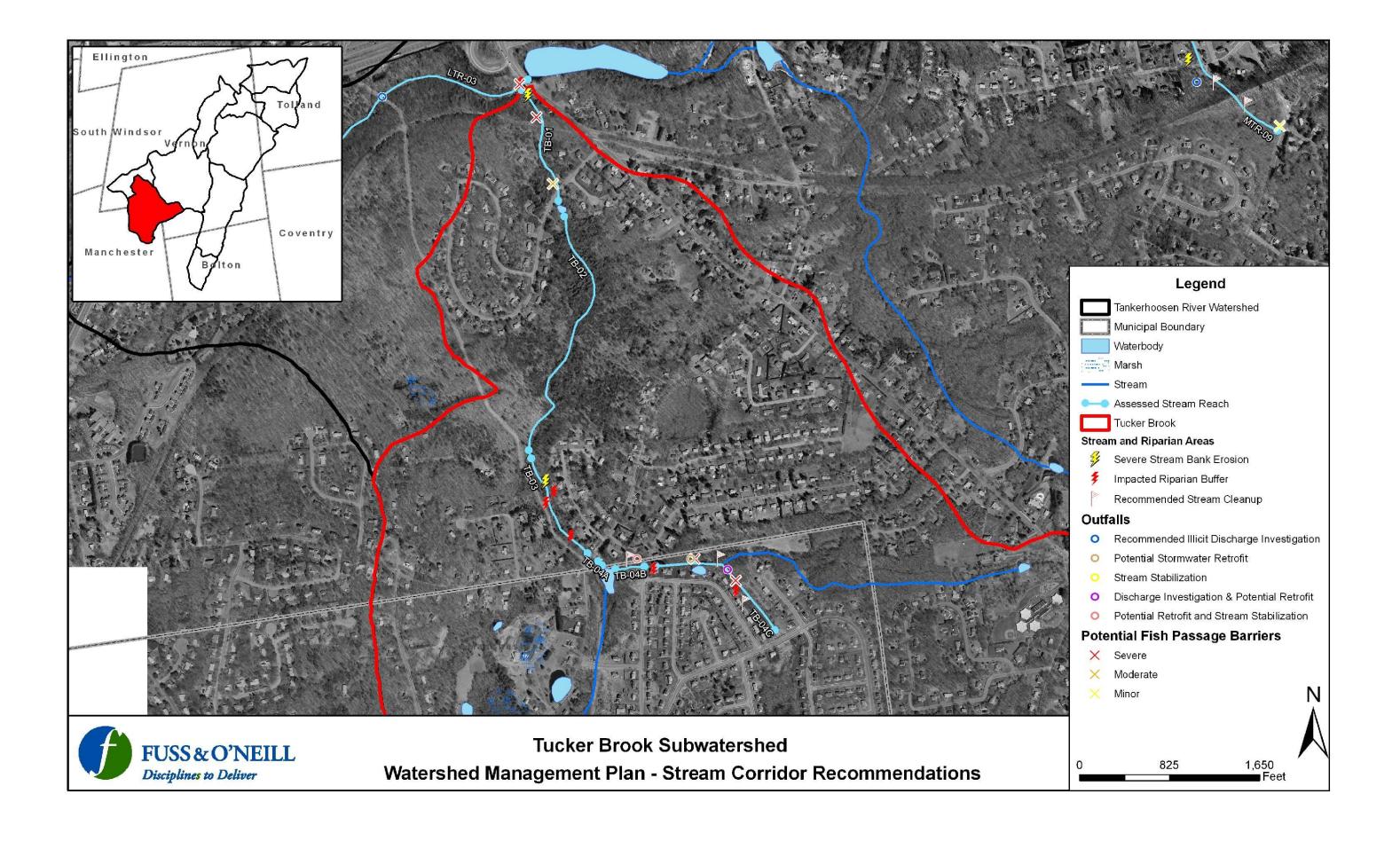


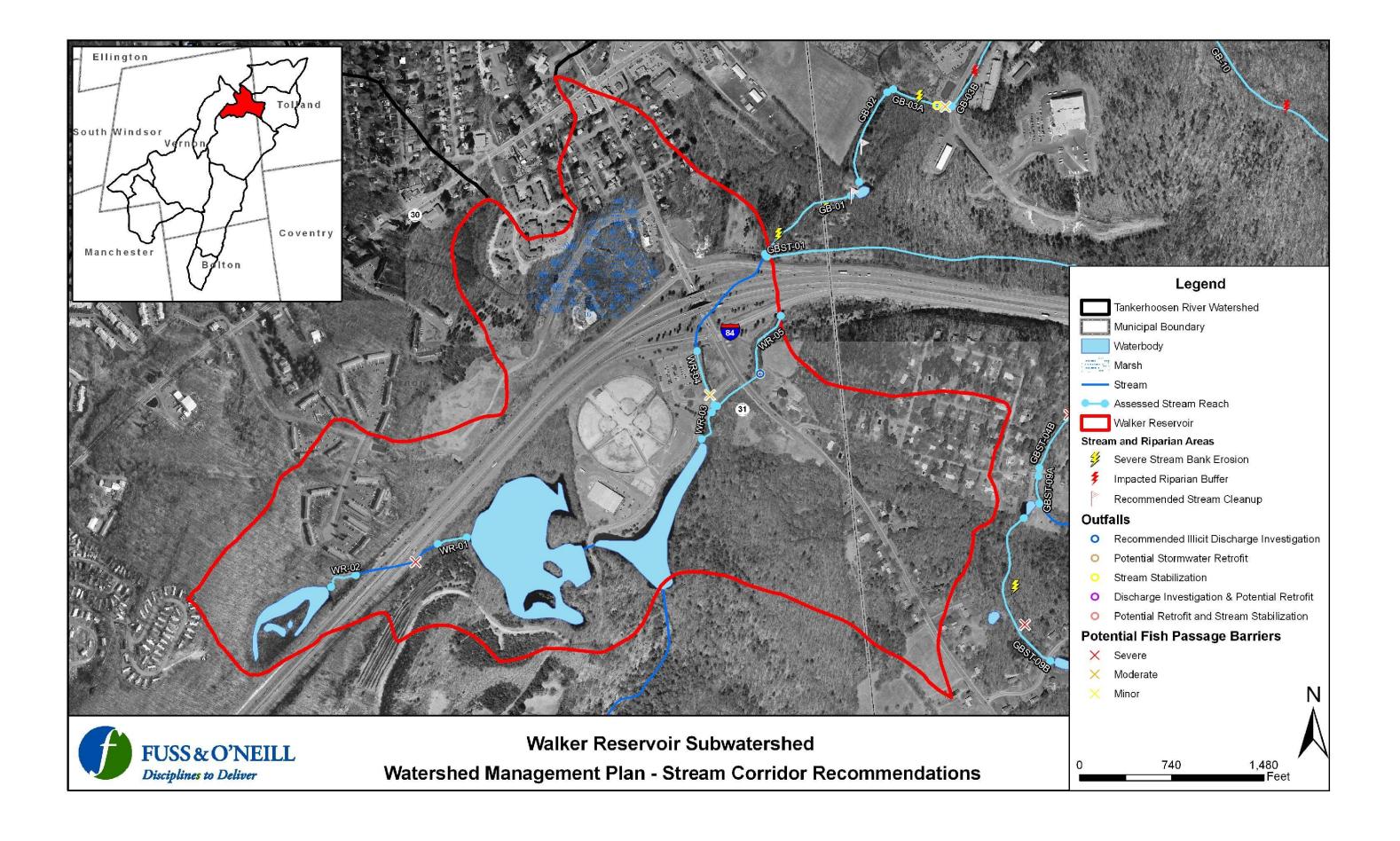
# **Appendix C**

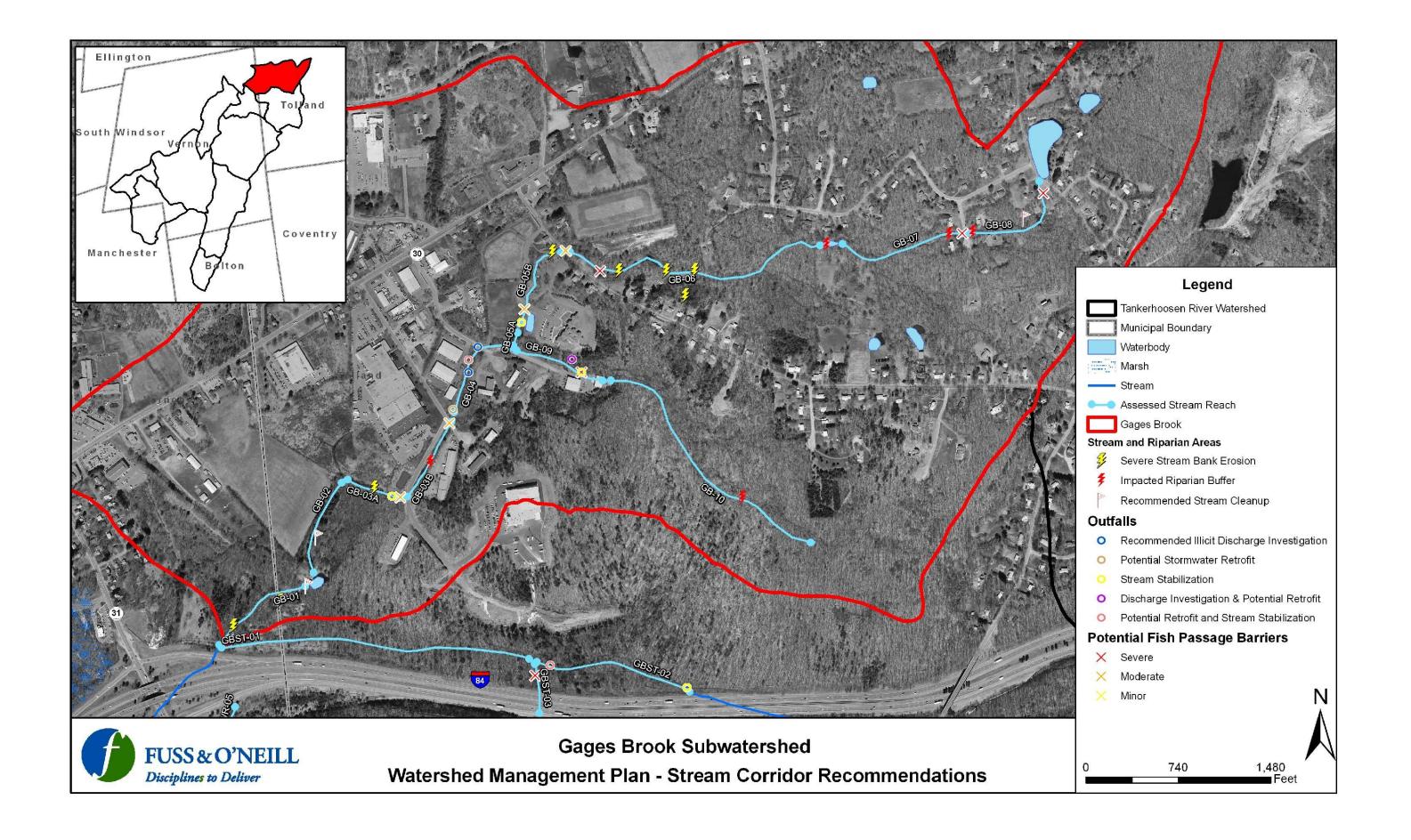
**Targeted Stream Corridor Recommendations** 

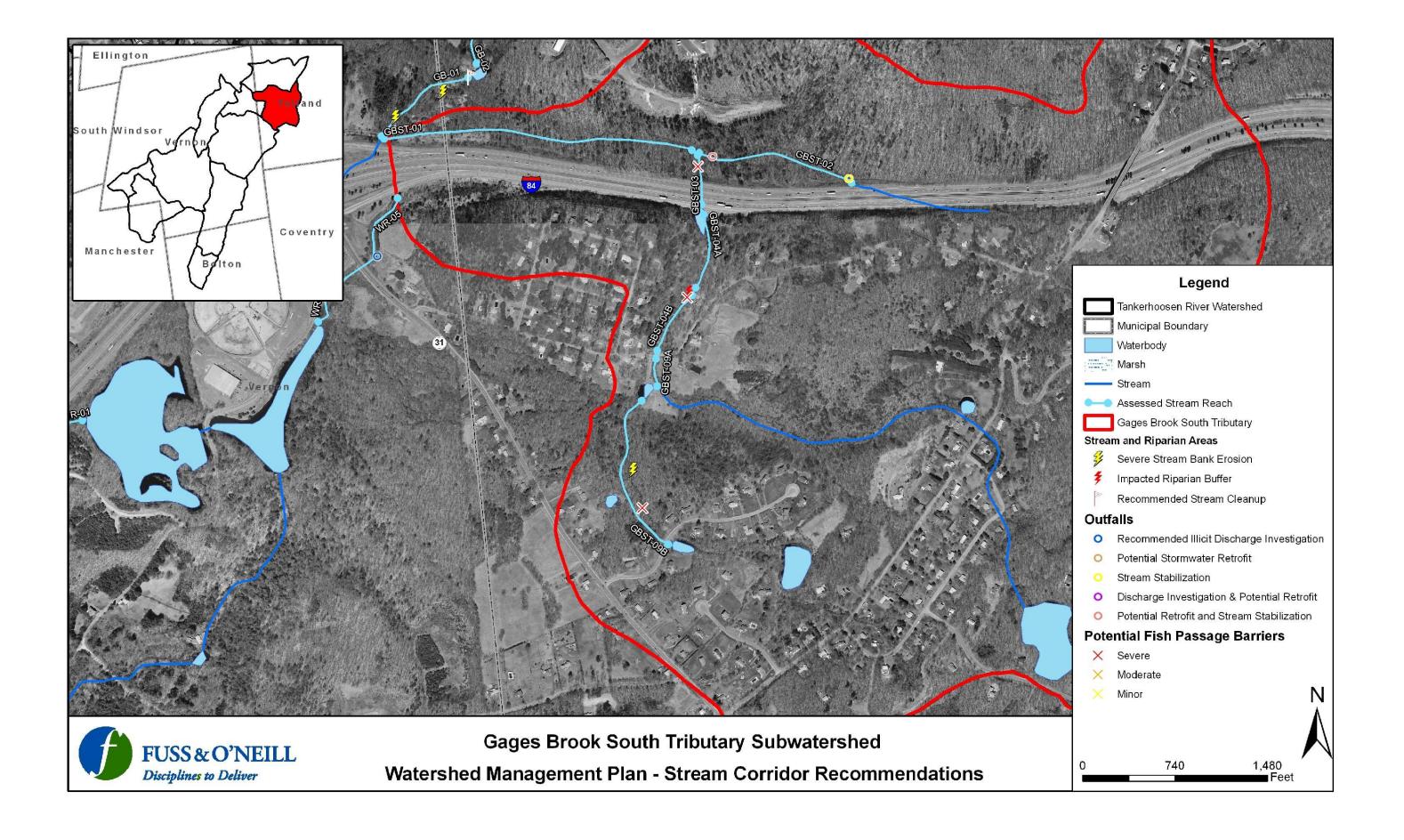


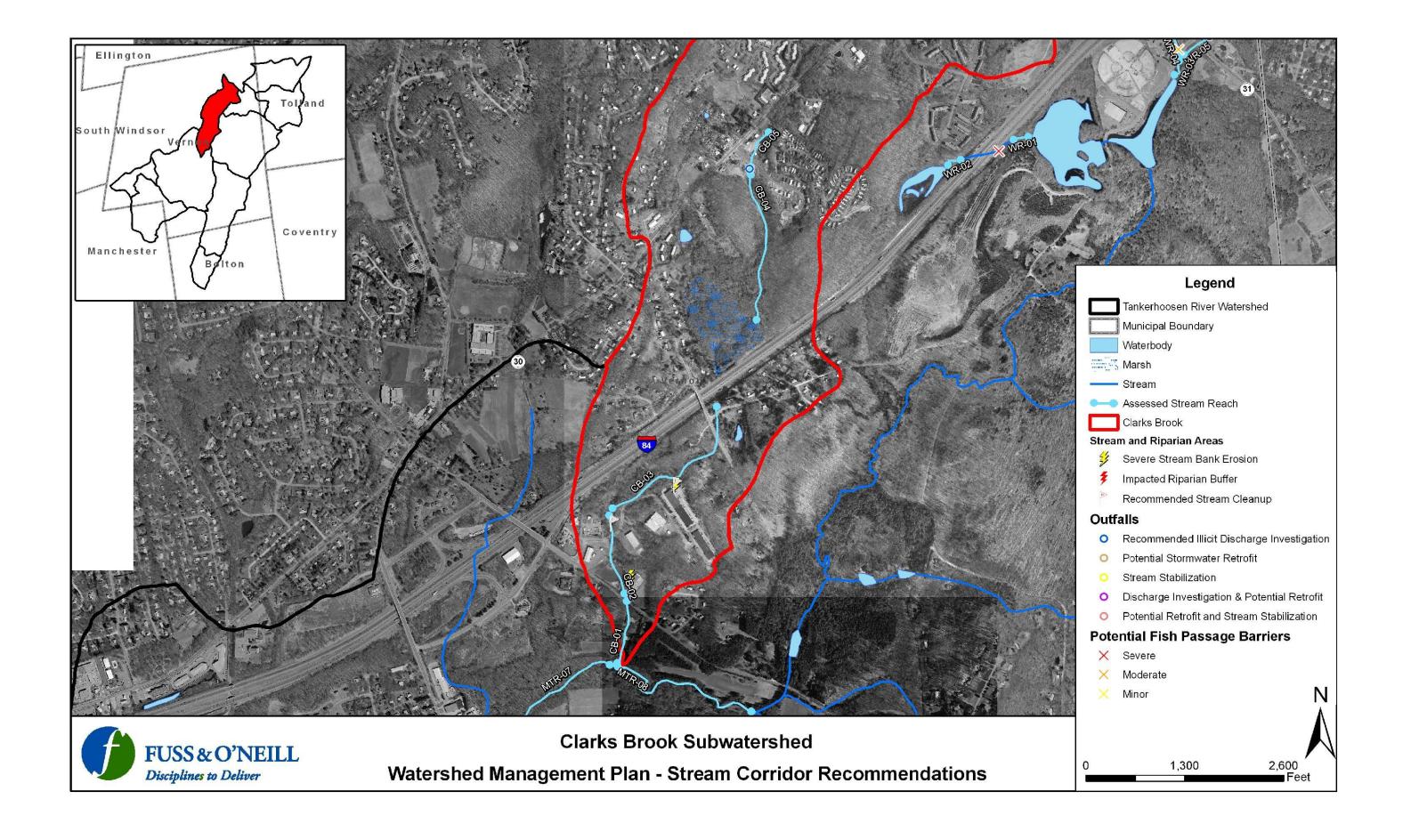








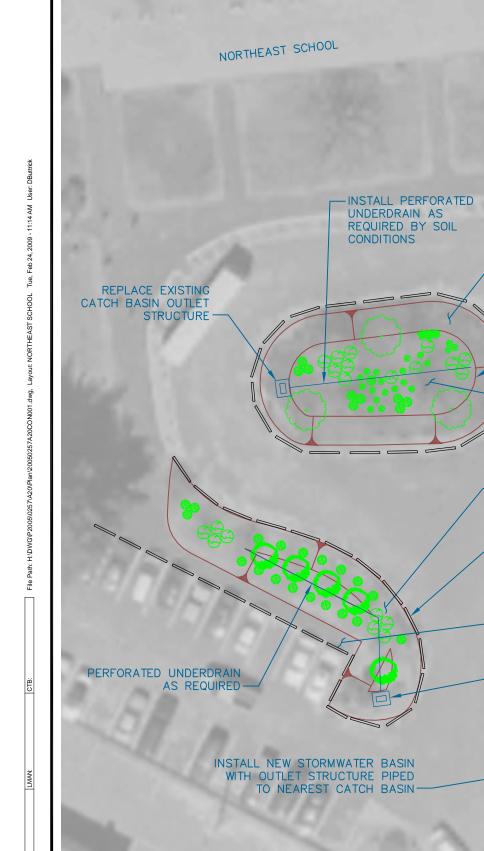






# **Appendix D**

Stormwater Retrofit Concept Designs



CONVERT EXISTING TRAFFIC ISLAND TO BIORETENTION AREA TO TREAT 0.28 ACRES IMPERVIOUS AREA

REPLACE CURB WITH CURB STOPS TO ALLOW STORMWATER TO FLOW INTO BASIN

DEPRESS BASIN BOTTOM APPROXIMATELY 3 TO 4 FEET WITH SIDE SLOPES OF 3H:1V OR FLATTER

LANDSCAPE WITH NATIVE PLANTS THAT TOLERATE WET CONDITIONS

CONVERT EXISTING TRAFFIC ISLAND TO BIORETENTION AREA TO TREAT 0.39 ACRES OF IMPERVIOUS SURFACE

REPLACE CURB WITH CURB STOPS TO ALLOW STORMWATER TO FLOW INTO BASIN

REMOVE SIDEWALK AND REPLACE WITH POROUS PAVERS EVEN WITH PARKING LOT ALLOWING STORMWATER TO DRAIN TO BASIN

INSTALL OUTLET STRUCTURE

ROUTE 30 | HYDE AVE

HORZ.: 1 INCH = 30 FEET VERT. HORZ. VERT.:

GRAPHIC SCALE

78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

WWW.FandO.COM FUSS & O'NEILL Disciplines to Deliver

FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT NORTHEAST SCHOOL

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

1

MS VIEW:



HORZ.: 1 INCH = 40 FEET VERT. VERT.: GRAPHIC SCALE



FUSS & O'NEILL Disciplines to Deliver

WEST SPRINGFIELD, MA 01089 413.452.0445

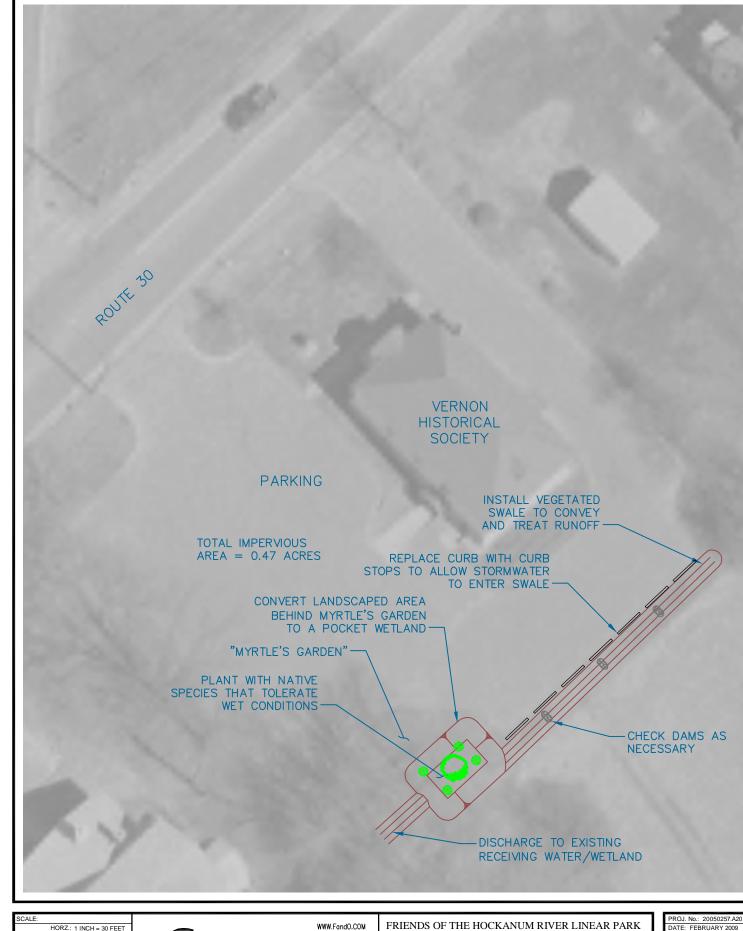
WWW.FandO.COM FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT

I-84 EXIT 67 COMMUTER LOT

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

DATE: FEBRUARY 2009



MS VIEW:

File Path: H:DWGIP20050257A201Plan/20050257A20CON001.dwg, Layout HISTORICAL SOCIETY Tue, Feb 24, 2009 - 11:14 AM User: DButrick

HORZ.: 1 INCH = 30 FEET VERT.: HORZ. VERT.: GRAPHIC SCALE

78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

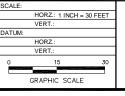
**FUSS & O'NEILL** Disciplines to Deliver

FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT VERNON HISTORICAL SOCIETY

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

DATE: FEBRUARY 2009





WWW.FandO.COM
FUSS & O'NEILL
Disciplines to Deliver

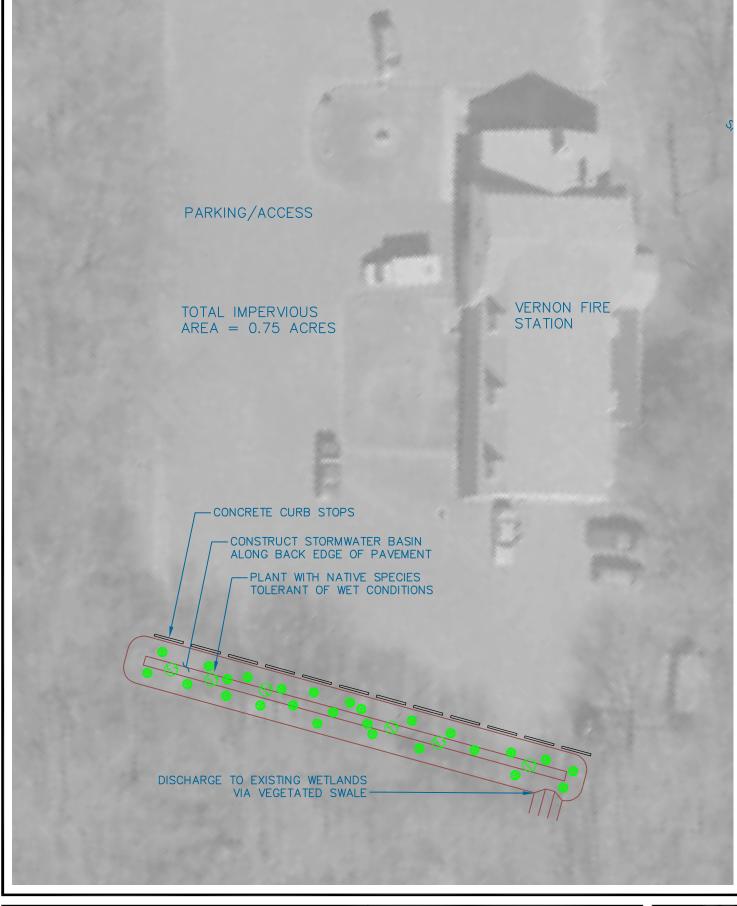
WEST SPRINGFIELD, MA 01089 413.452.0445

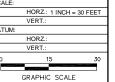
FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT VERNON FIRE STATION

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009





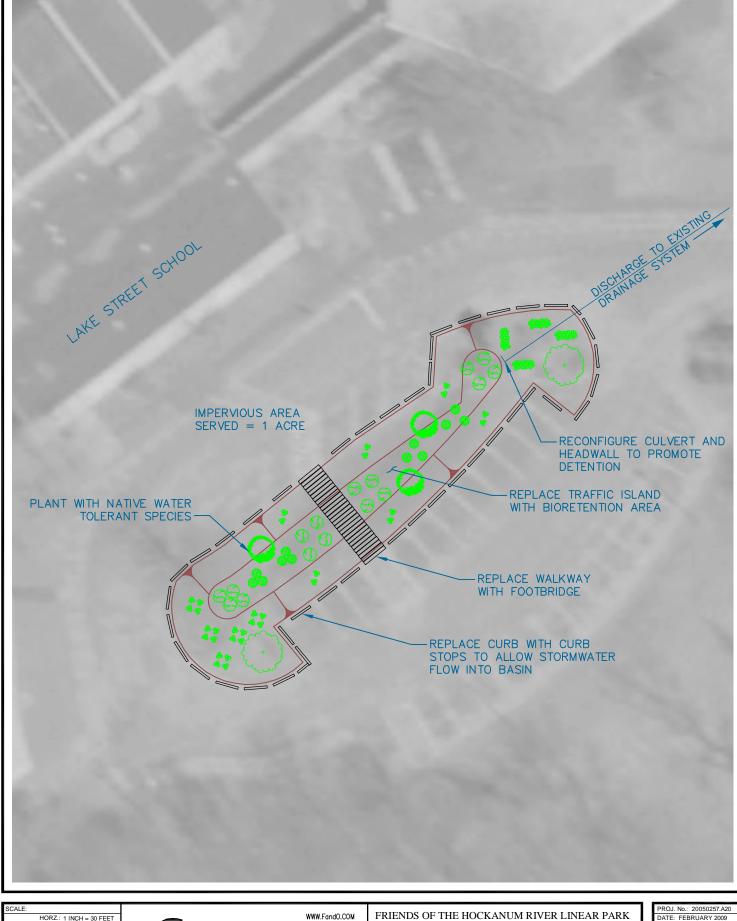


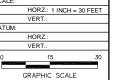
FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT LAKE STREET SCHOOL

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

DATE: FEBRUARY 2009



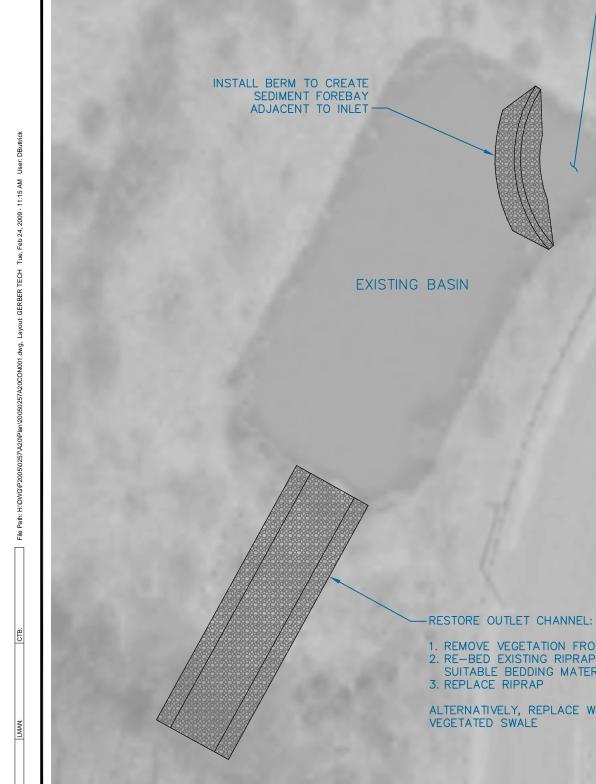




BOLTON NOTCH POND

TANKERHOOSEN RIVER WATERSHED CONNECTICUT

DIRECT TO SW. DOWNC	EXISTING 'LEAKOFF' ALE VIA RIPRAP HUTE (TYPICAL FOR LEAKOFFS)
CREATE GENTLY-SLOPING WATER QUALITY SWALE ALONG SLOPE	CONTRUCT BERM TO FORM SWALE
	SEDIMENT TRAP FOR COARSE POLLUTANTS (TYPICAL FOR BOTH LEAKOFFS)  CONSTRUCTED WETLAND OR STORMWATER BASIN
I-384/ROUTE 6/ROUTE 44 CONNDOT COMMUTER LOT IMPERVIOUS AREA = 0.88 ACRES	OUTLET STRUCTURE
	rectified to
D) EX	SCHARGE TO STING SWALE
	ROUTE & EAST
	ROUTE
HORZ: 1 INCH = 30 FEET   WWW.Fand0.COM   VERT:   DATUM:   FIISS & O'NEILL.	FRIENDS OF THE HOCKANUM RIVER LINEAR PARK  STORMWATER RETROFIT CONCEPT  PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009



1. REMOVE VEGETATION FROM OUTLET CHANNEL 2. RE-BED EXISTING RIPRAP CHANNELWITH SUITABLE BEDDING MATERIAL ALTERNATIVELY, REPLACE WITH WWW.FandO.COM FRIENDS OF THE HOCKANUM RIVER LINEAR PARK HORZ.: 1 INCH = 30 FEET VERT.: FUSS & O'NEILL Disciplines to Deliver HORZ. GERBER TECHNOLOGIES BASIN GRAPHIC SCALE 78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445 TANKERHOOSEN RIVER WATERSHED

STORMWATER RETROFIT CONCEPT

CONNECTICUT

DATE: FEBRUARY 2009

REMOVE ACCUMULATED SEDIMENT

7

MS VIEW:



**FUSS & O'NEILL** 

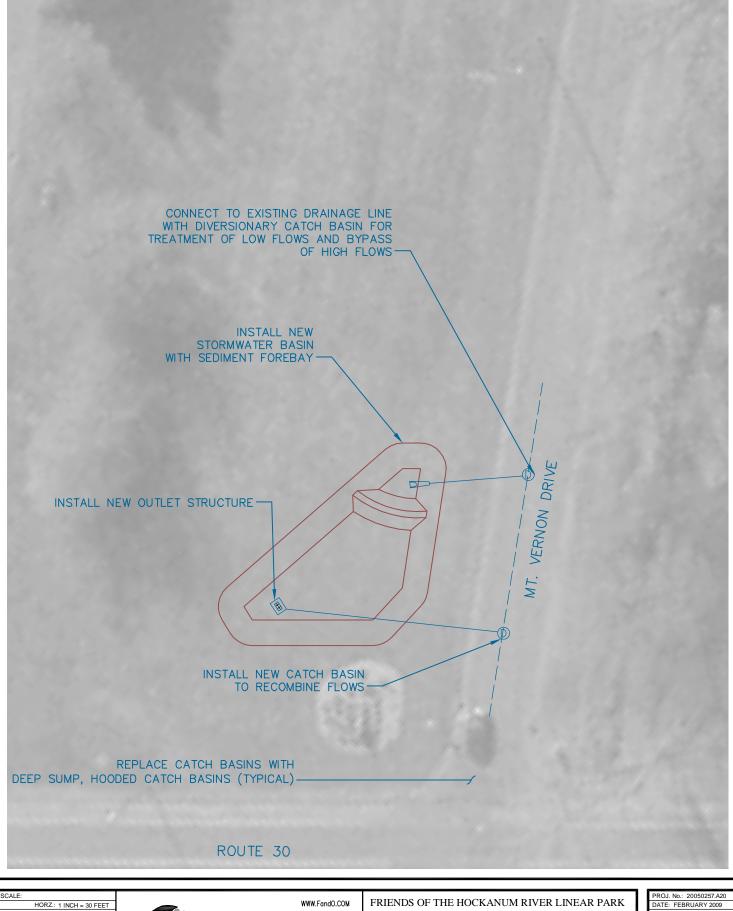
Disciplines to Deliver

WEST SPRINGFIELD, MA 01089 413.452.0445

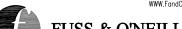
STORMWATER RETROFIT CONCEPT MOUNT VERNON APARTMENTS

CONNECTICUT TANKERHOOSEN RIVER WATERSHED

DATE: FEBRUARY 2009







Disciplines to Deliver

78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

# **FUSS & O'NEILL**

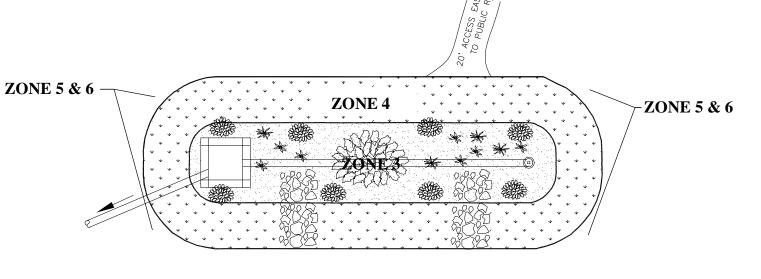
## FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT DETAILS BIORETENTION AREA

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

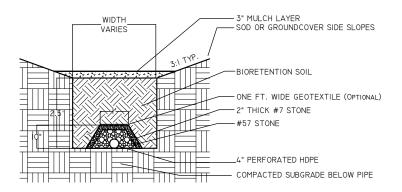
DET 1



## PLAN

#### NOTES:

- PLANTING ZONES AND PLANT SELECTION PER DETAIL SHEET 7
- ALL PLANTINGS SHALL BE LOCAL NATIVE SPECIES.
- IRRIGATION MAY BE PROVIDED FOR INITIAL ESTABLISHMENT AND DRY SEASONS.



ADAPTED FROM CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND CHARLOTTE -MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)

## WWW.FandO.COM



SCALE: HORZ.: N.T.S. VERT.: DATUM: HORZ.: GRAPHIC SCALE



WWW.FandO.COM

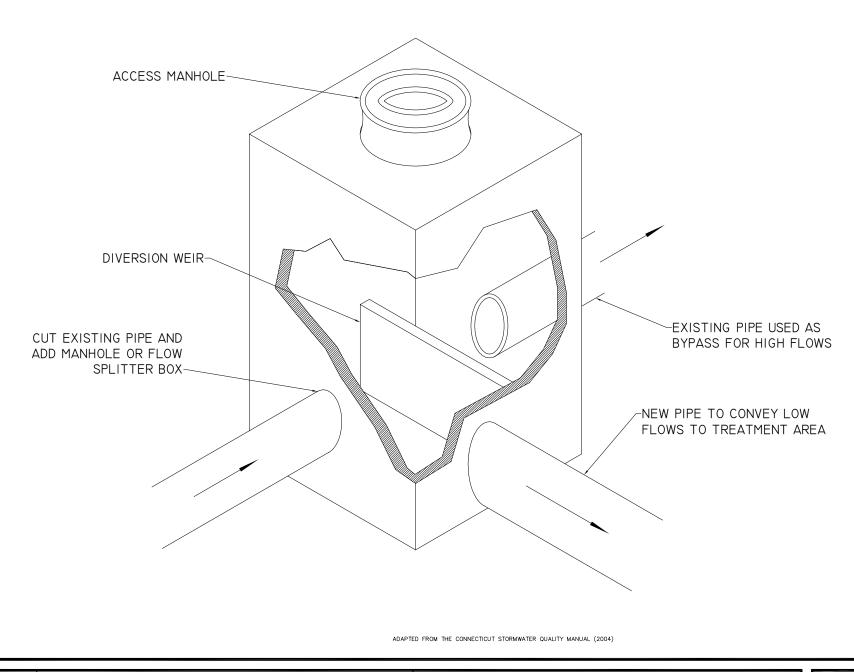
FUSS & O'NEILL Disciplines to Deliver

FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT DETAILS FLOW SPLITTER

TANKERHOOSEN RIVER WATERSHED

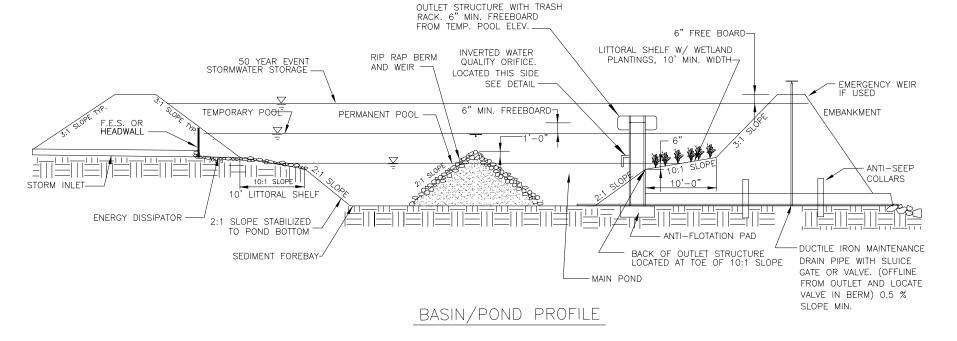
CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009



HORZ: N.T.S.
VERT:
DATUM:
HORZ:
VERT:
0
GRAPHIC SCALE

SCALE:



## NOTES:

1. 4-6 INCH LAYER OF AMENDED SOIL IS RECOMMENDED IN ANY AREA WHERE PLANTINGS ARE REQUIRED

ADAPTED FROM THE CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND THE CHARLOTTE — MECKLENBURG, NC POST—CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)



FRIENDS OF THE HOCKANUM RIVER LINEAR PARK
STORMWATER RETROFIT DETAILS
STORMWATER BASIN / POND PROFILE

TANKERHOOSEN RIVER WATERSHED CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

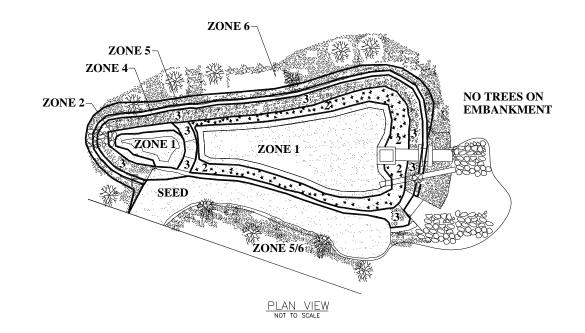
SCALE:

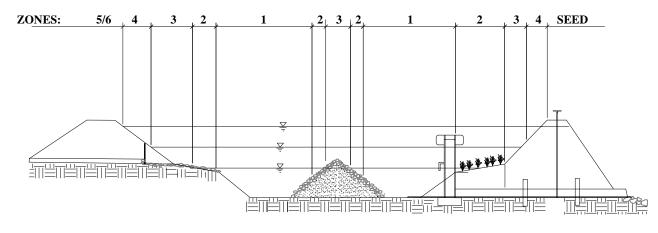
## DATUM: HORZ.: VERT. GRAPHIC SCALE

HORZ.: N.T.S. VERT.:

## NOTES:

- PLANTINGS ZONES AND PLANT SELECTION PER NOTES ON DETAIL SHEET 7
   ALL PLANTINGS SHALL BE LOCAL NATIVE
- SPECIES.
- IRRIGATION MAY BE PROVIDED FOR INITIAL ESTABLISHMENT AND DRY SEASONS.





POND CROSS SECTION

ADAPTED FROM THE CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND THE CHARLOTTE - MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)



78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

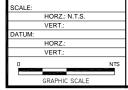
FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT DETAILS POND PLANTING PLAN

CONNECTICUT TANKERHOOSEN RIVER WATERSHED

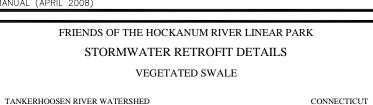
PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009







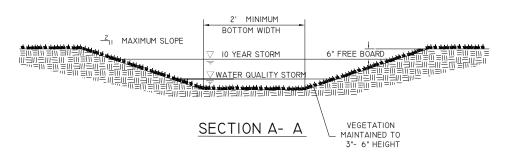




PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

DET 5

VARIES - MAXIMUM 100' POST CONSTRUCTION CONTROLS EASEMENT CHECK DAM FLOW 2% MAXIMUM EFFECTIVE SLOPE 2% MAXIMUM EFFECTIVE SLOPE STD. RIP RAP APRON **PLAN** WATER QUALITY STORM **PROFILE** 





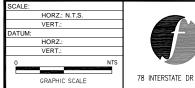
VARIES, HEIGHT TO BE DESIGNED TO MAINTAIN EFFECTIVE SLOPE LESS THAN 2%

CHECK DAM AND FOREBAY BERM DETAIL

### NOTES:

CONNECT GRASS SWALE EASEMENT TO A DEDICATED PUBLIC RIGHT OF WAY WITH A 20-FOOT ACCESS EASEMENT.

> ADAPTED FROM THE CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND THE CHARLOTTE -MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)





**FUSS & O'NEILL** Disciplines to Deliver

WEST SPRINGFIELD, MA 01089 413.452.0445

WWW.FandO.COM

FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT POCKET WETLAND

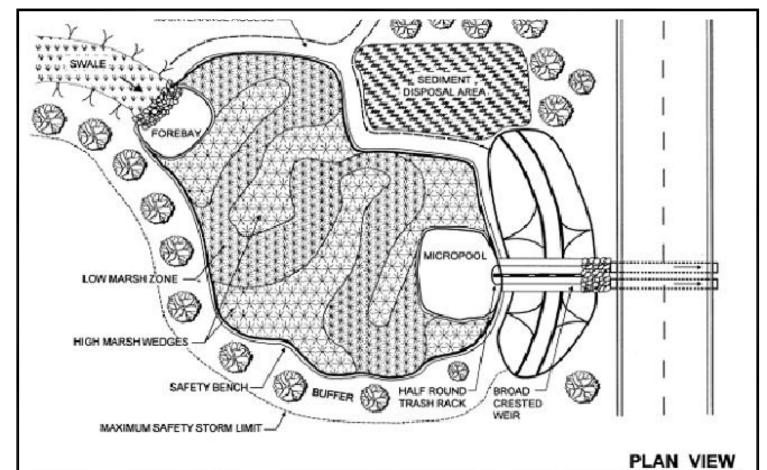
TANKERHOOSEN RIVER WATERSHED

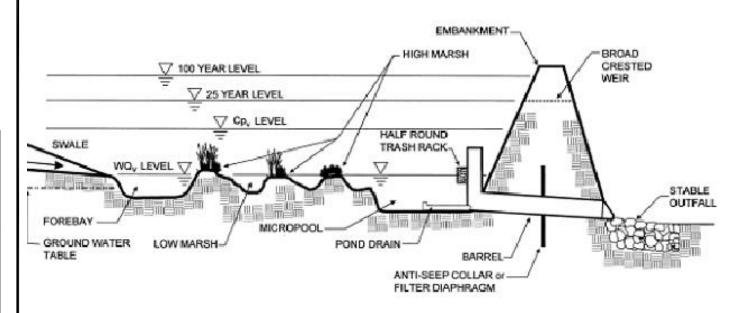
CONNECTICUT

PROJ. No.: 20050257.A20

**PROFILE** 

DET 6





SOURCE: CENTER FOR WATERSHED PROTECTION

	WWW.FandO.COM						
	FUSS & O'NI Disciplines to Deliver						
78 INTERSTATE DR	WEST SPRINGFIELD, MA 01089	413.452.0445					

ZONE DESCRIPTION DEEP WATER AREA INUNDATED WITH I TO 3 FEET OF WATER THROUGHOUT THE GROWING SEASON 2 SHALLOW WATER BENCH INUNDATED WITH 0.5 TO I FOOT OF WATER THROUGHOUT THE GROWING SEASON REGULARY INUNDATED, RANGING FROM 0.5 FT ABOVE TO 0.5 FT.BELOW THE 3 SHORELINE FRINGE PERMANENT POOL ELEVATION PERIODICALLY OR SEASONALLY INUNDATED, FROM 0.5 FT. ABOVE THE PERMANENT 4 RIPARIAN FRINGE POOL ELEVATION TO THE APPROXIMATE 2- YEAR STORM WATER SURFACE ELEVATION INFREQUENTLY OR IRREGULARLY INUNDATED, FROM THE APPROXIMATE 2- YEAR WATER 5 FLOODPLAIN TERRACE SURFACE ELEVATION TO THE 10- YEAR WATER SURFACE ELEVATION UPLAND ABOVE THE 10- YEAR WATER SURFACE ELEVATION 6

STORMWATER STRUCTURE PLANTING ZONES

### GENERAL PLANTING NOTES:

Grasses, Forbs, and Sedges in Zones 1, 2 and 3. Plant selections should be appropriate for the field environmental conditions of the planting site.

- •Zone 1 Deep Water Emergents: The designer should employ a method of "triangular spacing", and an approximate density of about 0.5 plants per square foot. A minimum of 2 herbaceous species shall be selected, for placement in each of the Zone 1 planting areas.
- •Zone 2 Shallow Water Bench Emergents: The designer should employ a method of "triangularspacing", and an approximate density of about 0.5 plants per square foot. A minimum of 3 herbaceous species shall be selected, for placement in each of the Zone 2 planting areas.
- •Zone 3 Shoreline Fringe: The designer should employ a method of "triangular spacing", and an approximate density of about 0.5 plants per square foot. A minimum of 4 herbaceous species shall be selected, for placement in each of the Zone 3 planting areas.

Grasses, Forbs, and Sedges (Seed Mixes) in Zones 4, 5 and 6.

•Zone 4 —Riparian Fringe, Zone 5 —Floodplain Terrace and Zone 6 — Planting zones shall receive preparation and seeding, with an appropriate seed mix, for establishing Native Wet Meadow, or Native Dry Meadow.

Trees, Shrubs, and Vines in Zones 4, 5 and 6 (ALL BMP's EXCEPT BIORETENTION): In designing and executing the plantings for Zone 4 - Riparian Fringe, Zone 5 - Floodplain Terrace and Zone 6 - Upland Plantings, the designer should consider the following:

- Upland Plantings, the designer should consider the following:
  •Employ a method of "random spacing", and a density of 1000 stems per acre. A full 70% of the species shall be Large Maturing Deciduous Tree species, and 30% shall be Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub, or Evergreen Shrub species.
- •A minimum of 5 Large Maturing Deciduous Tree species shall be selected for each planting area and a minimum of 3 Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub or Evergreen Shrub species shall be selected for each planting area.
- •The use of 3 plants of the same genus does not constitute the minimum selection and should be avoided.
- •In addition to the 5 large stock tree and the 3 small stock tree requirements, each planted area shall contain, interspersed randomly among the stock, large maturing decidious trees at a planting density of 20 trees per acre, and a minimum size of two—inch caliper (2"cal.).

Trees, Shrubs, and Vines in BIORETENTION AREAS ONLY: In designing and executing the plantings for Bioretention Areas, the designer should consider the following:

- •Employ a method of "random spacing", and a density of 2000 stems per acre. A maximum of 10% of the species shall be Large Maturing Deciduous Tree species, and 90% shall be Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub, or Evergreen Shrub species. Up to 25% of the Small Maturing Tree requirement (90%) may be substituted with certain grasses that grow to 3-ft to 5-ft in height if planted in five or seven-gallon pots.
- A minimum of 3 Large Maturing Deciduous Tree species shall be selected for each planting area,
- a minimum of 3 Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub or Evergreen Shrub species shall be selected for each planting area.
- •The use of 3 plants of the same genus does not constitute the minimum selection and should be avoided.

ADAPTED FROM THE CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND THE CHARLOTTE - MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)

# FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT PLANTING NOTES





## **Appendix E**

Site-Specific Stormwater Retrofit Cost Estimates

## Site-Specific Stormwater Retrofit Cost Estimates – Tankerhoosen River Watershed Management Plan

					Design, Permitting, Contingency				fespan			ost/yr
	Unit Cost	Unit	Units	Construction Cost (2009)	% Construction	Cost	Total Cost	Lifespan (yrs)	Annual Cost Over Lifespan	O&M (% Cost)	O&M (\$/yr)	Total Capitalized Cost/yr over lifespan
Tankerhoosen Lake	I	total, 2004 dollars				1		1	1		1	
Sediment Forebay	77,000	(BEC estimate)	1	\$93,700	32%	\$30,000	\$123,700	30	\$6,310	6%	\$380	\$6,690
4 Deep Sump CBs, piping, and swale	20,000	total, 2004 dollars (BEC estimate)	1	\$24,300	32%	\$7,800	\$32,100	50	\$1,250	15%	\$190	\$1,440
Northeast School												
Bioretention Area 1	\$14.56	/ft² (commercial/ industrial area	2892	\$42,100	32%	\$13,500	\$55,600	15	\$4,660	8%	\$370	\$5,030
Bioretention Area 2	\$14.56	/ft² (commercial/ industrial area	2137	\$31,100	32%	\$10,000	\$41,100	15	\$3,440	8%	\$280	\$3,720
SW Basin	\$7.27	/ft ³ (developed area)	2495	\$18,100	32%	\$5,800	\$23,900	30	\$1,220	6%	\$70	\$1,290
Mount Vernon Apartments												
SW Basin	\$7.27	/ft ³ (developed area)	5862	\$42,600	32%	\$13,600	\$56,200	30	\$2,870	6%	\$170	\$3,040
Deep sump CBs	\$3,125.00	ea.	6	\$18,800	32%	\$6,000	\$24,800	50	\$960	20%	\$190	\$1,150
Fire Station (Route 30)	47.07	1 (63 ( ) )	007/	404 (00	000/	<b>*</b>	400 500		T #4 450		400	<b>44.540</b>
SW Basin	\$7.27	/ft ³ (developed area)	2976	\$21,600	32%	\$6,900	\$28,500	30	\$1,450	6%	\$90	\$1,540
Vegetated Swale	\$14.56	/ft²	59	\$900	32%	\$300	\$1,200	10	\$140	7%	\$10	\$150
Vernon Historical Society (Route 30)  Pocket Wetland	30.6V^0.71 (03\$)	/ft³	1001	\$5,500	32%	\$1,800	\$7,300	10	\$860	6%	\$50	\$910
Vegetated swale	\$14.56	/ft ²	1081 657	\$9,600	32%	\$1,800	\$12,700	10 10	\$1,490	6%	\$90	\$1,580
ConnDOT Commuter Lot (Route 6/44 and I-38		/11	037	\$7,000	J2 /0	\$3,100	\$12,700	10	Ψ1,470	070	¥7U	\$1,500
Vegetated swale	\$14.56	/ft²	532	\$7,700	32%	\$2,500	\$10,200	29	\$530	7%	\$40	\$570
SW Basin	\$7.27	/ft ³ (developed area)	7105	\$51,700	32%	\$16,500	\$68,200	30	\$3,480	6%	\$210	\$3,690
ConnDOT Commuter Lot (I-84, Exit 67)				, ,								,
SW Basin	\$7.27	/ft ³ (developed area)	5299	\$38,500	32%	\$12,300	\$50,800	30	\$2,590	6%	\$160	\$2,750
Vegetated Swale	\$14.56	/ft²	103	\$1,500	32%	\$500	\$2,000	10	\$230	7%	\$20	\$250
Gerber Technologies Office Building												
Sediment Forebay	\$50	/yd ³ of riprap	40	\$2,000	32%	\$600	\$2,600	30	\$130	30%	\$40	\$170
Discharge Channel	\$3.86	/ft2	2324	\$9,000	32%	\$2,900	\$11,900	30	\$610	10%	\$60	\$670
Lake Street School												
Bioretention	\$14.56	/ft² in commercial/ industrial area	4900	\$71,300	32%	\$22,800	\$94,100	15	\$7,880	8%	\$630	\$8,510
Note:	401										ļ	
Rate of Inflation used =	4%											
Interest (discount) rate used =	7%											