APPENDIX D

FIELD NOTES, DATA SHEETS AND SUPPLEMENTAL DATA SUMMARIES

D1: IN-SITU WATER QUALITY MEASURMENTS

Sample Location ID	Property ID	Watercourse Name	Date	Depth (m)	Temperature (^{o}C)	Specific Conductance (µS/cm^{c})	Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Salinity (ppm)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	pH
P1-A	P1	Glenvale Cr. Trib.1	3-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P3-Pond-A	P3	Man Made	3-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P3-B	P3	Glenvale Cr. Trib.1	3-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P2-A	P2	Glenvale Cr. Trib.1	3-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P2-B	P2	Glenvale Cr. Trib.1	3-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P12-A	P12	Glenvale Cr.	3-Oct-11	1.30	12.20	NR	697	348	NR	NR	2.55	7.47
P12-B	P12	Glenvale Cr.	3-Oct-11	0.50	12.10	NR	693	346	NR	NR	3.09	7.42
P11-B	P11-B	NA	3-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P11-A	P11-A	NA	3-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P10	P10	NA	3-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P12-C	P12	Glenvale Cr.	4-Oct-11	0.56	12.20	NR	679	339	NR	NR	2.64	7.49
P13-A	P13	Glenvale Cr.	4-Oct-11	0.38	13.10	NR	675	340	NR	27	2.88	7.51
P6A-1	P6-A	Glenvale Cr. Trib.2c	4-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P6A-2	P6-A	Glenvale Cr. Trib.2c	4-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P6A-3	P6-A	Glenvale Cr. Trib.2b	4-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P6A-A	P6-A	Glenvale Cr. Trib.2c	4-Oct-11	1.15	16.00	NR	840	418	NR	57	5.50	7.33
P5-A	P5	Glenvale Cr. Trib.2b	4-Oct-11	NR	16.50	NR	303	151	NR	NR	NR	8.13
P16-P	P16	Glenvale Cr. Trib.3a	5-Oct-11	0.39	10.70	NR	472	235	NR	25	2.75	7.22
P16-P	P16	Glenvale Cr. Trib.3a	5-Oct-11	0.75	11.90	NR	524	261	NR	82	8.60	7.83
P20-A	P20	P20-A	5-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
20-B	P20	20-B	5-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P24-A	P24	P24-A(401 Drainage)	5-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P24-B	P24	Millhaven Cr. Trib.1	5-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P24-Pond	P24	Millhaven Cr. Trib.1	5-Oct-11	1.30	13.20	NR	351	176	NR	92	9.80	8.00
P23-A	P23	Millhaven Cr. Trib.1	5-Oct-11	0.10	15.00	NR	1052	525	NR	17	1.60	7.24
P23-B	P23	Millhaven Cr. Trib.2	6-Oct-11	NR	NR	NR	NR	NR	NR	NR	NR	NR
P14-B-South Pond	P14-B	Glenvale Cr. Trib.2	6-Oct-11	NR	13.00	NR	271	134	NR	94	9.80	8.50
P6-B	P6-B	P6-B	6-Oct-11	0.85	NR	NR	NR	NR	NR	NR	NR	NR
P9-Quarry-Pond	P9	P9-Quarry-Pond	25-Oct-11	<1	11.40	NR	397	189	NR	68.2	6.38	8.04
P23-Northern	P23	Millhaven Cr. Trib.2a	26-Oct-11	0.15	7.80	NR	261	133	NR	47.2	5.69	7.49

Notes:

NR = Not Recorded

NA= Not Applicable

D2: KEY HABITAT CHARACTERISTICS OF P9-QUARRY-POND

Waterbody	Littoral Zone Type	Substrates (%)[1]			Litorral Vegetation (%)			Supralittoral (%)[2]	Eulitorral (%)	Water Quality			DO (mg/L)	Temp. (°C)
		0-1m	1-2m	2-5m	Emergent	Floating	Submergent			pH	Cond. (µS/cm)	TDS (g/L)		
P9-Quarry-Pond	A	10% Co, 10% Gr, 5% Sa, 30% Si/Mu, 10% D, 10% Bo, 25% Br	NA	NA	25% (Cattail, Sedge, Blue Joint, Grass)	0%	5% (Elodea, Coontail)	10% RCe, 20% Ta, 30% Rm, 40% Ae	5% Alder, 20% Willow, 25% Graminoid, 20% Ericacious, 30% Other (Mixed Forest)	8.04	397	189	6.38	11.4
	B	35% Co, 35% Si/Mu, 10% Bo, 20% Br	NA	NA	10% Sedge	0%	0%	20% Ro, 20% Ta, 30% Rm, 30% Ae,	20% Willow, 5% Dogwood, 40% Graminoid, 15% Ericacious, 10% Other					
	C	20% Co, 40% Si/Mu, 40% Br	NA	NA	30% Sedge	0%	0%	10% Ju, 15% Ash, 5% Rce, 20% Ro, 10% Ta, 40% Ae	90% Graminoid, 10% Ericacious					
	D	30% Co, 30% Si/Mu, 5% Bo, 30% Br	NA	NA	15% Sedge	0%	10% Canada Pondweed	30% Rce, 15% Ta, 20% Rm, 35% Ae	10% Willow, 60% Graminoid, 10% Ericacious, 20% Other					

[1] Co = Cobble, Gr = Gravel, Sa = Sand, Sm = Silt/Muck, Cl = Clay, D = Detritus, Bo = Boulders, Br = Bedrock

[2] Ju = Juniper, RCe = Cedar, Ro = Red Oak, Ta = Trembling Aspen, Rm = Red Maple, Ae = American Elm

NA = Not Applicable

NR= Not Recorded

D3: Field Investigation Aquatic Habitat Features Summary - Kingston Sol-Luce Project

Watercourse Name	Sample Location ID	Property ID	Date Visited	UTM Easting & Northing	Watercourse Type	Wet/Dry	Section Length (m)	Channel Features	Mean Wetted Width (m)	Mean Wetted Depth (m)	Mean Bankfull Width (m)	Mean Bankfull Depth (m)	Floodplain Width (m)	Left Upstream Bank Stability	Right Upstream Bank Stability	Substrate Composition	In-stream Cover (% of surface area)	Aquatic Vegetation Type (based on overall 100% distribution)			Overhead Coverage (% stream shaded)	Migratory Obstructions / Potential Critical Habitat	Water Chemistry Parameters	Surrounding Land Use	Sources of Pollution	Upwellings
																		Emergent	Floating	Submergent						
Glenvale Cr. Trib.1	P1-A	P1	3-Oct-11	18N 0370611 4908823	Intermittent/Stream	Dry	80	CSP	NA	NA	3.00	0.70	NR	NR	NR	Cobble/gravel/sand/overlayed by terrestrial leaf litter/boulders present upstream	NA	NA	NA	NA	NA	NR	NA	Pasture	Agriculture/Road	None Observed
Glenvale Cr. Trib.1	P2-A	P2	3-Oct-11	18T 0370103 4909421	Drainage/Swale	Wet	NR	NR	NR	0.05	1.00	0.45	NR	NR	NR	NR	NR	Sedges/Graminoids	NR	NR	NR	NR	NR	Pasture	NR	None Observed
Glenvale Cr. Trib.1	P2-B	P2	3-Oct-11	18T 0370123 4909901	Intermittent/Marsh	Wet	NR	Choked with Vegetation	NR	0.10	1.00	0.45	NR	NR	NR	NR	NR	Waterweed	NR	NR	NR	NR	NR	Pasture	NR	None Observed
Glenvale Cr. Trib.1	P3-B	P3	3-Oct-11	18T 0370021 4909395	Intermittent/Stream	Dry	NR	Limestone Outcropping	NA	NA	2.50	0.65	NR	NR	NR	Bedrock (Limestone)	NA	Sedges/Graminoids	NA	NA	NA	NR	NA	Pasture	NR	None Observed
P3-Pond-A	P3-Pond-A	P3	3-Oct-11	18T 370030 4908418	Pond	Dry	NR	Man Made	NA	NA	15 X 12	0.20	NR	NR	NR	NR	NA	NA	NA	NA	NA	NR	NA	Pasture	NR	Possible upwelling at this location
Glenvale Cr. Trib 2b	P-5A	P5	4-Oct-11	18T 0368508 4908936	Grassed Drainage Swale	Dry	75	field speices in loosely defined channel	NA	NA	1.00	0.25	NR	NA	NA	grassed waterway, terrestrial soils	NA	NA	NA	NA	NA	NA	NA	Pasture	Agriculture	None Observed
Glenvale Cr. Trib.2b	P5-A(Small Pond)	P5	4-Oct-11	18N 0368508 4908936	Ephemeral/Pond	Wet	14	Possible Old Well	7x14	NR	NR	NR	NR	NR	NR	Bedrock suspected (Limestone)	NR	NR	NR	NR	graminoids, milkweed,	NR	pH: 8.13 Conductivity: 303 µS/cm DO: NR Water Temp: 16.5°C	Agriculture	Agriculture	Likely Ground Water/Possibly old well
Glenvale Cr. Trib.2b	P5-A(Largel Pond)	P5	4-Oct-11	18N 0368508 4908936	Ephemeral/Pond	Wet	60	Possible Ground Water Fed	45x60	NR	NR	NR	NR	NR	NR	Bedrock suspected (Limestone)	NR	NR	NR	NR	graminoids, milkweed,	NR	NR	Agriculture	Agriculture	Likely Ground Water
Glenvale Cr. Trib.2b	P6-A-3	P6-A	4-Oct-11	18N 0367980 4908234	Drainage/Swale	Dry	NR	CSP	NA	NA	0.80	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NR	NA	Agriculture	Agriculture	None Observed
Glenvale Cr. Trib.2b	P6-A-5	P6-A	4-Oct-11	18N 0367881 4908123	Swale	Dry	NR	Swale/Vegetation/ Cutting Practices	NA	NA	0.75	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NA	Agriculture	Agriculture	None Observed
Glenvale Cr. Trib.2c	P6-A-1	P6-A	4-Oct-11	18N 367965 4908611	Drainage/Swale	Dry	NR	Swale/Vegetation/ Cutting Practices	NA	NA	0.80	0.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NR	NA	Agriculture	Agriculture	None Observed
Glenvale Cr. Trib.2c	P6-A-2	P6-A	4-Oct-11	18N 0367977 4908283	Grassed Drainage Swale	Dry (Standing water @ CSP)	NR	Swale	NA	NA	0.75	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NA	Agriculture	Agriculture	None Observed
Glenvale Cr. Trib.2c	P6-A-4	P6-A	4-Oct-11	18N 0367766 4908246	Intermittent	Wet (slightly)	NR	Exposed Limestone	NR	NR	0.85	0.60	NR	NR	NR	Bedrock (Limestone), Silt & Muck, Detritus	NR	NR	NR	NR	NR	NR	NR	Agriculture	Agriculture	None Observed
Glenvale Cr.Trib.2	P6-A-A	P6-A	4-Oct-11	18N 367768 4908084	Intermittent/Creek	Wet	NR	Box Culvert	1.15m	0.18m	2.6m	0.75m	NR	NR	NR	Muck/Silt, Cobble, Leaf Litter / Detritus	NR	NR	NR	NR	Elms and Maples near drainage swales/Some sedges leaf litter and woody debris	NR	pH: 7.33 Conductivity: 840µS/cm DO: 5.50mg/L Water Temp: 16°C	Agriculture	Agriculture/Road	None Observed
P6-B	P6-B-Pond	P6-B	6-Oct-11	18N 0367408 4907492	Pond	Wet	69	Swale at North End	39.00	0.85	46.00	1.63	NR	NR	NR	Clay, Silt	NA	Cattails/Graminoids/Bullrush/Bluejoint/Plaintain/Thistle/Wild Strawberry	NR	NR	NR	NR	NR	Agriculture	Agriculture	None Observed

D3: Field Investigation Aquatic Habitat Features Summary - Kingston Sol-Luce Project

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																		Emergent	Floating	Submergent						
NA	P10	P10	3-Oct-11	NR	None	Dry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Pasture	NA	NA
NA	P11-A	P11-A	3-Oct-11	NR	None	Dry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Pasture	NA	NA
NA	P11-B	P11-B	3-Oct-11	NR	None	Dry	NA	Vegetation/Cutting Practices	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Pasture	NA	NA
Glenvale Cr.	P12-A	P12	3-Oct-11	18N 0370488 4908221	Permanent/Channelized/Stream	Wet	225	Gradient:Low/Entrenchment:0.56:0.82/ Woody Structure:Lots	8.50	1.30	10.20	2.00	>250	NR	NR	80% Silt/Muck/10% Detritus/10% Cobble	NR	NR	NR	NR	NR	NR	pH: 7.47 Conductivity: 697 µS/cm DO: 2.64 mg/L Water Temp: 12.2°C	Agriculture/Road	Agriculture/Road	None Observed
Glenvale Cr.	P12-B	P12	3-Oct-11	18N 0370387 4908166	Permanent/Stream	Wet	150	Gradient:0.01/Meander Length:2/Meander Aplitude:1/5% Organic Debris	1.20	0.50	2.50	0.80	>250	High	High	90% Silt/Muck;10% Detritus	0%	40% Sedges	NR	60% Lemna/Pond Lilly	30% Graminoid	NR	pH: 7.42 Conductivity: 693 µS/cm DO: 3.09 mg/L Water Temp: 12.1°C	Agriculture/Road	Agriculture/Rroad	None Observed
Glenvale Cr.	P12-C	P12	4-Oct-11	18N 0370136 4907864	Permanent/Channelized/Creek	Wet	70	Entrenchment:0.5:0.5/100% Organic Debris/Cow Bridge	5.20	0.56	8.00	1.06	>250	High	High	80% Silt/Muck/10% Clay/10% Detritus	100%	50% Sedges/Grasses/Cattails	NR	50% Lemna/Frogsbit/Bladderwort	100% Graminoid	Agriculture between P12 and P13 cattle crossing is causing a damming effect in channel	pH: 7.429 Conductivity: 679 µS/cm DO: 2.64 mg/L Water Temp: 12.2°C	Agriculture/Cattle Grazing	Agriculture between P12 and P13 cattle crossing is causing a damming effect in channel	None Observed
Glenvale Cr.	P13-A	P13	4-Oct-11	18N 0369899 4907582	Creek	Wet	75	Gradient:0.01/Meander Length:110/Meander Amplitude:50/Entrenchment:1:1/Woody Structure:15%/Organic Debris:20%	2.40	0.38	3.00	0.65	>200	High	High	80% Silt/Muck;10% Clay; 10% Detritus	<5% Logs	40% Sedges/Carex	NR	60% Bladderwort, Frogsbit/Lemna	20% Graminoid	NR	pH: 7.51 Conductivity: 675 µS/cm DO: 2.88 mg/L Water Temp: 13.1°C	Pasture	None Observed	None Observed
Glenvale Cr.	P13-A	P13	4-Oct-11	18N 0369958 4907673	Creek	Wet	NR	Higher mounds of vegetation and historic area of cattle crossing creating daming effect of creek	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	Higher mounds of vegetation and historic area of cattle crossing creating daming effect of creek	NR	NR	NR	None Observed
Glenvale Cr. Trib.2	P14-B1	P14-B	6-Oct-11	18N 0367706 4907965	Permanent channel	Wet	NR	Box Culvert continues under Unity Rd.	5.00	0.15	10.00	1.00	NR	NR	NR	Bedrock (limestone, Silt / Muck, Detritus	NR	NR	NR	NR	NR	NR	NR	Agriculture	Agriculture	Possible Ground Water
Glenvale Cr. Trib.2	P14-B2	P14-B	6-Oct-11	18N 0367760 4908027	Channel/Mouth to permanent pond	Wet	NR	Continues from Unity Rd. Box Culvert	2.50	<0.05	3.00	0.50	NR	NR	NR	Bedrock (limestone), Silt / Muck, Detritus and Clay	NR	Hardstem Bullrush/Graminoids/Sedge	NR	NR	NR	Cattle Crossing	NR	Agriculture	Agriculture	Likely Ground Water
Glenvale Cr. Trib.2	P14-B(Cattle Pond)	P14-B	6-Oct-11	18N 0367760 4908027	Pond	Wet	125	Cattle Pond	75.00	UN	NR	0.8-1.4	NR	NR	NR	Bedrock (Limestone), Clay and Silt at Margins	NR	NR	NR	NR	NR	NR	NR	Agriculture	NR	Possible Ground Water
Glenvale Cr. Trib.2	P14-B3	P14-B	6-Oct-11	18N 0367845 4907618	Intermittent	Wet	NR		0.50	<0.10	1.00	0.40	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	Agriculture	Agriculture	None Observed
Glenvale Cr. Trib.2	P14-B4	P14-B	6-Oct-11	18N 0367820 4907166	Grassed Drainage Swale	Dry	NR	Swale	NA	NA	0.70	0.40	NR	NA	NA	NR	NA	NA	NA	NA	NA	NA	NA	Forrest	None Observed	None Observed
Glenvale Cr. Trib.2	14B-South Pond	P14-B	6-Oct-11	18N 0367774 4907062	Pond	Wet	130	Pond	85.00	UN	NR	UN	NA	High	High	50% Silt/Muck; 50% Clay	2% Overhanging branches	5% Sedges	NA	30%	30% Canopy (Vertical Shading) 40% Trees	NR	pH: 8.5 Conductivity: NR DO:9.8 mg/L Water Temp: 13°C	Agriculture	Agriculture	Origingally thought springfed as no obvious drainage in or out. However, locals suggest that spring floods of P6A flow into 14B.
Glenvale Cr. Trib.2	14B-South Pond	P14-B	6-Oct-11	18N 0367689 4907097	Pond	Wet	130	Pond	85.00	UN	NA	UN	NA	High	High	50% Silt/Muck; 50% Clay	2% Overhanging branches	5% Sedges	NA	30%	30% Canopy (Vertical Shading) 40% Trees	NR	pH: 8.5 Conductivity: NR DO:9.8 mg/L Water Temp: 13°C	Agriculture	Agriculture	Origingally thought springfed as no obvious drainage in or out. However, locals suggest that spring floods of P6A flow into 14B.

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Watercourse Name	Sample Location ID	Property ID	Date Visited	UTM Easting & Northing	Watercourse Type	Wet/Dry	Section Length (m)	Channel Features	Mean Wetted Width (m)	Mean Wetted Depth (m)	Mean Bankfull Width (m)	Mean Bankfull Depth (m)	Floodplain Width (m)	Left Upstream Bank Stability	Right Upstream Bank Stability	Substrate Composition	In-stream Cover (% of surface area)	Aquatic Vegetation Type (based on overall 100% distribution)			Overhead Coverage (% stream shaded)	Migratory Obstructions / Potential Critical Habitat	Water Chemistry Parameters	Surrounding Land Use	Sources of Pollution	Upwellings
																		Emergent	Floating	Submergent						
Glenvale Cr. Trib.3a	P16-A	P16	5-Oct-11	18N 0367430 4906002	Permanent	Wet	NR	CSP	1.00	<0.1-0.15	2.80	0.40	NR	NR	NR	Silt & Muck / Leaf Litter / Detritus	NR	Cattail/Graminoid/Sedge/ Grasses	NR	NR	Lots of leaf litter, choking flow	Horse Crossing	NR	Agriculture	Agriculture	None Observed
Glenvale Cr. Trib.3a	P16-B	P16	5-Oct-11	18N 0367422 4906130	Permanent / Channelized	Wet	NR	NR	1.85	0.39	3.45	0.69	NR	NR	NR	Silt & Muck / Leaf Litter / Detritus	NR	Grasses/Waterweed	NR	Lemna	Graminoids/Burweed/Pyweed	NR	NR	Agriculture	Agriculture	None Observed
Glenvale Cr. Trib.3a	P16-C	P16	5-Oct-11	18N 0367387 4906595	Permanent / Semi-permanent / Chanelized	Wet	NR	NR	0.30	<0.05	1.80	0.35	NR	NR	NR	NR	NR	NR	NR	NR	99% Terrestrial grasses/Leaf litter	NR	NR	Agriculture	Agriculture	None Observed
Glenvale Cr. Trib.3a	P16-Pond	P16	5-Oct-11	18N 0367401 4906536	Pond/Creek	Wet	24	20% Woody Structure/20% Organic Debris	28.00	0.75	42.00	1.10	42.0	High	High	40% Clay/30% Silt/Muck/30% Detritus	5% Overhanging Branches/5% Branch Debris	20% Hardstem Bullrush/Carex/Graminoids/Equistum	NR	60% Pondweed/Bladerwort/Lemna Trisulea	10% Graminoid	NR	pH: 7.83 Conductivity: 524 µS/cm DO: 8.60 mg/L Water Temp: 11.9°C	Pasture	Agriculture	Suspected
Glenvale Cr. Trib.3b	SP18-D	P18	25-Oct-11	18N 0366808 4905949	Intermittent/Stream/Drainage	Wet	100	CSP	0.85	0.15	1.25	0.65	NR	NR	NR	Silt, Bedrock (Limestone)	NA	Cattail/Hardstem Bullrush/Graminoids	NR	NR	NR	NR	NR	NR	Road	None Observed
P20-A	P20-A	P20	5-Oct-11	18N 0365745 4906125	Ephemeral/Pond	Dry	50	Exposed Limestone	NA	NA	50 X 18 (L X W)	1.20	NR	NR	NR	Bedrock (Limestone)	NA	NA	NA	NA	NA	NR	NA	Forrest	NR	Suspected
P20-B	P20-B1	P20	5-Oct-11	18N 0365757 4906162	Interminnent/Creek	Dry	NR	Channelized	NA	NA	1.37	0.57	NR	NR	NR	Leaf litter/Root wads of mosses/Detritus/Organics/Silt/Clay	NA	NA	NA	NA	NA	NR	NA	Forrest	NR	None Observed
P20-B	P20-B2	P20	5-Oct-11	18N 0365689 4906220	Channel	Dry	NR	Channelized	NA	NA	0.95	0.45	NR	NR	NR	NR	NA	NA	NA	NA	NA	NR	NA	Forrest	NR	None Observed
P20-B	P20-C	P20	5-Oct-11	18N 0365817 4906139	Ephemeral/Pond	Dry	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NA	NA	NA	NA	NA	NR	NA	Forrest	NR	None Observed
Millhaven Cr. Trib.1	P23-A1	P23	5-Oct-11	18N 0364765 4904967	Permanent/Channelized/Wetland	Wet	50	Gradiend:0.001/Entrenchment:0/1% Beaver Dam/39% Woody Structure/60% Organic Debris	1.15 (Area Flooded)	0.10	NA (Area Flooded)	0.80	>300	High	High	90% Silt/Muck/10% Detritus	5% Logs	0%	NR	0%	(20%) 5% Shrubs/95%Graminoids	Beaver Activity	pH: 7.24 Conductivity: 1052 µS/cm DO: 1.6 mg/L Water Temp: 15.5°C	Agriculture to the North/Highway	Agriculture/Highway	None Observed
Odessa Lake Drainage	OL-A	NA	6-Oct-11	18N 0365154 4906992	Grassed Drainage Swale	Dry	4	CSP/Swale	NA	NA	1.00	0.25	NR	NA	NA	NR	NA	NA	NA	NA	NA	NR	NA	Agriculture	Agriculture	None Observed
Millhaven Cr. Trib.2a	P23-Northern-2	P23	26-Oct-11	18N 0364623 4905730	Intermittent/Drainage	Wet (rainwater)	NR	CSP	1.35	0.15	2.12	0.40	NR	NR	NR	Silt/Muck/Soils/Detritus/Leaf Litter	NR	NR	NR	NR	NR	NR	NR	Agriculture	Agriculture	None Observed
Millhaven Cr. Trib.2a	P23-Northern-1	P23	26-Oct-11	18N 0364524 4905683	Intermittent/Drainage	Wet (rainwater)	NR	Swale	0.89	0.10	1.65	0.28	NR	NR	NR	Silt/Muck/Soils/Detritus/Leaf Litter	NR	NR	NR	NR	NR	NR	NR	Agriculture	Agriculture	None Observed
Millhaven Cr. Trib.2a	P23-Northern-3	P23	26-Oct-11	18N 0364655 4905659	Grassed Drainage Swale	Wet (rainwater)	NR	CSP	NR	NR	NR	NR	NR	NR	NR	grassed waterway, terrestrial soils	NR	NR	NR	NR	NR	NR	NR	NR	NR	None Observed
Millhaven Cr. Trib.2b	P23-B1	P23	6-Oct-11	18N 0364492 4905515	Grassed Drainage Swale	Dry	NR	CSP	NA	NA	NA	NA	NR	NA	NA	NR	NA	Sparse Bullrush	NA	NA	NA	NR	NA	Agriculture	Agriculture	None Observed
Millhaven Cr. Trib.2b	P23-B2	P23	6-Oct-11	18N 0364575 4905522	Grassed Drainage Swale	Dry	NR	Swale	NA	NA	NA	NA	NR	NA	NA	NR	NA	Bullrush	NA	NA	NA	NR	NA	Agriculture	Agriculture	None Observed

D3: Field Investigation Aquatic Habitat Features Summary - Kingston Sol-Luce Project

Watercourse Name	Sample Location ID	Property ID	Date Visited	UTM Easting & Northing	Watercourse Type	Wet/Dry	Section Length (m)	Channel Features	Mean Wetted Width (m)	Mean Wetted Depth (m)	Mean Bankfull Width (m)	Mean Bankfull Depth (m)	Floodplain Width (m)	Left Upstream Bank Stability	Right Upstream Bank Stability	Substrate Composition	In-stream Cover (% of surface area)	Aquatic Vegetation Type (based on overall 100% distribution)			Overhead Coverage (% stream shaded)	Migratory Obstructions / Potential Critical Habitat	Water Chemistry Parameters	Surrounding Land Use	Sources of Pollution	Upwellings
																		Emergent	Floating	Submergent						
Millhaven Cr. Trib.1	P24-B	P24	5-Oct-11	18N 0365155 4905282	Intermittent/Drainage	Dry	100	CSP/Bridge	NA	NA	NR	NR	NR	NR	NR	NR	NA	NA	NA	NA	NA	NR	NA	Pasture	None Observed	None Observed
Millhaven Cr. Trib.1	P24-B Pond	P24	5-Oct-11	18N 0365193 4905312	Pond	Wet	15	Swale/Conveyance Between 2 Fields	6.00	1-1.3	NR	NR	NR	NR	NR	Bedrock (Limestone), Silt & Muck, Detritus, Organics	NR	NR	NR	NR	NR	NR	pH: 8 Conductivity: 351 µS/cm DO: 9.8 mg/L Water Temp: 13.2°C	Agriculture	Agriculture	Likely Ground Water
Millhaven Cr. Trib.1	P24-A	P24	5-Oct-11	18N 0364779 4904866	Cattail Marsh	Wet	NR	Box Culvert	6.00	0.40	8.50	1.60	NR	NR	NR	NR	NR	Cattails/Water Shield	NR	NR	NR	Beaver Activity	NR	Highway	Highway	None Observed
Unnamed Drainage 1 (401 Crossing)	P24-C	P24	5-Oct-11	18N 0365415 4904893	Pool	Wet	NR	Box Culvert	1.23	0.10	NR	NR	NR	NR	NR	NR	NR	Cattails/Sedges	NR	NR	NR	NR	NR	Highway	Highway	None Observed
Unnamed Drainage 1 (401 Crossing)	P24-D	P24	5-Oct-11	18N 0365511 4904973	Intermittent/Drainage, Ephemeral Pool, Small wetland feature	Wet	125	CSP culvert @ Hegadorn Rd.	NR	<0.10	NR	NR	NR	NR	NR	NR	NR	Sedges/Graminoids	NR	NR	NR	NR	NR	Agriculture	Agriculture	None Observed

Notes:

NR = Not Recorded

NA= Not Applicable

UN= Could not take measurement

observed ~2 rough legged Hawks.

LAKE PROFILE SHEETS

amec

1. Waterbody ID/Name: P9 - Quarry Pond. Field Dates: Oct 25/2011

GPS Start: 18T 367118 4908518 Weather: Sun to Cloud to wind.

End: walked circumference Time Start: 13:25

Field Crew: JAY & LEVI backto start. End:

2. Area (approx.): 1.08 ha

4. Secchi: 0.70 m Colour: clear.

5. Surrounding Land Use Agriculture, woodlots

Surrounding Pollution: Agriculture,

Dissolved Oxygen (mg/L) / Temperature (°C) Profile – Summer (S), Winter (W)

	0	1m	2m	4m	6m	8m	10m	15m	20m	25m
Dissolved Oxygen (S)										
Temperature (S)										
Dissolved Oxygen (W)										
Temperature (W)										

7. Key Water Quality Parameters (units, mg/L)

pH	8.04	Turbidity	
Conductivity	397 µS/cm	Phosphorus	
Alkalinity		Other DO.	6.38 mg/L
TDS	189 ppm	Other % DO	68.2%

Notes: Temp = 11°C Air temp
= 11.4°C water temp.

LAKE PROFILE SHEETS

8. Substrates (%) organics/substrate

Habitat	Type	Depth (M)	Cobble (%)	Gravel (%)	Sand (%)	Silt/Muck (%)	Clay (%)	Detritus (%)	Boulders	Bedrock
Littoral	A_L	0-1	10	10	5	35	10	15	10	25
		1-2								
		2-5								
		5+								
Littoral	B_L	0-1	35	ø	ø	35	ø	ø	15	20
		1-1.5								
Littoral	C_L	0-0.50	20			40				40
		1-2								
		2-5								
		5+								
Littoral	D_L	0-0.60	30	ø	ø	30			5	30
		1-2								
		2-5								
		5+								
Littoral	E_L	0-1								
		1-2								
		2-5								
		5+								
Profundal	A_P									
Profundal	B_P									

Notes:

Littoral habitat types A → D.

Type C - dominated by bedrock overlaid with silt/muck of a flocculent nature.

LAKE PROFILE SHEETS

9. Vegetation – Supralittoral/Eulittoral (%)

Supralittoral												
	~~JP~~ (%)	~~BS~~ (%)	WS (%)	BF (%)	Ce (%)	~~La~~ (%)	TA (%)	~~BP~~ (%)	WB (%)	Other (%)	Length (m)	Slope (%)
$A_{S/E}$					10		20	30		40	10	
$B_{S/E}$						20	20	30		30	8	
$C_{S/E}$	10	15			5	20	~~10~~			~~30~~	10	
$D_{S/E}$					30		15	20		35		
$E_{S/E}$												

Eulittoral							
	Alder (%)	Willow (%)	Dogwood (%)	Graminoid (%)	Ericaceous (%)	Other (%)	Width (m)
$A_{S/E}$	05	20	~~0~~	25	~~20~~	30	
$B_{S/E}$		20	5	~~40~~	15	~~10~~	
$C_{S/E}$				90	10		
$D_{S/E}$		10		60	10	20	
$E_{S/E}$							

Notes: Graminoids
- cattail
- sedge

Ericaceous
- ~~Pyrus~~ red
- birch
- goldenrod

Treed mixed forest
- trembling aspen
- ~~larch~~
- american elm
- red maple
- red cedar
- juniper
- red oak
- ~~Black spruce~~
- ash
- common buckthorn

Legend:
JP = Jack Pine BS = Black Spruce WS = White Spruce BF = Balsam Fir Ce = Cedar
La = Larch TA = Trembling Aspen BP = Balsam Poplar WB = White Birch

LAKE PROFILE SHEETS

amec

10. Vegetation – Littoral (%)

see aerial photo.

	Upper Littoral (Emergent M)	Middle Littoral (Floating M)	Lower Littoral (Submergent M)
Littoral A_L			
Length/width (m/m)	2.5m	NA.	1.5m.
Area (m^2)	→ calculate	from aerial photo.	
Vegetation cover (%)	25%	Ø	5%
Dominant species (%)	- cattail		- elodea
	- sedge.		- coontail
	- bluejoint grass		
Littoral B_L			
Length/width (m/m) + mapping.	0.5 m	Ø	Ø
Area (m^2)			
Vegetation cover (%)	10%		
Dominant species (%)	- sedge		

see photos.

Littoral C_L			
Length/width (m/m)	25 m	Ø	Ø
Area (m^2)			
Vegetation cover (%)	30%	Ø	Ø
Dominant species (%)	sedge		
Littoral D_L			
Length/width (m/m)	1.m		0.5
Area (m^2)			
Vegetation cover (%)	15	Ø	10
Dominant species (%)	~~[illegible]~~		canada pondweed
	~~sedge~~.		

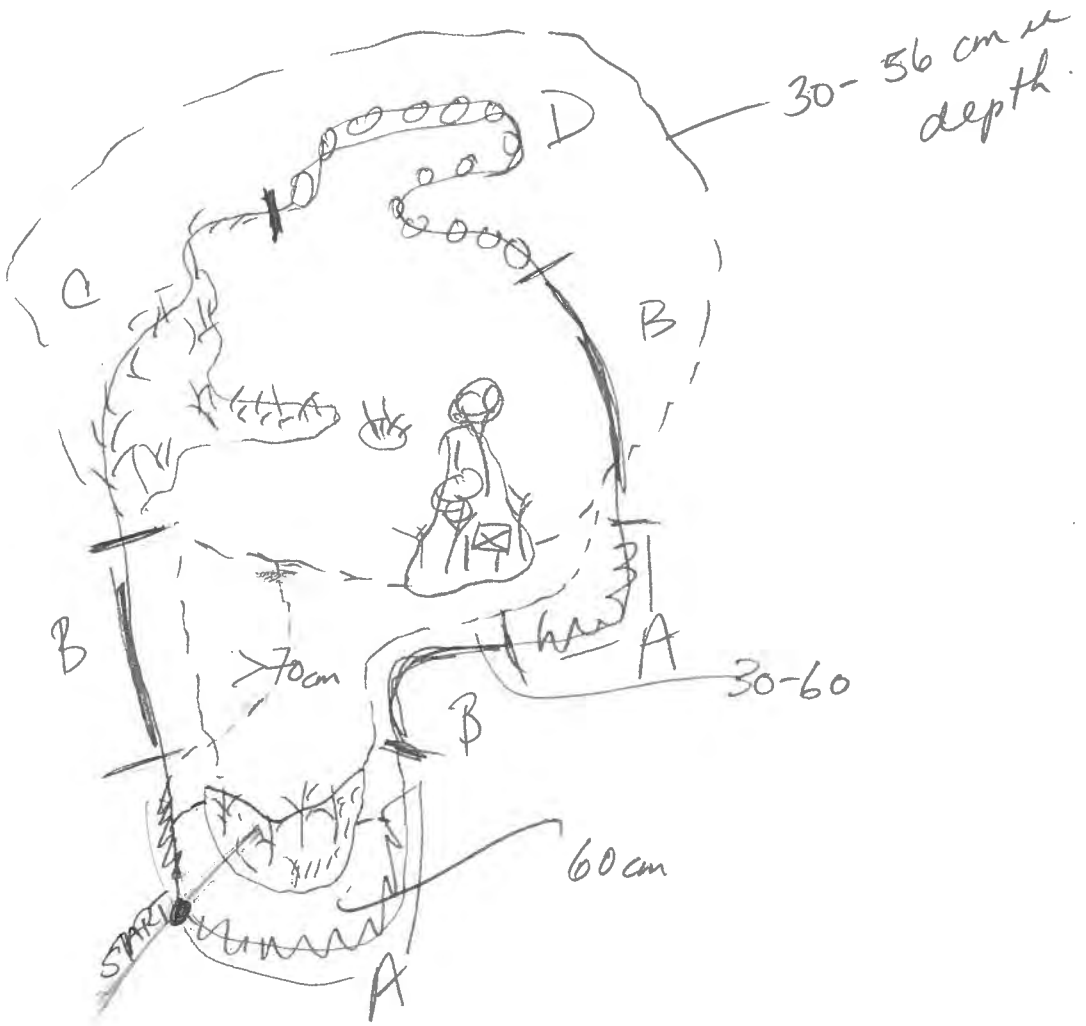
↳ most cover in D is provided by cobble & leaf litter.

Littoral E_L			
Length/width (m/m)			
Area (m^2)			
Vegetation cover (%)			
Dominant species (%)			

11. Underwater Cover 30 %
Overhanging Shrubs 15 %
Boulders 10 %
Logs 2 %
Macrophytes 3 %
Detritus 40 % — Leaf litter.
Undercut Banks 0 %

Area with available cover 35 %

12. Comments:


30-56 cm in depth
D
C
B
B
A
>70cm
30-60
B
60 cm
START
A

8

CREEK PROFILE SHEETS

amec

1. Creek/Reach Name: P1-A Field Dates: 03/10/2011

GPS Start: 18T 370611 4908823 Weather: overcast 8/8

End: 18T 370488 4908990 Time Start: 7:45

Field Crew: SA/JD End: 8:25

2. Reach Length: Valley Line GPS m Channel Line _____ m

Surrounding Land Use: Pasture

Surrounding Pollution: Agriculture / road

3. Channel Features:

Sinuosity	m/m	Gradient	m/m
Meander Length	m	Meander amplitude	m
Entrenchment	m		

Notes: - Drainage culvert

4. Channel Type:

Stream/River	Intermittent X
Channelized	Ephemeral
Permanent	

Notes: Dry

5. Channel Dimensions:

Floodplain width (m)	Channel depth (bank full) (m) 0.7
Channel width (wetted) (m) —	Top of Bank (m) 0.1
Channel width (bank full) (m) 3.0	Average thaleg depth (m) —

- Channel narrows to 2 meters + 0.7 deep

- narows again slightly, but still 0.7m deep

Notes:

6. Channel Morphology (%)

Pools	%	Flats	%	Runs	%
Riffles	%	Braided/diffuse	%	Beaver ponds	%

Notes: - diffuses upstream + narrows to 2 m wide

7. Other Channel Features:

Undercut banks Amount (m):	%	Beaver dams Number Observed:	%
Eroding banks	%	Woody structure	%
Organic debris	%		

Notes: Dry

8. Summer Temperature/Dissolved Oxygen

Summer Temperature	-water	°C	
	-air	°C	
Dissolved oxygen			mg/l
pH			
Conductivity			v/s

9. Key Water Quality Parameters (units, mg/l)

pH		Turbidity	
Conductivity		Phosphorus	
Alkalinity			
TDS			

10. Substrates (%)

Boulder	Cobble	Gravel	Sand	Silt/Muck	Clay	Detritus
A)						
B)						
C)						

Notes: - Cobble + gravel + sand overlayed by terrestrial leaf litter,
- further up boulders present

11. Upwellings/Seeps

Upwellings confirmed	—	m
Upwellings suspected	—	m
Supra water level seeps	—	#/m

Notes:

12. Vegetation Composition – Supralittoral/Eulittoral (%)

Supralittoral

JP	BS	WS	BF	Ce	La	TA	BP	WB

Notes: - wild grape, elm, grass, gramminoids, plantain, bedstraw? Elm, Maple
asterlaspan?

Eulittoral - pockets of deposited woody debris (ie. twigs) bur oak ? chesnut

Alder	Willow	Dogwood	Ericaceous	Graminoid	Width (m)

Notes: - Sumac, burdock, thistle, cow veg
- early meadow rube
- mosses
- Fungal growth

Vegetation Key

JP=Jack Pine BP=Bolar Poplar BS=Black Spruce WB=White Birch WS=White Spruce BF=Balsam Fir Ce=Cedar La= Larch TA=Trembling Aspen

13. Stream Cover (%)

In Water	Overhanging branches		%
	Bottom branch debris		%
	Undercut banks		%
	Logs		#/m
Overhead Cover	Canopy (vertical shading)		%
	Ground Vegetation	Shrubs	%
		Graminoid	%

Notes: Dry, some sedges present

14. Vegetation Composition (Macrophytes) – in-stream (%)

	Emergent	Submergent
Vegetation cover (%)		
Dominant species (%)		

15. Current velocity m/s: —

Notes:

Bank stability: Left bank_____ Right bank_____

Notes:

- further upstream becomes diffuse
- Dry :. no instream cover

- @ end of reach pitters out, diffuse flow through wooded area

CREEK PROFILE SHEETS

* Glenvale Creek.

1. Creek/Reach Name: P12-A Field Dates: Oct 3/11

GPS Start: 18T 0370488 4908221 Weather: overcast

End: 125 m downstream of crossing Time Start:

Field Crew: JF Steve. End:

2. Reach Length: Valley Line 225 m Channel Line 250 m

Surrounding Land Use: Agriculture, roadways

Surrounding Pollution: Agriculture, road (salt/siltation).

3. Channel Features:

Sinuosity	—	m/m	Gradient	low	m/m
Meander Length	—	m	Meander amplitude	N/A	m
Entrenchment	low	m			

Notes: 0.56/0.82 rise/run.

4. Channel Type:

Stream/River	stream	Intermittent	
Channelized	✓	Ephemeral	
Permanent	✓		

Notes:

5. Channel Dimensions:

Floodplain width (m) > 250 m	Channel depth (bank full) (m) 1.9 * 2.0
Channel width (wetted) (m) 8.5	Top of Bank (m) 0.56
Channel width (bank full) (m) 10.2	~~Average thaleg~~ wetted depth (m) 1.3

Notes:

6. Channel Morphology (%)

Pools	20	%	Flats	70	%	Runs	0	%
Riffles	0	%	Braided/diffuse	10	%	Beaver ponds	0	%

Notes:

7. Other Channel Features:

Undercut banks Amount (m):	%	Beaver dams Number Observed:	%
Eroding banks	%	Woody structure lots.	%
Organic debris	%		

Notes:

8. Summer Temperature/Dissolved Oxygen

Summer Temperature	-water	12.2	°C	
	16.4 -air	16.4	°C	
Dissolved oxygen	2.55 mg/L			mg/L
pH	7.47			
Conductivity	697 uS/cm.	TDS- 348 ppm		v/s

9. Key Water Quality Parameters (units, mg/l)

pH		Turbidity	
Conductivity		Phosphorus	
Alkalinity			
TDS			

10. Substrates (%)

Boulder	Cobble	Gravel	Sand	Silt/Muck	Clay	Detritus
A)	10			80		10
B)						
C)						

Notes: – silt/muck w detritus.
– some cobble likely from construction materials.

11. Upwellings/Seeps

Upwellings confirmed	none	m
Upwellings suspected		m
Supra water level seeps		#/m

Notes:

12. Vegetation Composition – Supralittoral/Eulittoral (%) Riparian veg.

Supralittoral

JP	BS	WS	BF	Ce	La	TA	BP	WB

Notes:
– willow (large).
– graminoid

Eulittoral – cattail.

Alder	Willow	Dogwood	Ericaceous	Graminoid	Width (m)

Notes:

Vegetation Key
JP=Jack Pine BP=Bolar Poplar BS=Black Spruce WB=White Birch WS=White Spruce BF=Balsam Fir Ce=Cedar La= Larch TA=Trembling Aspen

13. Stream Cover (%)

In Water	Overhanging branches		%
	Bottom branch debris		%
	Undercut banks		%
	Logs		#/m
Overhead Cover	Canopy (vertical shading)		%
	Ground Vegetation	Shrubs	%
		Graminoid	%

Notes:

14. Vegetation Composition (Macrophytes) – in-stream (%)

	Emergent	Submergent
Vegetation cover (%)		
Dominant species (%)		

15. Current velocity m/s: _____

Notes:

Bank stability: Left bank_____ Right bank_____

Notes:

JPD (2011/04/29)

amec

ELECTROSHOCKING FISH SAMPLE FORM

Project Code: TC111406 SAMSUNG					Page 1 of 1
Stream Name: Glenvale Cr.	Date (YYYY/MM/DD): 2011/10/03	Water Temp.: 12°C	Shocker: LR-24 JA4		Run 1 of 1
Location Coordinates (UTM):	Start Time: 15:30	Stop Time: 15:45	Netters: Steve		Site Area (Length X Width): 120 x 1.5 m
Sample ID: P12-E1	Elapsed Time: 15 mins	Shocker Seconds: 550	Voltage: 400	Frequency: 60	Pulse: Std

Fish Number	Species	Species Code	Length (mm) Fork	Length (mm) Total	Wet Body Weight (g)	Aging Structures	Pres. for Analysis (Y/N)	Comments
1	FSD		55	59	—	—	—	
2	"		53	56	—	—	—	
3	NRBD		55	59				
4	BSB		-	45				
5	FSD		54	57				
6	BSB		-	44				
7	RBD		44	49				

Species	Total Catch	Species	Total Catch	Species Box Tally Area / Site Comments
FSD				2 FISH CAUGHT BY MINNOW TRAP set for 1 hr.
NRBD				
		TOTAL		

CREEK PROFILE SHEETS

1. Creek/Reach Name: Glenvale Creek R12-B Field Dates: Oct 3/11

GPS Start: 18T 370387 4908116 Weather: Overcast 8/8 ~~10~~ 16.5°C

End: Time Start: 1445

Field Crew: JAY & STEVE End:

2. Reach Length: Valley Line 150 m Channel Line 150 m

Surrounding Land Use: Agriculture

Surrounding Pollution: Road runoff, agriculture.

3. Channel Features:

Sinuosity	NA	m/m	Gradient	0.01	m/m
Meander Length	2	m	Meander amplitude	1	m
Entrenchment	NA	m			

Notes: channel is ill-defined & very overgrown.

4. Channel Type:

Stream/River	Stream	Intermittent	
Channelized	Barely	Ephemeral	
Permanent	✓		

Notes: creek is most channelized @ this location but generally diffuse with connecting channels throughout large sedge and grass dominated wetland.

5. Channel Dimensions:

Floodplain width (m) > 250	Channel depth (bank full) (m) 0.8
Channel width (wetted) (m) 1.2	Top of Bank (m) 0.25
Channel width (bank full) (m) 2.5	Average thaleg depth (m) 0.5

Notes:

6. Channel Morphology (%)

Pools	Ø %	Flats	Ø %	Runs	Ø %
Riffles	Ø %	Braided/diffuse	100 %	Beaver ponds	Ø %

Notes:

See previous note.

7. Other Channel Features:

Undercut banks Amount (m):	% Ø	Beaver dams Number Observed:	% Ø
Eroding banks	Ø %	Woody structure	Ø %
Organic debris	5 %		

Notes:

8. Summer Temperature/Dissolved Oxygen

Summer Temperature	-water	12.1 °C	
	-air	16.5 °C	
Dissolved oxygen	3.09 mg/L		mg/l
pH			
Conductivity			v/s

9. Key Water Quality Parameters (units, mg/l)

pH 7.42		Turbidity	
Conductivity 693 µs/cm		Phosphorus	
Alkalinity —			
TDS 346			

10. Substrates (%)

Boulder	Cobble	Gravel	Sand	Silt/Muck	Clay	Detritus
A) ∅	∅	∅	∅	90		10
B)						
C)						

all the same.

Notes:

11. Upwellings/Seeps

Upwellings confirmed	m
Upwellings suspected	m
Supra water level seeps	#/m

Notes:

12. Vegetation Composition – Supralittoral/Eulittoral (%)

Supralittoral

JP	BS	WS	BF	Ce	La	TA	BP	WB

Notes: Some dyery willows (large), larch.

Eulittoral

Alder	Willow	Dogwood	Ericaceous	Graminoid	Width (m)
				100	>250

Notes:

large trees interspersed in graminoid wetland.

Vegetation Key

JP=Jack Pine BP=Bolar Poplar BS=Black Spruce WB=White Birch WS=White Spruce BF=Balsam Fir Ce=Cedar La= Larch TA=Trembling Aspen

13. Stream Cover (%)

In Water	Overhanging branches	6	%
	Bottom branch debris	Ø	%
	Undercut banks	Ø	%
	Logs	Ø	#/m
Overhead Cover	Canopy (vertical shading)	30	%
	Ground Vegetation — Shrubs	Ø	%
	Ground Vegetation — Graminoid	100	%

Notes:

N

14. Vegetation Composition (Macrophytes) – in-stream (%)

	Emergent	Submergent
Vegetation cover (%)	40	60
Dominant species (%)	sedge.	Lemna.
		Pond Lily

15. Current velocity m/s: Ø

Notes:

Bank stability: Left bank high Right bank high

Notes:

Chemocha.

CREEK PROFILE SHEETS

1. Creek/Reach Name: Glencoe Creek P12-C Field Dates: Oct 4/11

GPS Start: 18T 370136 4907864 Weather: Cloudy.

End: ~ 70 m. Time Start: 8:30

Field Crew: _____ End: _____

2. Reach Length: Valley Line 75 m Channel Line 80 m — very straight here.

Surrounding Land Use: agriculture.

Surrounding Pollution: agriculture - little current use - cattle watering.

3. Channel Features:

Sinuosity	0 m/m	Gradient	m/m
Meander Length	little to none. m	Meander amplitude	m
Entrenchment	m		

Notes:
- right bank 0.5 m height, 1:1 ratio
- 0.5 wide.
- left bank - no entrenchment - primary floodplain.

4. Channel Type:

Stream/River	creek.	Intermittent	
Channelized	✓	Ephemeral	
Permanent	✓		

Notes:

5. Channel Dimensions:

Floodplain width (m) > 250 m.	Channel depth (bank full) (m) 1.06
Channel width (wetted) (m) 5.2	Top of Bank (m) 0.5
Channel width (bank full) (m) 8.0	Average thaleg depth (m) wetted 0.56

Notes:

Julie says whole area ~~is~~ now inundated for much of the year, however it used to be much drier in the past. Changes to surrounding landuse? - Beaver activity? no signs found.

6. Channel Morphology (%)

Pools	%	Flats	100 %	Runs	%
Riffles	%	Braided/diffuse	%	Beaver ponds	%

Notes:

Smaller braided wetted areas empty in mostly from the SE portion of the wetland.

7. Other Channel Features:

Undercut banks 0 % Amount (m):		Beaver dams 0 % Number Observed:	
Eroding banks 0 %		Woody structure 0 %	
Organic debris 100 %			

Notes:

8. Summer Temperature/Dissolved Oxygen

Summer Temperature	-water	12.2 °C	
	-air	16 °C	
Dissolved oxygen	2.64		mg/l
pH	7.49		
Conductivity	679 mS/cm	TDS = 339 ppm	v/s

9. Key Water Quality Parameters (units, mg/l)

pH		Turbidity	
Conductivity		Phosphorus	
Alkalinity			
TDS			

10. Substrates (%)

Boulder	Cobble	Gravel	Sand	Silt/Muck	Clay	Detritus
A)				80	10	10
B)						
C)						

Notes:

11. Upwellings/Seeps

Upwellings confirmed	m
Upwellings suspected	m
Supra water level seeps	#/m

Notes:

12. Vegetation Composition – Supralittoral/Eulittoral (%)

Supralittoral

JP	BS	WS	BF	Ce	La	TA	BP	WB

Notes: ~~Suprati~~ tree line > 250 m back of mixed forest of cedar, elm, maple, spruce (SE side)

Eulittoral

Alder	Willow	Dogwood	Ericaceous	Graminoid	Width (m)
				100	

Notes: - consisting of cattail, burreed & grasses

Vegetation Key

JP=Jack Pine BP=Bolar Poplar BS=Black Spruce WB=White Birch WS=White Spruce BF=Balsam Fir Ce=Cedar La= Larch TA=Trembling Aspen

13. Stream Cover (%)

In Water	Overhanging branches		0	%
	Bottom branch debris		0	%
	Undercut banks		0	%
	Logs		0	#/m
Overhead Cover	Canopy (vertical shading)			%
	Ground Vegetation	Shrubs		%
		Graminoid	100	%

100% aquatic & emergent sedge veg & root mass cover.

Notes:

— reed canary grass present.

14. Vegetation Composition (Macrophytes) – in-stream (%)

	Emergent	Submergent
Vegetation cover (%)	50 beaked sedge	50
Dominant species (%) reed canary Fowl meadow grass	50 sedge / 50 grass. cattail	20 Lemna sp. 20 Frogbit. 10 - Bladderwort

15. Current velocity m/s: _____

Notes:

Bank stability: Left bank hyl Right bank hyl

Notes:

- floodprone.

JPD (2011/04/29)

amec

Minnow Trap 2 baited

ELECTROSHOCKING FISH SAMPLE FORM

Project Code: TC 111406					Page ____ of ____
Stream Name	Date (YYYY/MM/DD): 2011/10/04	Water Temp.	Shocker: —		Run ____ of ____
Location Coordinates (UTM): See habitat P12-C	Start Time: 8:40	Stop Time: 12:40	Netters: —		Site Area (Length X Width): —
Sample ID: P12-C	Elapsed Time: 4hrs	Shocker Seconds: —	Voltage: —	Frequency: —	Pulse: —

Fish Number	Species	Species Code	Length (mm) Fork	Length (mm) Total	Wet Body Weight (g)	Aging Structures	Pres. for Analysis (Y/N)	Comments
1	NRBD	(182)	49	52				
2	"		45	47				
3	"		52	57				
4	"		57	62				
5	"		52	56				
6	Brassy	(189)	59	63				
7	NRBD		56	60				
8	"		54	57				
9	"		57	62				
10	"		58	62				
11	"		54	56				
12	"		50	53				
13	"		49	53				
14	"		53	57				
15	"		64	68				
16	"		56	61				
17	PD		70	80				
18	BSB	281	—	45				
19	Brassy		62	67				
20	"		61	66				
21	FSD	210	64	69				
22	Brassy		52	56				
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								

Species	Total Catch	Species	Total Catch	Species Box Tally Area / Site Comments
				NRBD ☒☒☒☒☒☒☒☒☒☒☒☒☒☒☒ ☒ 159
				Brassy 1
		TOTAL		

JPD (2011/04/29)

amec

ELECTROSHOCKING FISH SAMPLE FORM		Project Code TC111406		Page ____ of ____
Stream Name	Date (YYYY/MM/DD) 2011/10/04	Water Temp.	Shocker JD	Run ____ of ____
Location Coordinates (UTM) See habitat P12-C	Start Time 930	Stop Time 1015	Netters SA	Site Area (Length X Width):
Sample ID P12-E2	Elapsed Time 45 mins	Shocker Seconds 762	Voltage 400	Frequency 50 / Pulse Std

Fish Number	Species	Species Code	Length (mm) Fork	Length (mm) Total	Wet Body Weight (g)	Aging Structures	Pres. for Analysis (Y/N)	Comments
1	FSD	210	50	53				
2	BSB	281	–	41				

Species	Total Catch	Species	Total Catch	Species Box Tally Area / Site Comments
				* missed 4 BSB
		TOTAL		

CREEK PROFILE SHEETS

1. Creek/Reach Name: Glengyle Creek P13-A Field Dates: Oct 4/11

GPS Start: 18 T 369899 4907582. Weather:

End: ~ 50 m Time Start:

Field Crew: End:

2. Reach Length: Valley Line 75 m Channel Line 105 m

Surrounding Land Use:

Surrounding Pollution:

3. Channel Features:

Sinuosity	—	m/m	Gradient	low ~0.1	m/m
Meander Length	110	m	Meander amplitude	50	m
Entrenchment	1:1	m			

Notes:

27:30
2:W

4. Channel Type:

Stream/River	Intermittent
Channelized	Ephemeral
Permanent	

Notes:

5. Channel Dimensions:

Floodplain width (m) > 200 m	Channel depth (bank full) (m) 0.65
Channel width (wetted) (m) 2.4	Top of Bank (m) 0.27.
Channel width (bank full) (m) 3.0	~~Average thaleg~~ depth (m) wetted. 0.38

1
38
27
65

Notes:

6. Channel Morphology (%)

Pools	%	Flats	100 %	Runs	%
Riffles	%	Braided/diffuse	%	Beaver ponds	%

Notes:

7. Other Channel Features:

Undercut banks Amount (m):	0 %	Beaver dams Number Observed:	0 %
Eroding banks	0 %	Woody structure	15 %
Organic debris	20 %		

Notes:

8. Summer Temperature/Dissolved Oxygen

Summer Temperature	-water	13.1	°C	
	-air	16	°C	
Dissolved oxygen	2.88 mg/L	27	DO (%)	~~mg/l~~
pH				
Conductivity				v/s

9. Key Water Quality Parameters (units, mg/l)

pH	7.51	Turbidity	
Conductivity	675 µS/cm	Phosphorus	
Alkalinity			
TDS	340 ppm		

10. Substrates (%)

Boulder	Cobble	Gravel	Sand	Silt/Muck	Clay	Detritus
A)				80	10	10
B)						
C)						

Notes:

11. Upwellings/Seeps

Upwellings confirmed	m
Upwellings suspected	m
Supra water level seeps	#/m

Notes:

12. Vegetation Composition – Supralittoral/Eulittoral (%)

Supralittoral

JP	BS	WS	BF	Ce	La	TA	BP	WB

Notes: red maple 20%
willow 20%
Graminoid 60%

Eulittoral

Alder	Willow	Dogwood	Ericaceous	Graminoid	Width (m)
				100%	

Notes:

- Slough grass
- Fowl meadow grass.
- reed canary grass.

Vegetation Key

JP=Jack Pine BP=Bolar Poplar BS=Black Spruce WB=White Birch WS=White Spruce BF=Balsam Fir Ce=Cedar La= Larch TA=Trembling Aspen

13. Stream Cover (%)

In Water	Overhanging branches	Ø	%
	Bottom branch debris	Ø	%
	Undercut banks	Ø	%
	Logs	1/30	#/m
Overhead Cover	Canopy (vertical shading)	20	%
	Ground Vegetation — Shrubs	Ø	%
	Ground Vegetation — Graminoid	20	%

Notes:

14. Vegetation Composition (Macrophytes) – in-stream (%)

	Emergent	Submergent
Vegetation cover (%)	40	60
Dominant species (%)	- sedges	- Bladderwort
	- carex sp.	- Frogsbit
		- lemna sp.

15. Current velocity m/s: Ø

Notes:

Bank stability: Left bank high Right bank high

Notes: - flooded. - flooded

JPD (2011/04/29)

amec

ELECTROSHOCKING FISH SAMPLE FORM		Project Code TC111406 (SAMSUNG)		Page 1 of 1
Stream Name: Glenvale Cr.	Date (YYYY/MM/DD): 2011/10/04	Water Temp.: 12.2	Shocker: STEVE	Run 1 of 1
Location Coordinates (UTM): 18T 369899 4907582	Start Time: 11:15	Stop Time: 12:00	Netters: JAY	Site Area (Length X Width): 75 X 2.5
Sample ID: P13-E1	Elapsed Time: 45 min	Shocker Seconds: 1085	Voltage: 400	Frequency: 40 / Pulse: Stdrd

Fish Number	Species	Species Code	Length (mm) Fork	Length (mm) Total	Wet Body Weight (g)	Aging Structures	Pres. for Analysis (Y/N)	Comments
1	BSB	281	–	46				
2	BSB	281	–	45				
3	BSB	281	–	48				
4	BSB	281	–	45				
5								
6								

Species	Total Catch	Species	Total Catch	Species Box Tally Area / Site Comments
				BSB
		TOTAL		

* Pics of Gastropodas, Sphaeriids

P-16-Pond Glenvale Cr.

CREEK PROFILE SHEETS

1. Creek/Reach Name: South-west brand Field Dates: Oct 5/11

GPS Start: 18 T 0367401 4906536 Weather:

End: small pond see map. Time Start:

Field Crew: End:

2. Reach Length: Valley Line _____ m Channel Line _____ m

Surrounding Land Use: _____

Surrounding Pollution: _____

3. Channel Features:

Sinuosity	m/m	Gradient	m/m
Meander Length	m	Meander amplitude	m
Entrenchment	m		

Notes:

4. Channel Type:

Stream/River	Pond - creek.	Intermittent	
Channelized	C	Ephemeral	
Permanent	yes.		

Notes:

5. Channel Dimensions:

Floodplain width (m)	42	Channel depth (bank full) (m)	1.1 m
Channel width (wetted) (m)	28 m wetted length 24 m	Top of Bank (m)	0.30
Channel width (bank full) (m)	42	Average thaleg depth (m)	0.75 m

Notes:

pond

6. Channel Morphology (%)

Pools	100 %	Flats	%	Runs	%
Riffles	%	Braided/diffuse	%	Beaver ponds	%

Notes:

7. Other Channel Features:

Undercut banks Amount (m):	0 %	Beaver dams Number Observed:	0 %
Eroding banks	0 %	Woody structure	20 %
Organic debris	20 %		

Notes:

8. Summer Temperature/Dissolved Oxygen

Summer Temperature	-water	11.9	°C	
	-air	15.0	°C	
Dissolved oxygen	8.6 mg/L	82 %		mg/l
pH				
Conductivity				v/s

9. Key Water Quality Parameters (units, mg/l)

pH	7.83	Turbidity	
Conductivity	524 uS/cm	Phosphorus	
Alkalinity			
TDS	261 ppm		

10. Substrates (%)

Boulder	Cobble	Gravel	Sand	Silt/Muck	Clay	Detritus
A)				30	40	30
B)						
C)						

Notes:

11. Upwellings/Seeps

Upwellings confirmed	10	m
Upwellings suspected	yes. +	m
Supra water level seeps		#/m

Notes:

12. Vegetation Composition – Supralittoral/Eulittoral (%)

Supralittoral

JP	BS	WS	BF	Ce	La	TA	BP	WB

Notes: Beech trees, red maple, cedar, speckled alder.
50% 20% 10% 20
- some trace wild rose.

Eulittoral

Alder	Willow	Dogwood	Ericaceous	Graminoid	Width (m)
10				90%	

Notes: & sedges

Vegetation Key
JP=Jack Pine BP=Bolar Poplar BS=Black Spruce WB=White Birch WS=White Spruce BF=Balsam Fir Ce=Cedar La= Larch TA=Trembling Aspen

13. Stream Cover (%)

In Water	Overhanging branches		5	%
	Bottom branch debris		5	%
	Undercut banks		~~0~~	%
	Logs		0.3	#/m
Overhead Cover	Canopy (vertical shading)		10	%
	Ground Vegetation	Shrubs	~~0~~	%
		Graminoid	~~10~~ 10	%

Notes:

lots of leaf litter.

14. Vegetation Composition (Macrophytes) – in-stream (%)

	Emergent	Submergent
Vegetation cover (%)	20	~~2~~ 60
Dominant species (%)	- ~~Dulrush~~ hardstem bulrush	- ~~Pondweed~~
	- carex sp.	- pondweed sp
	- graminoids	- bladderwort
	- equisetum	- lemna trisulca

15. Current velocity m/s: ~~_____~~

Notes:

Bank stability: Left bank high Right bank high

Notes:

CREEK PROFILE SHEETS

1. Creek/Reach Name: Milhaven Cr. P23-A Field Dates: Oct 5/11

GPS Start: 18T 0564765 4904967 Weather: Sunny

End: 50 m Time Start: 16:11

Field Crew: IAN & Steve. End:

2. Reach Length: Valley Line 50 m Channel Line 62 m

Surrounding Land Use: 401 wetland complex agriculture to the North.

Surrounding Pollution: road way runoff downstream upstream agriculture.

3. Channel Features:

Sinuosity	— m/m	Gradient	0.001 m/m
Meander Length	see map. m	Meander amplitude	— m
Entrenchment	∅ m		

Notes:

4. Channel Type:

Stream/River	wetland.	Intermittent	
Channelized	✓ at this point.	Ephemeral	~~this~~
Permanent	yes.		

Notes: permanent side channel near ephemeral wetland hummocks

5. Channel Dimensions:

Floodplain width (m)	>300 m	Channel depth (bank full) (m)	~0.80
Channel width (wetted) (m)	1.15 wetted area NA – floods wetland.	Top of Bank (m)	1.0 – side limestone / cedar embankment.
Channel width (bank full) (m)	NA – foodplain	Average thaleg depth (m)	welted channel 0.10 m.

no channel bank on left side.

Notes:

6. Channel Morphology (%)

Pools	%	Flats	%	Runs	%
Riffles	%	Braided/diffuse 90	%	Beaver ponds 10	%

Notes:

large cattail marsh with braids flowing @ higher water levels.

7. Other Channel Features:

Undercut banks Amount (m): 0	%	Beaver dams Number Observed: 1 ~~1~~ #01 ~~about~~ upstream on site	%
Eroding banks 0	%	Woody structure 39	%
Organic debris ~~#~~ 60	%		

Notes:

8. Summer Temperature/Dissolved Oxygen

Summer Temperature	-water	15°	°C
	-air	~~#~~ 18	°C
Dissolved oxygen	1.60 mg/L, 17% DO		mg/l
pH			
Conductivity			v/s

9. Key Water Quality Parameters (units, mg/l)

pH	7.24	Turbidity	
Conductivity	1052 µS/cm	Phosphorus	
Alkalinity			
TDS	525 ppm		

10. Substrates (%)

Boulder	Cobble	Gravel	Sand	Silt/Muck	Clay	Detritus
A)	✓	✓	✓	90	✓	10
B)						
C)						

Notes:

11. Upwellings/Seeps

Upwellings confirmed	m
Upwellings suspected	m
Supra water level seeps	#/m

Notes:

12. Vegetation Composition – Supralittoral/Eulittoral (%)

Supralittoral

JP	BS	WS	BF	Ce	La	TA	BP	WB

Notes:
- redcedar on right bank 30%
- dead deciduous trees - likely beech all through wetland. 80% willow 20%

Eulittoral

Alder	Willow	Dogwood	Ericaceous	Graminoid	Width (m)

Notes:
cattail 100%

Vegetation Key
JP=Jack Pine BP=Bolar Poplar BS=Black Spruce WB=White Birch WS=White Spruce BF=Balsam Fir Ce=Cedar La= Larch TA=Trembling Aspen

13. Stream Cover (%)

In Water	Overhanging branches	Ø	%
	Bottom branch debris	Ø	%
	Undercut banks	Ø	%
	Logs	5	#/m
Overhead Cover	Canopy (vertical shading)	20	%
	Ground Vegetation — Shrubs	5	%
	Ground Vegetation — Graminoid	95	%

Notes:

Cattail marsh.

14. Vegetation Composition (Macrophytes) – in-stream (%)

	Emergent	Submergent
Vegetation cover (%)	0% in braided areas.	0% in braided areas.
Dominant species (%)		

15. Current velocity m/s: Ø

Notes:

Bank stability: Left bank NA Right bank NA

Notes:

CREEK PROFILE SHEETS

Pond

1. Creek/Reach Name: 14B South Pond Field Dates: Oct 6/11

GPS Start: 18T 367774 4907062 Weather: Sunny

End: Time Start: 12:20

Field Crew: JAY & STEVE End:

2. Reach Length: Valley Line / m Channel Line / m

Surrounding Land Use: agriculture

Surrounding Pollution: /

3. Channel Features:

Sinuosity	m/m	Gradient	m/m
Meander Length	m	Meander amplitude	m
Entrenchment	m		

Notes:

pond length - 130 m
width - 85 m
max depth - unknown as very mucky & can't wade to centre.
- steep sloped 65-70% slope

4. Channel Type:

Stream/River	Intermittent
Channelized	Ephemeral
Permanent	

Notes:

5. Channel Dimensions:

Floodplain width (m)	Channel depth (bank full) (m)
Channel width (wetted) (m)	Top of Bank (m)
Channel width (bank full) (m)	Average thaleg depth (m)

Notes:

6. Channel Morphology (%)

Pools	%	Flats	%	Runs	%
Riffles	%	Braided/diffuse	%	Beaver ponds	%

Notes: Pond.

7. Other Channel Features:

Undercut banks Amount (m):	%	Beaver dams Number Observed:	%
Eroding banks	%	Woody structure	%
Organic debris	%		

Notes:

8. Summer Temperature/Dissolved Oxygen

Summer Temperature	-water	13	°C	
	-air		°C	
Dissolved oxygen	94% DO%		9.8 mg/L	mg/l
pH	8.5			
Conductivity				v/s

9. Key Water Quality Parameters (units, mg/l)

pH		Turbidity	
Conductivity	271 µS/cm	Phosphorus	
Alkalinity			
TDS	134 ppm		

10. Substrates (%) — only know @ margins

Boulder	Cobble	Gravel	Sand	Silt/Muck	Clay	Detritus
A)				50	50	
B)						
C)						

Notes:

11. Upwellings/Seeps — whole pond expected to be spring fed as no drainage in or out.

Upwellings confirmed	m
Upwellings suspected	m
Supra water level seeps	#/m

Notes:
- possible historic quarry as banks are extremely elevated
- possible "kettle" lake? - check definition

12. Vegetation Composition – Supralittoral/Eulittoral (%)

Supralittoral

JP	BS	WS	BF	Ce	La	TA	BP	WB

Notes:
- red maple 60% / white oak 10%
- american beech 30%

Eulittoral

Alder	Willow	Dogwood	Ericaceous	Graminoid	Width (m)
			20%	80%	

Notes:

Vegetation Key
JP=Jack Pine BP=Bolar Poplar BS=Black Spruce WB=White Birch WS=White Spruce BF=Balsam Fir Ce=Cedar La= Larch TA=Trembling Aspen

13. Stream Cover (%)

In Water	Overhanging branches	2	%
	Bottom branch debris	Ø	%
	Undercut banks	Ø	%
	Logs	~~4~~	#/m
Overhead Cover	Canopy (vertical shading)	30	%
	Ground Vegetation — Shrubs	Ø	%
	Ground Vegetation — Graminoid	40	%

Notes:

— Trees 40 %
Lred maple.

14. Vegetation Composition (Macrophytes) – in-stream (%)

	Emergent	Submergent
Vegetation cover (%)	~~5~~ 5%	30%
Dominant species (%)	— sedge	— Ceratophylum
		— Valisneria

15. Current velocity m/s: /

Notes:

Bank stability: Left bank hyl Right bank hyl

Notes:

— Signs of human use as large drain hose or pump hose (CPP) is located @ the west end of pond (see pics)
— also detergent bottle in east end
— no discernible inlet or outlet drainages.
— berm around outside fully vegetated for long period of time, berm is elevated at least 6–7 m above the surrounding forest
— water is currently at surrounding forest elevation

man made

Tues

DAY 2

12 ✓
13 ✓
5 ✓
~~6~~A ✓

DAY 3 → 14A leave for later.

14B ~~→~~
14C
6B

down to wetland

DAY 6

~~21~~
~~22~~
(23) 1 of 2
~~24~~ also 125m. outside this bodes.

Sunday travel *

DAY 4

~~6A~~
(9)
10
~~11A~~
~~11B~~

9 — not have to do

DAY 5

15
(16) — Howes Rd.
20

MON, OCT 3 / 11

7:45 JAY & STEVE

P1 - A
- no water, no fish
- habitat
- intermittent drainage
- diffuse upstream to downstream culvert
- measured bankfull

9:30 P3 - Pond A 18T 3 700 30 4908418
- pond dug out
- lower pocket ground water fed
- dug out deeper between 20-25 yrs ago when road was widened
- ~~no~~ water standing
- depth ~ 20 cm
- groundwater, former watering area for cattle

10:30 P3-B 18T 0370021
4909325

- intermittently wetted low lying area near limestone outcropping draw to neighbouring property channel / pond (pond man made).
- terrestrial plants with some tolerance to water.
- some die off of woody trees & shrubs.
- veg changes to more of a wetland area.
  - sedge, graminoid
  - wet soil
  - not aquatic habitat
    ↳ currently dry.

* - one pick after these notes is P3-B

- frogs calling
  ↳ green frog?

11:00 P-2A

↳ lower (southerly same as P3-B area.

11:30 P-2B 18T 0370123
4909801

- willow / dogwood / cattail marsh.
- small intermittent & diffuse channels.
- not fish habitat
  ~ 10 cm depth.
  - choked w vegetation mainly → 1) ~~[illegible]~~ lemna trisulca
    2) unidentified emergent / aquatic
- also pipweed

Anacharis sp. = waterweed

- whorled
- opposite in 2's
- conspicuously veined
- veins are
- oval leafs

12:00 P2-A cont.
18T 0370103 4909421
<5cm deep – wetted pseudo channel
– bankful width 1m
" height 45cm.
– little water while there graminoid & sedge
– continues along property line
– not fish bearing

1345 2 Minnow traps set (baited)
P12-A 18T 0370488 4908221
Glenvale Creek @ bridge (
Air temp = 16.4°C
water temp. 12.2°C
see field sheets for complete H2O

1445 1 Minnow Trap set (baited)
P12-B 18T 0370387 4908116
Atemp = 16.5°C 693 = µS/cm 7.42 = pH
wtemp = 12.1°C 346 = ppm
DO = 8.09 mg/L

Glenvale Creek
15:45 – minnow trap
2 fish
– RBD.

1620 Lift for 2 traps (P12-A)

1 = BSB/2R1 49mm TL

17:00 – P11B – moon
– no drainage channel here as thought observed in mapping – actually is change in veg due to cutting practices.
– also no watercourse in P-4A or P-10!

TUES. Oct 4/2011 18T 0370436
– 8:20 P-12C 4907862
– accessed through Julie's farm property
– walked to ~~the~~ cow bridge.

- 2 minnow traps set @ 8:40.

- See habitat sheets.

12:20 - Between P13-A & the end of P12 just west of property line 18T 369958 4907673
higher mounds of veg &/or historic areas of cattle crossing are creating a damming effect on creek.
Pictures taken

12:40 - 4 hrs set on minnow trap @ P12-C.
- see electrofishing/bio-sheet for enumeration of catch

14:22 P-6A 18T 367965
West Glenvale Cr. 4908611
① - upper trib expected to cross road however no water or channel visible at all
- no water veg either
- mapping might be depicting cattle for fields
- no culvert or any signs of water conveyance here. just spring/fall * wetted Swale

② 18T 0367977
4908283
- no water just cattle watering hole with some standing water in depressions
- intermittent to ephemeral
- # Swale #

③ Closer to road 18T 367950
4908234

- CSP crossing for
  - ephemeral drainage
  - no water there.

15:15 West Glenvale Creek
Unity Rd crossing
P6A – A.
- intermittent drain from
- upper fields swales.
- flows to Box culvert @ Unity Rd.
  18T 367768 4908084

Set 2 minnow traps
in approx 0.20 m water

Bankfull ~~Depth~~ = 0.75 m
" Width = 2.6 m
wetted width = 1.15 m
" depth = 0.18 m

~~H_2O Quality~~
- elms, maples near
to drainage swale.
with some sedge
& leaf litter + woody debris

- cow vetch
- aster sp.
- burdock
- sow thistle

H_2O Qual.
Cond. 840 µS/cm
T - 16 °C
pH - 7.33
TDS - 418 ppm
DO - 5.50 mg/L → 57% DO

* upstream of these locations the drainages are dry.

- resident indicated that all this area is fully inundated in the spring & flows down into man made pond downstream in 14B.

* also small pond on P6A is manmade & excavated down to limestone. Full of ~~ferns~~ herps and sparse minnows introduced likely by avian introduction.

18T
367766
4908246
- same as other swale accept slightly wetter & with exposed limestone area with some ephemeral water.

milkweed.

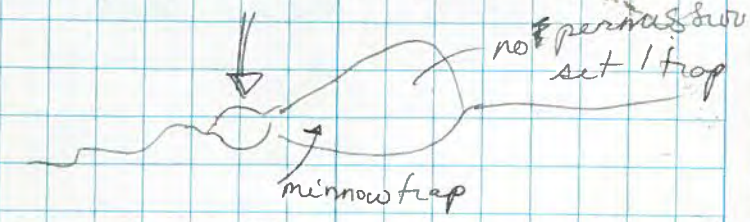
18T
367811 4908123
some ash & elm
likely white cedar

Picture # 100-0334

- no water terrestrial veg
- seasonal swale field water conveyance

16:15
Collected minnow traps
1 hr set, no fish in the
- very limited amount of water to fish
- will need to see what's in the tub downstream @ pond.

16:40 P-5A
- 18T 368508
4908936
- ephemeral pond



↳ amphibians, toads & frogs calling (green frog?). (spotted frog? chorus?)
- wetted width.
↳ 7 m W x 14 m long.
- put 2 minnow traps (baited w tuna) @ this location

- large pond = 45 x 60 m
limestone outcropping
- possible old well location
- likely groundwater input here (upwelling).
- drainage to the west of West Hendale Cr.

is intermittent, ephemeral
swale currently ~5 cm
of water in low lying
area
- not fish habitat
-

Air T = 16°c
Cond = 303 uS/cm
TDS = 151 ppm
pH 8.13
H2OT = 16.5°C.
DO = ~~10.35 mg/l~~
~~105 %~~ %

Large Pond not on property allowed
access to.

- area dominated by:
Sambucus, milkweed,
Canada goldenrod
- lamb's quarters, thistle, burdock
- Scirpus, carex sp.

17:00 dip netting

- used dip nets to sweep small ponds / standing water for fish
- after 20 dips no fish were captured or observed swimming
- few aquatic insects in the area thought to be well upwelling
- tadpoles + aquatic insects captured in small ephemeral pool.

17:20 - retrieved minnow traps
- 40 min set.
- catch - likely stranded in ponds (overwinter?)

#	SPC	FL	TL	#	SPC	FL	TL
1	Brassy	43	46	7	Brassy	45	48
2	"	59	64	8	Brassy	56	62
3	"	55	59	9	"	44	46
4	FHM	62	66	10	"	46	50
5	"	54	56	11	"	46	49
6	NRBD	45	50	12	FHM	62	66

#	EPC	FL	TL
13	FSD(210)	54	56
14	NEBD(180)	27	30
15	11	46	50
16	Brassy(208)	45	48

Brassy ☒

Wed, Oct 5

Try to do 5 sites
16, 18, 20
21, 24, 22, 23

8:30 P-16 @ Howes Rd.
Culvert - CSP drainage
Swale
- typically wetted but currently dry
- intermittent
- Beech trees, wild grape
- cattail, graminoid & sedge
- downstream flows
lying standing water
Same

- water is lost ~ 75m down turns into intermittent drainage feature for surrounding fields.

- 18T 0367930 ✻
4906002
- standing water @ tree line (beech trees? see pics)
- St. John's wort. - cedar
- aster - grasses growing in
- horse crossing "channel"
- 3 dips as foil
- lots of leaf litter (choking flow)
- ~~grass~~ ~~stem~~ humocks between the tree line
- wetted D = <10 - 15 cm
wetted W = 1.0 m
Bankfull D = 0.40 cm
Bankfull W = 2.8 m.
- no real channel actually connected humocks.

9:05 18T 367422
4906130 — 1 minnow trap set to bait

— changes to a more defined channel w aquatic veg
Fowl-grass & Watercress = (see previous pics)
— lemna & other unidentified aquatic
— sparganium & burreed
— pyeweed.

wetted D – 0.39 m
" W – 1.85 m
Bankful D – 0.62 m
" W – 3.95

To top of Bank = 0.28 m = rise
run = 0.8 m

Air T = 15.8 °C
Water T = 10.7 °C
Cond = 472 uS/cm
pH = 7.22
TDS = 235 ppm
DO = 25%, 2.75 mg/L

9:30 18T 0367396
4906534

— small pond @ top of drainage holding water from upper field drainage.
— tadpoles observed.
— see habitat sheet for more data.

+ — Set 2 minnow traps baited.

— Steve – 15 dips with dip net.

P-16 cont.
10:00 — walked to 18T 367387
4906575

— becomes unchannelized & water in depressions between trees & hummocks intermittent / semi-perm
~~5~~ 15 cm in depth
" 30 cm wet width
" bankful Width = 1.8 m
" Depth = 0.35 m.

* Beech, ash, cedar, pyweed.

- 99% canopy cover
- terrestrial grasses & leaf litter

(281)
- 15 dip nets: 12 BSB
captured - 38 YOY NRBD (182?)
all approx 30 mm in length

- last pic looking downstr of pond. shows after notes delineation.

10:20 - minnow traps pulled
~ 1/hr slt
1 yoy RBD ~ ~~30~~ mm

11:30 P-20-A 18T 365745 4906125
- Low lying bedrock (limestone) ephemeral pond area
- no water
- 20 m x 40 m
- no water or drainage

- ~~Coming in: no groundwater seeps that I see~~.
- red maples
- young basswoods
- white ash w no leaves & appear to be dying
- bryophytes & sedges on southern edge indicate some groundwater effects.
- bankful depth = 1.2 m
" width = 18 m
" length = 50 m

39
23

P20-B
- 18T 365757
4906162
- intermittent creek w relatively incised channel
- took pics @ fork
- dries forest, same species as described above
- totally dry

Bankfull W = 1.37
" D = 0.57

substrate – leaf litter
– root wads & mosses.
– detritus organics in some silt/clay substrate.
– some noticeable gradient > 0.05.
– further upstream white pine & red cedar & trembling aspen.

12:12 18T 365689
4906220

– looks like mix of tiled fields & corrugated plastic pipe installed in channel followed up from the pond downstream

– outflow of pond toward house & last pic taken here
– same habitat & channel as above. (slightly narrower in spots)
↳ 18T 365817
4906139
– small pond just downstream of channel terminates & water course, area likely all floods (pic #100-0375)

13:15 P-24A – intermittent drain
– examined @ culvert down toward #01
– 125 upstream of culvert no change in habitat
– small pockets of water <10 cm deep
– no channel defined

18T 365511 4904473

- ~~spruce~~ cattail ~~Bur~~ uc
- beech trees, sedges & grasses
- all wetted but no channel.
- not high rush fish habitat.
- no fishable habitat.
- spring would be higher levels.
- 6 deps in nets - no fish
- further down toward highway 401 where more runoff from highway there are more cattail & hardstem bullrush.

14:00 P-24B - intermittent drain #2

- currently dry, drains field to the Northeast.
- focused to the Southwest 100 m
- no defined channel small CST is creeping ~~st~~ structure under small bridge struct. to allow access to Flying J billboard

18T 365155 4905282

- terrestrial veg & dominated by beech, some white ash red maple.
- golden rod
- bedstraw
- wild grape.
- common ~~&~~ buckthorn (see pics 100-0410 → 412)

P-24B - Pond.

14:05 6 x 15 meters 18T 365193
- 1 - 1.3 m deep. 4905312
- this deep likely spring fed or tiled fields conveying water to this location.
- 1 minnow trap set w bait
- intermittent drain swale upstream of pond between 2 cut fields.
- few wetland species there
  - wild grape, beech, grasses nightshade, ~~some bushes~~ not sure of about. common buckthorn
- this is on restricted area

H_2O Quality

Cond = 351 uS/cm
TDS = 176 ppm (low)
PH = 8.00
H_2O T = 13.2 (Quite low).
DO = 92% 9.8 mg/L

— 10 dips with net — no fish or insects.
— leaf litter & substrate likely of limeston.
14:30 — minnow trap
1/2 hr set. — ∅ fish.

15:15 P-24-A — location of culvert crossing
18T 365415
4904893
— pool @ culvert only
— 0.10 m deep (wetted)
— wetted width @ culvert 1.23 m.
— cattail, sedge
— culvert to middle 401 swale

15:40 — 2 baited minnow traps set
18T 364779
4904866
— ROW for 401
— at ROW boundary
wetted W = 6 m
" D = 0.40 cm.
Bankfull W = 8.5 m
" D = 1.6 m
— Dominated by cattail
— aquatics also. Water shield
— beaver activity here.
15:50 set 1 minnow trap @ 18T 364771 4904903.
See field sheet for this location = P23
retrieved this minnow
16:40 → trap @ 16:40
~ 1 hr set — no fish.

16:50 — retrieved 2 traps @ culvert
— 1 hr set
— ~~#~~ RBD ~ 40 mm

Tally

RBD ⊠⊠⊠⊠⊠⊠⊠ (96)

TL Max = 48
Min = 32

THURS, OCT 5 / 2011

8:38 Drainage swale 6/6 properties @
LET 365154 - P23-A
4906992
- intermittent + dry
- not fish habitat
- 100% terrestrial species (graminoid, aster)
- meets up w roadside ditch.
- possible location of tree fire crossing?
- other side of road to be

- drain does not extend into farmers field but scours @ mouth of culvert indicates water conveyance to the road side ditch in spring & during wet periods.
- culvert is 0.60m diameter
- pool @ north side 1m x 4m
W x L
- ~~flows South~~ → North west.

9:30 - P23B - intermittent drainage with no water or signs of wetting for multiple seasons @ the east end (in old field).
- to west culvert placed to maintain lane crossing
- low lying depression swale here indicated by some hardstem bulrush, dogwood
- "channel" to terrestrial grass, beech trees, alder.
- ~~seepies to see but not I Did~~
- red oak, common buckthorn

LET 364492 4905515

- only draining to margin of P-23

- hardstem bulrush ends to the east @ 18T 364575 4905522 indicating that water does not ~~stay~~ pool in across the width of the field (P-23) annually but only possible during wet years.

11:00 P-14B Taylor property
- man made channel dug to limestone @ 18T 367706 4907765
- drains off of swale drainage on other side of road @ Roy dwelling
- ~~possibly~~ likely groundwater upwelling here.
- large oaks
- ~~channel 5m wide wetted~~

- wetted width = 5m
  " D = 0.15 m
- Bank height = 0.85m
- Bankfull width = 10m
  " Depth = 1.0 m

P-14B * @ mouth to pond

- culvert to wetted drainage swale - seeps < 5cm water 18T 367760 4908027 D.
  - approx 2.5 m wide
- no fish Habitat.
- hardstem bulrush & wet tolerant grasses & sedge.
- no flow past GPS point or water
- used by cattle.

- 11:15 - 3 minnow traps (baited)
  1 at inflow channel
  2 in pond.

- pond 75 m x 125 m
  max depth unknown
  depth to bedrock
  approximately 0.8 to
  1.4 m in depth.
- spring fed.
- amphibians noticed.
- clay & silt margins.

- small drainage @
  18T 367845
  4907618
  - 0.3 m wide
  - ~~<~~0.10 depth when
    inundated
- flooding will cause whole
  field to flood

12:00 18T 367820 4907166
- beech, red maple,
- ~~dominated~~ low lying
  damp area on margin
  some sedge & reeds at
  margin of bush line

12:15 - 14B - South Pond
- Large pond surrounded
  by lower lying
  mixed forest.
- unknown history
- large berm around
  circumference.
- see field sheets.

12:20 - 2 minnow traps baited
  & set.
- is this the pond that
  was historically a
  quarry & is not
  stocked w trout?
- ~~rapids~~
- cut path down
  to this area.
- tractor trail back to
  farm from this location
  18T 367687 4907097

13:10 - ~~one~~ 2 minnow trap set
  @ west end of pond

Tschools of small fish on surface won't approach minnow trap and too far out to dip net.

13:20 – First two minnow traps pulled
Fish caught
~1 hr set

	Specie	Fish #	FL	TL
182?	NRBD	1	51	55
	NRBD	2	62	66
	"	3	45	50
	"	4	62	67
	"	5	64	68
	"	6	60	64
	"	7	45	49
	"	8	53	56
	"	9	54	57
	NRBD	10	60	65
210	FSD	11	51	55
281	BSB	12	–	39

NRBD ⊠ ☐

(17)

SPC	#	FL	TL
BSB 281			
(281) BSB	13	–	42

2 others pulled
14:00 / hr set
NRBD : (3)
BSB . (1)

14:33 P6-B small pond.
18T 367408 4907492

– 2 minnow traps set
1 ~0.20m
1 ~0.50m

85
78
163

– Pond 61m x 39m
– approx max depth = 0.85m
– top of bank = 0.78m
– bankful depth = 1.63m
– bankful L = 69m
" W = 46m
– ~~[illegible]~~
– standing water pond.

red
- maple, ash, red cedar dead trees surrounding
- east margin dominated by cattail
- large boulders at North end
- clay & silt substrate.
- graminoids (bluejoint grass), sedge (hardstem bulrush)
- plantain, thistle, wild carrot, wild strawberry.

other shore veg

- low lying area to the south dominated by cattails & hardstem bulrush
- swale at north end terrestrial veg intermittent hardstem bulrush & balsam poplar.

3:00 pulled minnow traps
- 1/2 hr set
BSB: 3 total

- Talked to Mr. Taylor 14B.
- no ponds in area presage to bottom as to much current due to drainage
- he mentioned unlikely groundwater here as no features. Water just sitting on limestone slabs.
- he indicated that this pond was strictly a natural pond that receives drainage from the north.
- only 1 quarry on site not permitted to access.
- second hand information of stocking trout (sp?) in quarry.

15:35 - collected all minnow trap 3
4.25 hr set

RBD ⊠ ⊏ (17)

BSB ⁞ (5)

* — need to check all field sheets & books regarding ground water thoughts

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Oct 25/11 JAY & LEVI

13:30 Property 9 – Quarry Pond. shallow on south side

2 minnow traps set (baited) @ 18 T 367118 4908518.

P9=Pond-MT-1

14:20 1 trap set (baited).

15:30 Collected minnow traps 2 set for 2 hr. 1 set for 1 hr.

Common Shiner ⊠⊠⊠⊠⊠⊠⊠⊠ ⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠ ⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠ :: (224)

Golden Shiner ⊠⊠⊠⊠⊠⊠⊠ ⊠⊠: (92)

Brown Bullhead ⁞ (5)

Finescale Dace ⊠⊠⊠· (31)

11
224
92
5
31
(352) Total.

16:45 - South of Property 18 drainage
- intermittent @ culvert.
- currently wadeable ditch
- set 2 minnow traps (baited).

18T 366808 4905949

- ~~Acha~~ loosely channelized with more hummock areas to north.
- dominated by cattail & sedge
- 0.15 m depth channel width wetted = 0.85 m
- bankful - 1.25 m width
- bankful depth 0.65 cm.
- substrate silt on top of limestone
- low lying depression between farmer fields.
- 0.05 m/s

- white ash
- red cedar
- elm
- common buckthorn
- ~~black ash~~
- on south side less defined past culvert lying on surface
- watering hole for livestock.
- swale catchment.
- similar species except no cattail - replaced by narrow leaf cattail & other graminoids.
- intermittent *.
  * no aquatic veg observed 50-60 m upstream or downstream of culvert.

Oct 26/2011

8:30 - J+Levi
- retrieved minnow traps @ Howes Rd. crossing of intermittent drainage South of Prop. 18

- No FISH in 15 hr. set
- 2 leopard frogs (one in each trap).

9:18 JAY & LEVI 7°C
- P23 → northern
18T364623 intermittent drainage
4905730 going west to east.
- small culvert 4m long crossing roadway (18cm diameter)

rain water
- H_2O T = 7.8°C
- pH = 7.49
- Cond = 261 uS/cm
- TDS = 133 ppm
- DO = 47.2%
- DO = 5.69 mg/L

- culvert conveying water after rain, was dry on last visit.
- not fish habitat
- took pics of culvert & then moved westward.

wetted width - 1.35 m
wetted depth - 0.15 m
bankful width - 2.12
bankful depth - 0.40 m.

- riparian species (this is a nonecut area with trees & bushes.
- after reaching bankful water would inundate farmers fields to North & South; currently fields draining right into it.
- flows east to west.
-

substrate - silt/muck
- rocks (fields)
- detritus
- hay litter (majority)
- terrestrial grasses, sedge
- elm, ash, red cedar, red oak ~~dominant~~ common buckthorn (bushes & trees growing right

- is the drainage feature.
- flow - 0.02 m/s to less than this.

- slightly downstream "channel" becomes narrower (less standing water).
  - wetted depth = 0.10
  - " width = 0.89
  - bankful width = 1.65
  - bankful depth = 0.28 m

9:46 - west end of property.
18T - Fork of drainage feature
364524 & depression in the
4905683 field.
- standing water in tilled field that is corded dry & will drain to other channel to the west.
- pictures of this fork"

18T 364655 4905659

10:00 Last 3 pics
- small culvert conveying field runoff over laneway
- larger depression here collecting water
- little discernible flow
- culvert diameter 0.28 m
  ↳ CSP

10:13 - Possible Sackville habitat
- send to Jeff.
- 18T 364459
  4906109

APPENDIX E

DEPARTMENT OF FISHERIES AND OCEANS OPERATIONAL STATEMENTS FOR THE PROVINCE OF ONTARIO

CULVERT MAINTENANCE

Fisheries and Oceans Canada
Ontario Operational Statement

Version 3.0

Culvert maintenance is undertaken to extend the life of the structure and to ensure that it functions as designed, thus ensuring public safety and safe fish passage. Culvert maintenance includes the removal of accumulated debris (e.g., logs, boulders, garbage, ice build-up) that prevents the efficient passage of water and fish through the structure. Culvert maintenance may also include the reinforcement of eroding inlets and outlets, but does not include the replacement of damaged or destroyed bevel ends. Culverts requiring regular maintenance should be considered for future remediation via redesign or reinstallation.

Culvert maintenance activities can affect fish and fish habitat by the removal of woody debris that is important for cover and food production, by causing flooding and excessive stream scouring if blockages are removed too quickly, excessive erosion and sedimentation from the use of equipment along the stream bank, and disruption of critical fish life stages. Replacement of eroded rock armouring can alter flows and fish movement patterns if done excessively.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your culvert maintenance project without a DFO review when you meet the following conditions:

- the work does not include realigning the watercourse, installing a culvert liner or support struts, replacing damaged or destroyed bevels ends, or extending/replacing the existing culvert,
- explosives are not used to remove debris,
- the work does not include any dredging, infilling (e.g., filling scour pools) or excavation of the channel upstream or downstream of the culvert, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Maintaining Culverts* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*. For activities carried out under the *Crown Forest Sustainability Act*, the requirements of this Operational Statement are addressed through an existing agreement and the Ontario Ministry of Natural Resources is the first point of contact.

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (**www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Maintaining Culverts

1. Use existing trails, roads, or cut lines wherever possible to avoid disturbance to the riparian vegetation.

2. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be required. This removal should be kept to a minimum.

3. Unless accumulated material (i.e., branches, stumps, other woody materials, garbage, ice build-up, etc.) is preventing the passage of water and/or fish through the structure, time material and debris removal to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*). Any proposal to conduct such work under ice-covered conditions, with the exception of ice build-up removal, requires prior review by your Conservation Authority, DFO, or Parks Canada office, as appropriate.

4. Emergency debris removal using hand tools or machinery (e.g., backhoe) can be carried out at any time of year. Emergencies include situations where carrying out the project

immediately is in the interest of preventing damage to property or the environment, or is in the interest of public health or safety. Your local Conservation Authority, DFO, or Parks Canada office, as appropriate, is to be notified immediately. **You should follow all other measures to the greatest extent possible.**

5. Install effective sediment and erosion control measures before starting work to prevent sediment from entering the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

6. Limit the removal of accumulated material (i.e., branches, stumps, other woody materials, garbage, etc.) to the area within the culvert, immediately upstream of the culvert and to that which is necessary to maintain culvert function and fish passage.

7. Remove accumulated material and debris slowly to allow clean water to pass, to prevent downstream flooding and reduce the amount of sediment-laden water going downstream. Gradual dewatering will also reduce the potential for stranding fish in upstream areas.

7.1. A separate Operational Statement exists for the removal of beaver dams and associated debris and it applies to dams that are not directly connected or immediately adjacent to the culvert structure.

8. Operate machinery on land (from outside of the water) and in a manner that minimizes disturbance to the banks of the watercourse.

8.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
8.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
8.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
8.4. Restore banks to original condition if any disturbance occurs.

9. If replacement rock reinforcement/armouring is required to stabilize eroding inlets and outlets, the following measures should be incorporated:

9.1. Place appropriately-sized, clean rocks into the eroding area.
9.2. Do not obtain rocks from below the ordinary high water mark (see definition below) of any water body.
9.3. Avoid the use of rock that is acid-generating. Also avoid the use of rock that fractures and breaks down quickly when exposed to the elements.
9.4. Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment.
9.5. Ensure rock does not interfere with fish passage or constrict the channel width.
9.6. If any in-water work is involved, adhere to fisheries timing windows, as outlined in Measure 3 above.

10. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.

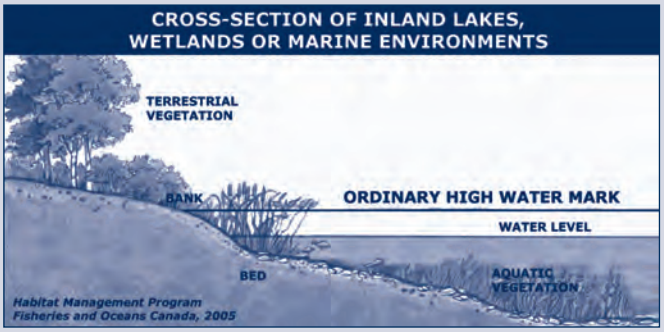
11. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

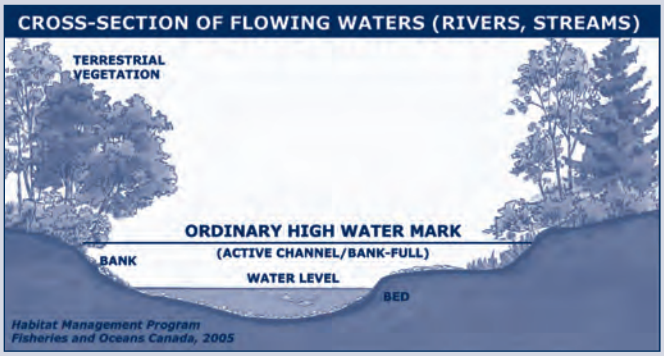
11.1. Maintain effective sediment and erosion control measures until re-vegetation of the disturbed areas is achieved.

Definition:

Ordinary high water mark – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO's *Fish Habitat and Determining the High Water Mark on Lakes*.





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Aussi disponible en français

http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_f.asp

DFO/2007-1329

HIGH-PRESSURE DIRECTIONAL DRILLING

Fisheries and Oceans Canada
Ontario Operational Statement

Version 3.0

For the purpose of this Operational Statement, the term High-Pressure Directional Drilling (HPDD) means trenchless methods of crossing a watercourse using pressurized mud systems. HPDD is used to install cables and pipelines for gas, telecommunications, fibre optics, power, sewer, oil and water lines underneath watercourses and roads. This method is preferable to open-cut and isolated crossings since the cable or pipeline is drilled underneath the watercourse with very little disturbance to the bed or banks. HPDD involves drilling a pilot bore hole underneath the watercourse towards a surface target, back-reaming the bore hole to the drill rig while pulling the pipe along through the hole. This process typically uses the freshwater gel mud system composed of a mixture of clean, freshwater as the base, bentonite (clay-based drilling lubricant) as the viscosifier and synthetic polymers.

The general order of preference for carrying out a cable or pipeline stream crossing in order to protect fish and fish habitat is: a) a punch or bore crossing (see *Punch & Bore Crossings* Operational Statement), b) HPDD crossing, c) dry open-cut crossing, and d) isolated open-cut crossing (see *Isolated or Dry Open-cut Stream Crossings* Operational Statement). This order must be balanced with practical considerations at the site.

One of the risks associated with HPDD is the escape of drilling mud into the environment as a result of a spill, tunnel collapse or the rupture of mud to the surface, commonly known as "frac-out". A frac-out is caused when excessive drilling pressure results in drilling mud propagating toward the surface. The risk of a frac-out can be reduced through proper geotechnical assessment practices and drill planning and execution. The extent of a frac-out can be limited by careful monitoring and having appropriate equipment and response plans ready in the event that one occurs. HPDD can also result in excessive disturbance of riparian vegetation and sedimentation and erosion due to operation of equipment on the shoreline or fording to access the opposite bank.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act.*

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your high-pressure directional drill project without a DFO review when you meet the following conditions:

- the crossing technique will not damage the stream bed and thereby negatively impact fish or fish habitat,
- the crossing is not a wet open-cut crossing,
- you have an emergency frac-out response plan and a contingency crossing plan in place that outline the protocol to monitor, contain and clean-up a potential frac-out and an alternative method for carrying out the crossing, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when High-Pressure Directional Drilling* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (**www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when High-Pressure Directional Drilling

1. Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.

2. Design the drill path to an appropriate depth below the watercourse to minimize the risk of frac-out and to a depth

to prevent the line from becoming exposed due to natural scouring of the stream bed. The drill entry and exit points are far enough from the banks of the watercourse to have minimal impact on these areas.

3. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the road or utility right-of-way.

4. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing* Operational Statement is also available.

- **4.1.** If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
- **4.2.** Grading of the stream banks for the approaches should not occur.
- **4.3.** If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
- **4.4.** Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
- **4.5.** Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

5. Operate machinery on land above the ordinary high water mark (see definition below) and in a manner that minimizes disturbance to the banks of the watercourse.

- **5.1.** Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
- **5.2.** Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
- **5.3.** Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
- **5.4.** Restore banks to original condition if any disturbance occurs.

6. Construct a dugout/settling basin at the drilling exit site to contain drilling mud to prevent sediment and other deleterious substances from entering the watercourse. If this cannot be achieved, use silt fences or other effective sediment and erosion control measures to prevent drilling mud from entering the watercourse. Inspect these measures regularly during the course of construction and make all necessary repairs if any damage occurs.

- **6.1.** Dispose of excess drilling mud, cuttings and other waste materials at an adequately sized disposal facility located away from the water to prevent it from entering the watercourse.

7. Monitor the watercourse to observe signs of surface migration (frac-out) of drilling mud during all phases of construction.

Emergency Frac-out Response and Contingency Planning

8. Keep all material and equipment needed to contain and clean up drilling mud releases on site and readily accessible in the event of a frac-out.

9. Implement the frac-out response plan that includes measures to stop work, contain the drilling mud and prevent its further migration into the watercourse and notify all applicable authorities, including the closest DFO office in the area (see Ontario DFO office list). Prioritize clean up activities relative to the risk of potential harm and dispose of the drilling mud in a manner that prevents re-entry into the watercourse.

10. Ensure clean up measures do not result in greater damage to the banks and watercourse than from leaving the drilling mud in place.

11. Implement the contingency crossing plan including measures to either re-drill at a more appropriate location or to isolate the watercourse to complete the crossing at the current location. See *Isolated or Dry Open-cut Stream Crossings* Operational Statement for carrying out an isolated trenched crossing.

12. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with preferably native grass or shrubs.

13. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

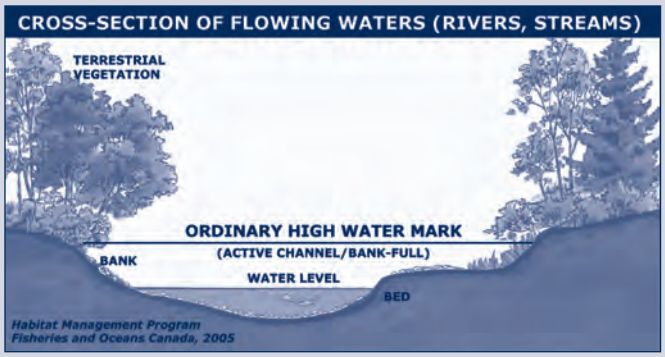
- **13.1.** Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

Ordinary high water mark – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the “active channel/bank-full level” which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial

vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO's *Fish Habitat and Determining the High Water Mark on Lakes*.



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DFO/2007-1329

OVERHEAD LINE CONSTRUCTION

Fisheries and Oceans Canada
Ontario Operational Statement

Version 3.0

Overhead lines are constructed for electrical or telecommunication transmission across many watercourses that range in size from small streams and ponds to large rivers, lakes and reservoirs. This Operational Statement applies to selective removal of vegetation along the right-of-way to provide for installation and safe operation of overhead lines, and passage of equipment and materials across the water body.

Although fish habitat occurs throughout a water system, it is the riparian habitat that is most sensitive to overhead line construction. Riparian vegetation occurs adjacent to the watercourse and directly contributes to fish habitat by providing shade, cover, and spawning and food production areas. It is important to design and build your overhead line project to meet your needs while also protecting riparian areas. Potential impacts to fish and fish habitat include excessive loss of riparian vegetation, erosion and sedimentation resulting from bank disturbance and loss of plant root systems, rutting and compaction of stream substrate at crossing sites, and disruption of sensitive fish life stages.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your overhead line project without a DFO review when you meet the following conditions:

- it does not require the construction or placement of any temporary or permanent structures (e.g. islands, poles, crib works, etc.) below the ordinary high water mark (HWM) (see definition below), and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Constructing Overhead Lines* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act.*

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (**www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Constructing Overhead Lines

1. Installing overhead lines under frozen conditions is preferable in all situations. On wet terrains (e.g., bogs), lines should be installed under frozen conditions, where possible, or using aerial methods (i.e., helicopter).

2. Design and construct approaches so that they are perpendicular to the watercourse wherever possible to minimize loss or disturbance to riparian vegetation.

3. Avoid building structures on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in erosion and scouring of the stream bed or overhead line structures.

3.1. Wherever possible, locate all temporary or permanent structures, such as poles, sufficiently above the HWM to prevent erosion.

4. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to accommodate the overhead line. This removal

should be kept to a minimum and within the road or utility right-of-way.

5. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing* Operational Statement is also available.

- **5.1.** If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
- **5.2.** Grading of the stream banks for the approaches should not occur.
- **5.3.** If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
- **5.4.** Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
- **5.5.** Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

6. Operate machinery on land and in a manner that minimizes disturbance to the banks of the watercourse.

- **6.1.** Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
- **6.2.** Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
- **6.3.** Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
- **6.4.** Restore banks to original condition if any disturbance occurs.

7. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

- **7.1.** Avoid work during wet, rainy conditions or use alternative techniques such as aerial methods (i.e., helicopter) to install overhead lines.

8. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.

9. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

- **9.1.** Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

Ordinary high water mark (HWM) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

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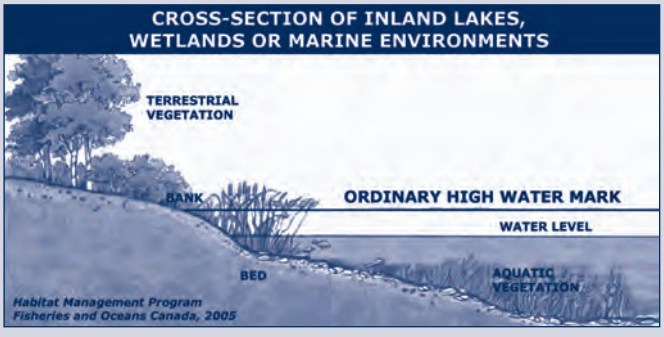

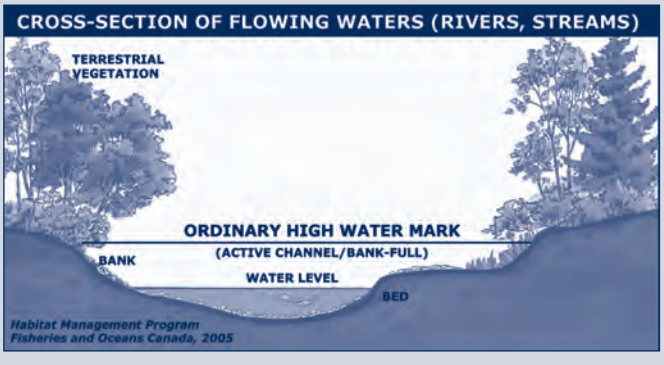

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DFO/2007-1329

PUNCH & BORE CROSSINGS

Fisheries and Oceans Canada
Ontario Operational Statement

Version 3.0

For the purpose of this Operational Statement, the term punch and bore refers to a trenchless crossing method which involves the excavation of a vertical bell hole or shallow depression on either side of the watercourse. Horizontal punching or boring between the two points, at an appropriate depth below the watercourse, completes the creation of a passage-way for the crossing. Punch and bore crossings allow cables and pipelines to be installed under watercourses without imparting any disturbance to the bed and banks. Punch and bore crossings differ from high-pressure directional drilled crossings, in that no pressurized mud systems are required, thereby avoiding the risk of sediment release due to frac-out.

Punch and bore crossings can negatively impact fish and fish habitat due to erosion and sedimentation from site disturbance and dewatering of bell holes or the collapse of the punch or bore hole under the stream. Disturbing riparian vegetation can reduce important shoreline cover, shade and food production areas. Machinery fording the stream can disturb bottom and bank substrates, disrupt sensitive fish life stages, and introduce deleterious substances if equipment is not properly maintained. Impacts can be reduced if an emergency response plan and clean-up materials are in place.

The general order of preference for carrying out a cable or pipeline stream crossing in order to protect fish and fish habitat is: a) a punch or bore crossing, b) high-pressure directional drill crossing (see *High-Pressure Directional Drilling* Operational Statement), c) dry open-cut crossing, and d) isolated open-cut crossing (see *Isolated or Dry Open-cut Stream Crossings* Operational Statement). This order must be balanced with practical considerations at the site.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to be incorporated into your project in order to avoid negative impacts to fish habitat. You may proceed with your punch or bore crossing project without a DFO review when you meet the following conditions:

- the crossing is not a wet open-cut crossing,
- the crossing technique will not damage the stream bed or bank and thereby negatively impact fish or fish habitat,
- the site does not occur at a stream location involving known fish spawning habitat, particularly if it is dependent on groundwater upwelling, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Conducting Punch and Bore Crossings*, listed below.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act.*

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (**www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Conducting Punch and Bore Crossings

1. A punch or bore crossing can be conducted at any time of the year provided there is not a high risk of failure and it does not require in-water activities such as machinery fording.

2. Design the punch or bore path for an appropriate depth below the watercourse to prevent the pipeline or cable from becoming exposed due to natural scouring of the stream bed.

3. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site and to excavate the bell holes. This removal is to be kept to a minimum and within the utility right-of-way.

4. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the water body. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

5. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing* Operational Statement is also available.

- **5.1.** If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
- **5.2.** Grading of the stream banks for the approaches should not occur.
- **5.3.** If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
- **5.4.** Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
- **5.5.** Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

6. Operate machinery on land above the ordinary high water mark (HWM) (see definition below) and in a manner that minimizes disturbance to the banks of the watercourse.

- **6.1.** Machinery is to arrive on-site in a clean condition and is to be maintained free of fluid leaks.
- **6.2.** Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
- **6.3.** Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.

7. Excavate bell holes beyond the HWM, far enough away from any watercourse to allow containment of any sediment or deleterious substances above the HWM.

- **7.1.** When dewatering bell holes, remove suspended solids by diverting water into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering the watercourse.
- **7.2.** Stabilize any waste materials removed from the work site (including bell holes) to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
- **7.3.** After suitably backfilling and packing the bell holes, vegetate any disturbed areas (see Measure 11).

8. Monitor the watercourse to observe signs of malfunction during all phases of the work.

9. For the duration of the work, keep on-site and readily accessible, all material and equipment needed to contain and clean-up releases of sediment-laden water and other deleterious substances.

10. Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance. This plan is to include measures to: a) stop work, contain sediment-laden water and other deleterious substances and prevent their further migration into the watercourse; b) notify all applicable authorities in the area, including the closest DFO office; c) promptly clean-up and appropriately dispose of the sediment-laden water and deleterious substances; and d) ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse.

11. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

- **11.1.** Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

Ordinary high water mark (HWM) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

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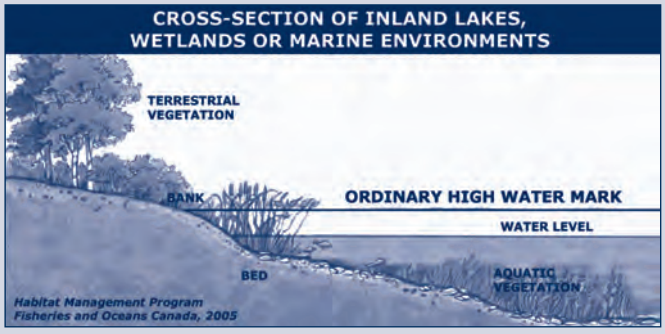

CROSS-SECTION OF INLAND LAKES, WETLANDS OR MARINE ENVIRONMENTS

CROSS-SECTION OF FLOWING WATERS (RIVERS, STREAMS)

FISHERIES AND OCEANS CANADA OFFICES IN ONTARIO

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DFO/2007-1329

ISOLATED OR DRY OPEN-CUT STREAM CROSSINGS

Fisheries and Oceans Canada
Ontario Operational Statement

Version 1.0

For the purpose of this Operational Statement, the term "Isolated Crossing" means a temporary stream crossing technique that allows work (e.g., trenched pipeline or cable installation) to be carried out "in-the-dry" while diverting the natural flow around the site during construction. These types of open trenched crossings are isolated using flume or dam and pump techniques (see *Pipeline Associated Watercrossings*, 2005 at **http://www.capp.ca/default.asp?V_DOC_ID=763&PubID=96717**). The term "Dry Open-cut Stream Crossing" means a temporary stream crossing work (e.g., trenched pipeline or cable installation) that is carried out during a period when the entire stream width is seasonally dry or is frozen to the bottom.

The risks to fish and fish habitat associated with isolated open cut stream crossings include the potential for direct damage to substrates, release of excessive sediments, loss of riparian habitat, stranding of fish in dewatered areas, impingement/entrainment of fish at pump intakes, and disruption of essential fish movement patterns. Similarly, dry open-cut stream crossings pose a risk to fish and fish habitat due to potential harmful alteration of substrates, loss of riparian habitat, and release of excessive sediment once stream flows resume.

The order of preference for carrying out a cable or pipeline stream crossing, in order to protect fish and fish habitat, is: a) punch or bore crossing (see *Punch & Bore Crossings* Operational Statement); b) high-pressure directional drill crossing (see *High-Pressure Directional Drilling* Operational Statement); c) dry open-cut crossing; and d) isolated open-cut crossing. This order must be balanced with practical considerations at the site.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your isolated or dry open-cut stream crossing project without a DFO review when you meet the following conditions:

- if working within the Thames River, Sydenham River, Ausable River, Grand River, or Maitland River, you have contacted your Conservation Authority or local DFO Office (see Ontario DFO office list) to ensure that your project will not impact Schedule I mussel species at risk under the federal *Species at Risk Act* (SARA), before proceeding,
- for dry, open-cut crossings the watercourse is dry or frozen completely to the bottom at the site,
- for isolated crossings, the channel width of the watercourse at the crossing site is less than 5 meters from ordinary high water mark to ordinary high water mark (HWM) (see definition below),
- the isolated crossing does not involve the construction or use of an off-stream diversion channel, or the use of earthen dams,
- the isolated crossing ensures that all natural upstream flows are conveyed downstream during construction, with no change in quality or quantity,
- the site does not occur at a stream location involving known fish spawning habitat, particularly if it is dependent on groundwater upwelling,
- the use of explosives is not required to complete the crossing, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated or Dry Open-cut Stream Crossing* listed below.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial and federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with SARA (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending the Ontario Operational Statement notification form (**www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated or Dry Open-Cut Stream Crossing

1. Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.

2. Locate crossings at straight sections of the stream, perpendicular to the banks, whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in the erosion and scouring of the stream bed.

3. Complete the crossing in a manner that minimizes the duration of instream work.

4. Construction should be avoided during unusually wet, rainy or winter thaw conditions.

5. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the utility right-of-way.

6. Machinery fording a flowing watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and is to occur only if an existing crossing at another location is not available or practical to use. Operational Statements are also available for *Ice Bridges and Snow Fills*, *Clear-Span Bridges*, and *Temporary Stream Crossing*.

    - **6.1.** If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
    - **6.2.** Grading of the stream banks for the approaches should not occur.
    - **6.3.** If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
    - **6.4.** Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
    - **6.5.** Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

7. Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.

    - **7.1.** Protect entrances at machinery access points (e.g., using swamp mats) and establish single site entry and exit.
    - **7.2.** Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
    - **7.3.** Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent deleterious substances from entering the water.
    - **7.4.** Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.

8. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

9. Stabilize any waste materials removed from the work site, above the HWM, to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.

10. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

    - **10.1.** Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated Crossing

Temporary isolation is used to allow work “in-the-dry” while maintaining the natural downstream flow by installing dams up and downstream of the site and conveying all of the natural upstream flow into a flume, or pumping it around the isolated area. In addition to measures 1 to 10, the following measures should be carried out when conducting an isolated stream crossing:

11. Time isolated crossings to protect sensitive fish life stages by adhering to fisheries timing windows (see Measure 6.4).

12. Use dams made of non-earthen material, such as water-inflated portable dams, pea gravel bags, concrete blocks, steel or wood wall, clean rock, sheet pile or other appropriate designs, to separate the dewatered work site from flowing water.

    - **12.1.** If granular material is used to build dams, use clean or washed material that is adequately sized (i.e., moderately sized rock and not sand or gravel) to withstand anticipated flows during the construction. If necessary, line the outside face of dams with heavy poly-plastic to make them impermeable to water. Material to build these dams should not be taken from below the HWM of any water body.
    - **12.2.** Design dams to accommodate any expected high flows of the watercourse during the construction period.

13. Before dewatering, rescue any fish from within the isolated area and return them safely immediately downstream of the worksite.

13.1. You will require a permit from DFO to relocate any aquatic species that are listed as either endangered or threatened under SARA. Please contact your Conservation Authority or the DFO office in your area to determine if an aquatic species at risk is in the vicinity of your project and, if appropriate, use the DFO website at **www.dfo-mpo.gc.ca/species-especes /permits/sarapermits_e.asp** to apply for a permit.

14. Pump sediment laden dewatering discharge into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering any water body.

15. Remove accumulated sediment and excess spoil from the isolated area before removing dams.

16. Stabilize the **streambed** and restore the original channel shape, bottom gradient and substrate to pre-construction condition before removing dams.

17. Ensure **banks** are stabilized, restored to original shape, adequately protected from erosion and re-vegetated, preferably with native species.

18. If rock is used to stabilize banks, it should be clean, free of fine materials, and of sufficient size to resist displacement during peak flood events. The rock should be placed at the original stream bank grade to ensure there is no infilling or narrowing of the watercourse.

19. Gradually remove the downstream dam first, to equalize water levels inside and outside of the isolated area and to allow suspended sediments to settle.

20. During the final removal of dams, restore the original channel shape, bottom gradient and substrate at these locations.

21. Pumped Diversion
Pumped diversions are used to divert water around the isolated area to maintain natural downstream flows and prevent upstream ponding.

21.1. Ensure intakes are operated in a manner that prevents streambed disturbance and fish mortality. Guidelines to determine the appropriate mesh size for intake screens may be obtained from DFO (e.g., *Freshwater Intake End-of-Pipe Fish Screen Guideline* (1995), available at **www.dfo-mpo.gc.ca/Library/223669.pdf**).

21.2. Ensure the pumping system is sized to accommodate any expected high flows of the watercourse during the construction period. Pumps should be monitored at all times, and back-up pumps should be readily available on-site in case of pump failure.

21.3. Protect pump discharge area(s) to prevent erosion and the release of suspended sediments downstream, and remove this material when the works have been completed.

Measures to Protect Fish and Fish Habitat when Carrying Out a Dry Open-Cut Stream Crossing

In addition to measures 1 to 10, the following measures should be carried out when conducting a dry open-cut stream crossing:

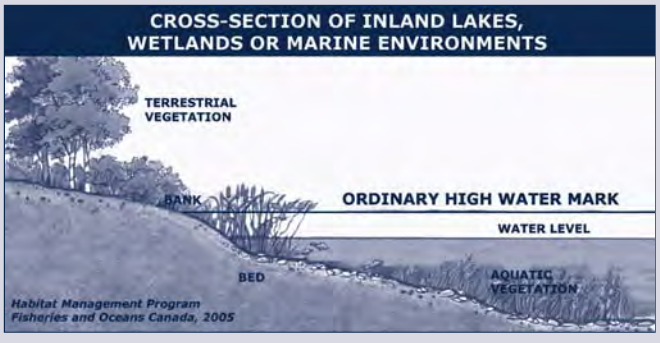
22. Stabilize the **streambed** and restore the original channel shape, bottom gradient and substrate to pre-construction condition.

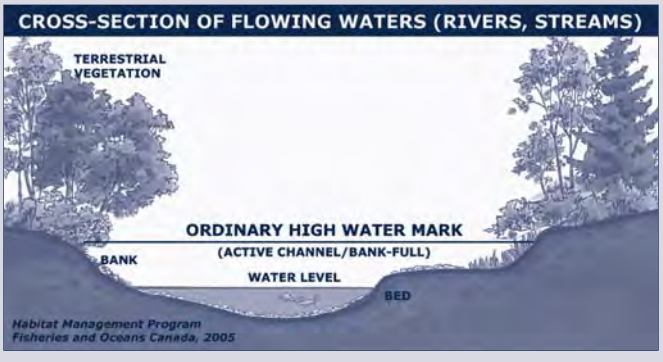
23. Ensure **banks** are stabilized, restored to original shape, adequately protected from erosion and re-vegetated, preferably with native species.

Definition:

Ordinary high water mark (HWM) - The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO's Fish Habitat and Determining the High Water Mark on Lakes.





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DFO/2007-1329

TEMPORARY STREAM CROSSING

Fisheries and Oceans Canada
Ontario Operational Statement

Version 1.0

A temporary stream crossing consists of i) a one-time ford in flowing waters, ii) a seasonally dry streambed ford, or iii) a temporary bridge (e.g., Bailey bridge or log stringer bridge). Temporary stream crossings are employed for short term access across a watercourse by construction vehicles when an existing crossing is not available or practical to use. They are not intended for prolonged use (e.g., forest or mining haul roads). The use of temporary bridges or dry fording is preferred over fording in flowing waters due to the reduced risk of damaging the bed and banks of the watercourse and downstream sedimentation caused by vehicles. Separate Operational Statements are available for *Ice Bridges and Snow Fills* used for temporary access during the winter and for non-temporary *Clear Span Bridges*.

The risks to fish and fish habitat associated with temporary stream crossings include the potential for direct harm to stream banks and beds, release of excessive sediments and other deleterious substances (e.g., fuel, oil leaks), loss of riparian habitat and disruption to sensitive fish life stages.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your temporary stream crossing project without a DFO review when you meet the following conditions:

- the bridge is no greater than one lane in width, and no part of its structure is placed within the wetted portion of the stream,
- the work does not include realigning the watercourse,
- for fording in flowing waters and temporary bridges, the channel width at the crossing site is no greater than 5 metres from ordinary high water mark to ordinary high water mark (HWM) (see definition below),
- disturbance to riparian vegetation is minimized,
- the work does not involve dredging, infilling, grading or excavating the bed or bank of the watercourse,
- all crossing materials will be removed prior to the spring freshet, or immediately following project completion if this occurs earlier,
- fording involves a one time event (over and back) and will not occur in areas that are known fish spawning sites,
- the crossing will not result in erosion and sedimentation of the stream, or alteration (e.g., compaction or rutting) of the bed and bank substrates,
- the crossing does not involve installation of a temporary culvert, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Carrying Out a Temporary Stream Crossing* listed below.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*. For activities carried out under the *Crown Forest Sustainability Act*, the requirements of this Operational Statement are addressed through an existing agreement and the Ontario Ministry of Natural Resources is the first point of contact.

You are required to respect all municipal, provincial and federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (SARA) (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending the Ontario Operational Statement notification form (**www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Carrying Out a Temporary Stream Crossing

1. Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.

2. Locate crossings at straight sections of the stream, perpendicular to the bank, whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, or any other area that is inherently unstable and may result in the erosion and scouring of the stream bed.

3. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the road or utility right-of-way. When practicable, prune or top the vegetation instead of uprooting.

4. Generally, there are no restrictions on timing for the construction of bridge structures or fording seasonally dry streambeds, as they do not involve in-water work. However, if there are any activities with the potential to disrupt sensitive fish life stages (e.g., fording of the watercourse by machinery) these should adhere to appropriate fisheries timing widows (see the *Ontario In-Water Construction Timing Windows*).

5. Machinery fording a flowing watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and is to occur only if an existing crossing at another location is not available or practical to use.

    5.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used, provided they do not constrict flows or block fish passage.
    5.2. Grading of the stream banks for the approaches should not occur.
    5.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary bridge should be used in order to protect these areas.
    5.4. The one-time fording should adhere to fisheries timing windows (see Measure 4).
    5.5. Fording should occur under low flow conditions, and not when flows are elevated due to local rain events or seasonal flooding.

6. Install effective sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

7. For temporary bridges also employ the following measures:

    7.1. Use only clean materials (e.g., rock or coarse gravel fill, wood, or steel) for approaches to the bridge (i.e., not sand, clay or organic soil) and install in a manner that avoids erosion and sedimentation.
    7.2. Design temporary bridges to accommodate any expected high flows of the watercourse during the construction period.
    7.3. Restore the bank and substrate to pre-construction condition.
    7.4. Completely remove all materials used in the construction of the temporary bridge from the watercourse following the equipment crossing, and stabilize and re-vegetate the banks.

8. Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.

    8.1. Protect entrances at machinery access points (e.g., using swamp mats) and establish single site entry and exit.
    8.2. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
    8.3. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent deleterious substances from entering the water.
    8.4. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.

9. Stabilize any waste materials removed from the work site, above the HWM, to prevent them from entering any watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with preferably native grass or shrubs.

10. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

    10.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

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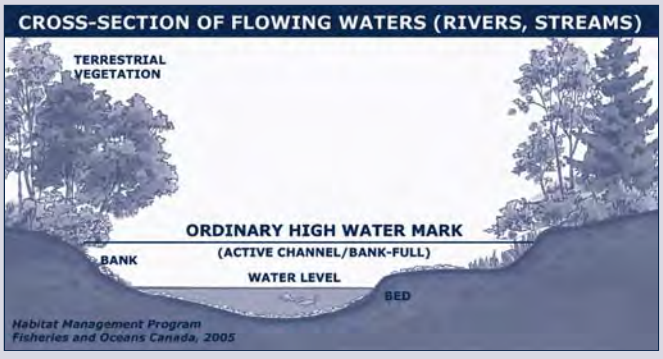

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