APPENDIX A

Consultant Biographies

Craig Hodder

GIS Technologist

Membertou
GEOMATICS CONSULTANTS

EDUCATION

2000-2002 B.A., Economics, Carleton University, Ottawa, Ontario

1997-2000 Sydney Academy High School, Sydney, NS – Graduated with distinction in the International Baccalaureate Program

PROJECTS

Jamaica Cadastral Conversion Project. The conversion of land parcels using IKONOS satellite imagery as the ground control. Involved in implementing QC procedures.

Involved in the implementation of the Membertou community plan.

Involved in the Wentworth/Membertou softcopy photogrammetry projects.

SKILLS

Computer Assisted Drafting (AutoCAD)
ArcView, ArcMap
DVP Softcopy photogrammetry

EXPERIENCE

2002 to Present — GIS Technician - Membertou Geomatics Consultants

- Assist a team of GIS specialists and provide GIS data to various projects.
- Provide consulting services including needs analysis and gap analysis to assist clients in meeting their GIS requirements
- Assist Membertou First Nation to meet their community planning goals and objectives

2002 – 2003 — Eastcan Geomatics Limited – Involved in a training program

- Trained in data capturing, data converting.
- Data converting includes AutoCAD training and softcopy photogrammetry.
- Involved with quality assurance/quality control aspects.

Dave Moore

Planner \ GIS Technologist

Membertou
GEOMATICS CONSULTANTS

EDUCATION

1982	Construction Technology Holland College, Charlottetown, P E.I.
2000	Bachelor of Design (Honours), Environmental Planning, Minor Degree in Digital Media Nova Scotia College of Art and Design, Halifax, N.S.
2007	Master of Urban and Regional Planning Queen's University, Kingston, ON.

PROJECTS

Membertou Connector Road, Business Case and Routing Study (CBCL)

Habitat Threats – Sedimentation – Bras d'Or Lakes Watershed (UINR)

Physical, infrastructure and policy design, Community Plan, Membertou First Nation

Parking lot and storm drainage design, Membertou Trade and Convention Centre and Membertou Entertainment Centre

On-site project management, multi-residential condominiums, Chandler's Cove, Chester, N.S.

Numerous design and research projects with both public and private engineering and architectural organizations

SKILLS

Remote Sensing (PCI Geomatics)	AutoCad (Autodesk)	SSPS Statistics
Civil Design (Autodesk)	3D Studio Max (Autodesk)	IDRISI Raster GIS
ArcView and ArcMap (ESRI)	MapInfo	MS Office

EXPERIENCE

2003 to Present	Planner\GIS Technician - Membertou Geomatics Consultants
1999- 2001	CAD Technician\Planner, W.M. Fares & Associates, Halifax, N.S.
1985- 1995	Survey Supervisor\Cartographic Assistant, Public Works and Government Services Canada
1984- 1985	Estimator\Technician, MBB-Trecan, Halifax, N.S.
1983- 1984	Project Manager, Research Project, Municipality of Chester

Jason Googoo

Manager

Membertou
GEOMATICS CONSULTANTS

EDUCATION

1999-2001 Centre of Geographic Sciences (C.O.G.S) – Computer Technician/Analyst Diploma
1998 University College of Cape Breton (UCCB) – BA Degree in Sociology

PROJECTS

Jamaica Cadastral Conversion Project. The conversion of land parcels using IKONOS satellite imagery as the ground control. Involved in implementing QC procedures.

Involved in the implementation of the Membertou community plan.

Flood Model Project. Simulated a flood based on Truro, NS. Created several routines which modified and displayed aerial photographs as a flood progressed.

Implemented the Membertou Fisheries into a G.I.S. project.

SKILLS

Computer Assisted Drafting (AutoCAD)
ArcView, ArcMap
Various scripting and programming (VB/VBA, Perl, C/C++, java/javascript

EXPERIENCE

2002 to Present Manager – Membertou Geomatics Consultants

- Responsible for supervision and job performance evaluations for staff.
- Assist a team of GIS specialists and provide GIS data to various projects.
- Provide consulting services including needs analysis and gap analysis to assist clients in meeting their GIS requirements
- Assist Membertou First Nation to meet their community planning goals and objectives

2002 – 2003 Eastcan Geomatics Limited – Involved in a training program

- Trained in data capturing, data converting.
- Data converting includes AutoCAD training and softcopy photogrammetry.
- Involved with quality assurance/quality control aspects.

Melanie Smith, MES
Environmental Specialist (Strum)
Ms. Smith coordinates and project manages environmental assessments for various types of projects including bridge and other infrastructure replacements, wind farms and other developments. She also develops the work scope and manages the completion of all associated field components that support the EA submission. This includes assessment of wetlands, watercourses, wildlife, birds, noise, shadow flicker, fish/fish habitat, vegetation, benthic community, contaminants, archaeology, and species at risk. Ms. Smith is also responsible for completing the environmental effects assessment and developing project specific mitigation measures. Ms. Smith has also worked in a regulatory capacity with Ontario's Ministry of the Environment as a Project Officer in the Environmental Assessment and Approvals Branch. In this capacity, Ms. Smith was responsible for reviewing and coordinating the technical review of environmental assessment reports for large highway projects and landfill sites, providing guidance to proponents, responding to media and stakeholder inquiries, and providing advice to senior management regarding the approval of environmental assessment submissions.

Andy Walter, B.Sc Hort
Environmental Specialist (Strum)
Mr. Walter is a qualified wetland delineator in Nova Scotia. Andy has completed multiple wetland delineation projects for proposed wind farm development sites in Nova Scotia, in addition to hundreds of other large and small scale assessments in support of land development within the province. Projects often involve the completion of species at risk assessments, function assessments, and detailed wetland characterization in support of wetland alteration applications. In addition, Mr. Walter routinely coordinates and completes post construction monitoring at wetland alteration sites, including soil, vegetation, hydrology, species at risk, and stream assessments as necessary, and authors the associated monitoring reports. An experienced biologist through his work in wetlands, streams, and forests, Mr. Walter is also skilled at identifying plants in a variety of habitat types, and is active in completing flora and fauna surveys, as well as habitat characterization. In this regard, Andy relates habitat observations to the wildlife community in an area, always with a focus on identifying suitable habitat for species of conservation concern. He is knowledgeable in the area of provincial and federal approvals processes and works closely with senior staff to prepare regulatory submissions.

1.0 Environmental Consultants

1.1 Garrett Bell, B.Sc.E, Environmental Technologist

Mr. Bell graduated from the University of New Brunswick in Fredericton, NB, with a B.Sc.E (Geological engineering). He has more than ten years in characterizing and evaluating natural resources including geology, soil, hydrology, mineral resources, vegetation and wildlife. Mr. Bell is responsible for collection of all types of environmental data from available sources including field investigations, and providing environmental monitoring/ protection services. He has extensive experience in environmental impact assessment and environmental management including review of Project Environmental Protection Plans. Mr. Bell specializes in wetland ecology, plant species at risk, and ecological land classification/ resource management.

1.2 Shawnna Cox, B.Sc., Biologist

Ms. Cox graduated from the University of New Brunswick in Fredericton, NB, with a B.Sc. in Biology. She received additional training in electrofishing and rare plant identification. Ms. Cox has ten years of experience in areas of Natural Resource Management, Environmental Impact Assessment, Environmental Monitoring, Environmental Management and Project Planning, as well as Habitat Delineation and Protection. In particular, she has experience in detailed fish and aquatic habitat assessments, water sampling, benthic invertebrates sampling, wetland habitat assessment and delineation, and species at risk surveys (plants, salmonids, wood turtles, etc.).

1.3 Scott Sangster, BSc, Environmental Scientist

Mr. Sangster graduated from Saint Mary's University, Halifax, NS with a B.Sc. in Environmental Studies, and from Niagara College, Niagara On The Lake, ON with a Certificate in Environmental Management. Mr. Sangster has five years combined experience managing, preparing, and reviewing environmental assessments with AMEC Earth & Environmental, Halifax International Airport Authority, and Nova Scotia Environment and Labour. In particular, he has extensive experience in developing and implementing environmental protection and monitoring plans for rare plants. Mr. Sangster was part of a team that successfully transplanted a small number of rare plants to Acadia University for scientific research.

1.4 Marion Sensen, PhD., Botanist

Dr. Sensen is a biologist specializing in botany with a doctorate in lichenology. She received her credentials from Heinrich- Heine University in Duesseldorf, Germany. Since moving to Canada, she gained more than ten years of experience with Nova Scotia and Atlantic Canada flora, both as a member on the Nova Scotia Wild Flora Society, and professionally. During her postdoctoral research at St. Mary's University in Halifax, she concentrated on air pollution monitoring with lichens. She has carried out wetlands environmental effects monitoring programmes, environmental constraints mapping, plant inventories and rare plant surveys.

2.0 Ornithological Consultants

2.1 Clarence Stevens

Mr. Stevens is a well-known and respected naturalist specializing in ornithology. He has more than 25 years of birding experience, and is trained in methods of scientific bird observation and data collection. He is the author of numerous books and articles on birds in Nova Scotia, e.g. “Backyard Birds of Nova Scotia” and a 310 page regional birding guide. Also, for now 15 years he has been writing on birds for a birding column that appears in a regional newspaper. He has volunteered numerous hours for important projects such as six years spent gathering data for the Maritime Breeding Bird Atlas, and serving as the provincial coordinator for the Piping Plover Guardianship programme. He has carried out bird surveys for numerous larger and smaller infrastructures projects in Nova Scotia, New Brunswick and Prince Edward Island, such as the Sable Gas Pipeline, and highway construction or twinning projects. He also carried out an Assessment of Bird Hazards to aircraft at both Shearwater and Greenwood Airbases. Some survey projects included plant and small mammals surveys.

2.2 Fulton Lavender

Mr. Lavender is a well known and respected naturalist specializing in ornithology. He has more than 35 years birding experience, and is trained in methods of scientific bird observation and data collection. He has carried out numerous bird surveys for large and small infrastructure and scientific projects in Nova Scotia, New Brunswick and Ontario. His most recent projects include: the Maritimes and NorthEast Gas Pipeline, several wind farm projects, a diamond mine, as well as several years of collecting bird data for Parks Canada at Fundy National Park.

3.0 Archaeological consultants

3.1 Dr. Stephen A. Davis, B.A, M.A.

Dr. Stephen A. Davis is the President of the independent, Halifax- based company “Davis Archaeological Consultants Limited” (DAC). He holds a D.Phil in prehistory from the University of Oxford, M.A. in Anthropology (specialization in prehistoric archaeology) from Memorial University of Newfoundland, and a B.A. (Honours) in Anthropology from the University of New Brunswick, Fredericton. His formal training has been augmented with thirty-one years of teaching archaeology, part-time at the University of Oxford, Memorial University of Newfoundland and St. Francis Xavier University. Dr. Davis is presently a tenured Professor of Anthropology at Saint Mary’s University, Halifax. He has recently been granted the President’s Award for Excellence in Research (Saint Mary’s University).

Through research and consultancy experience over a thirty-year period, Dr. Davis brings a wealth of archaeological experience to any cultural project. Although his specialization is the prehistory of Atlantic Canada, he has worked on projects in Spain, Norway, Maine, the British Isles, N.W.T., Ontario and the Canadian Arctic. With a growing public interest in protecting cultural resources of all types, Dr. Davis has become involved with

numerous projects involving historic site archaeology. During his professional career he has directed archaeological investigations of fifteen prehistoric sites, twenty-five historic sites and conducted one hundred and twenty cultural resource assessment surveys under the guidelines for a Category C Permit (Nova Scotia Museum). These activities have resulted in over 100 publications in the form of books, book chapters, journal articles and contractual documents.

3.2 April MacIntyre, B.A., Senior Technologist

April D. MacIntyre is a M.A. student at Memorial University of Newfoundland (specialization in historic archaeology) and holds a B.A. (Honours) in Anthropology from Saint Mary's University. She has been employed in the consulting field since 1999 on various projects including the Little Dutch Church burial mitigation, the Maritimes and Northeast Pipeline Project, the Shubenacadie Portobello Inclined Plane assessment, the Halifax Regional Municipality Parkade, and the Halifax Regional Municipality Sewage Treatment Plant. Prior to her employment as a consulting archaeologist, Ms. MacIntyre was involved with various archaeological projects at Saint Mary's University. Her specialization is in the historic archaeology of Nova Scotia and she is currently conducting research on a nineteenth-century Scottish homestead in Cape Breton. She works through "Davis Archaeological Consultants Limited" (DAC).

3.3 Kelly J. Peters, B.A., First Nations Technician

Kelly J. Peters is a recent graduate of Anthropology (Bachelor of Arts) at Saint Mary's University (2003) and is actively involved in the protection of aboriginal rights and resources. He has been employed by the *Treaty & Aboriginal Rights Research Centre of Nova Scotia* and the *Confederacy of Mainland Mi'kmaq* to research archaeological resources and historic documents pertaining to aboriginal peoples. He has also been employed as a consultant on various aboriginal as well as historic archaeological resource impact assessment including the Maritimes and Northeast Pipeline project and the National Historic Palaeo-Indian site at Debert for the Mi'kmawey Debert Cultural Centre. He works through "Davis Archaeological Consultants Limited" (DAC).

APPENDIX B

Fish Habitat Survey Data Sheets (2006)

DNR&E / DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

River: Winter Creek Start Point: End Point : Stream/River No.

Personnel: SC Date: September 8th & 9th, 2004 Stream Order No.

UNIT NO.	STREAM TYPE	CHANNEL TYPE	CHAINAGE END	LENGTH (m)	AVE WIDTH (m)		SUBSTRATE (%)							AVE DEPTH WET WIDTH (cm)	0-50% UNDERCUT BANK		0-50% OVER-HANGING BANK VEGETATION		LARGE WOODY DEBRIS IN STREAM (m)	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	INSTREAM VEGETATION	COMMENTS
					WET	BANK CHANNEL	BEDROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R				
1	24	1	27	27	1	1.5	0	0	40	20	0	10	30	30	0	0	30	30	0.5	3	N	ATV crossing; no visible flow
2	3/24	1	31	11	1	1	0	0	50	30	0	0	20	10-30	0	5	10	10	3	3	N	Wood debris obstruction @31 m
3	24	1	94	63	1	1	0	0	30	50	0	0	20	30	0	10	5	5	1	3	N	@ 68 m and 70 m small cascade drop between pools
4	24	1	105	11	1.5	1.5	0	0	30	50	0	0	20	35	0	0	10	10	0.5	3	N	Very small riffles between natural dead water pools
5	3	1	117	12	0.6	0.6	0	0	20	60	0	0	20	15	5	5	0	0	0	3	N	
6	24	1	140	23	2	2	0	0	30	50	0	0	20	30	5	0	0	0	0.5	3	N	Wood and leaf debris obstructions
7	3	1	156	16	1	1.5	0	30	40	0	0	0	30	5	0	0	0	0	0	1	N	Some underground flow due to size of boulders and rock substrate
8	3	1	169	13	1	1	0	5	40	30	0	0	25	10	0	0	5	5	0.2	1	N	
9	3	1	185	16	1	1	0	5	40	30	0	0	25	10	10	0	5	5	0	1	N	Flows underground around large boulders
10	3/24	1	223	38	1	1	0	5	40	40	0	0	15	10-30	5	5	5	5	0.5	3	N	
11	3	1	253	30	1	1	0	5	30	50	0	0	15	15	5	5	5	5	0.5	3	N	Wood and leaf debris
12	3/24	1	301	48	2	2	0	10	40	30	20	0	0	10-30	0	0	10	10	1.5	3	N	Deer carcass remnants on right bank
13	3/24	1	320	19	2	2	0	10	40	30	20	0	0	10-30	0	10	5	5	0.8	3	N	
14	3/8	1	340	20	2	2	0	10	30	40	10	0	10	10-20	0	10	5	5	1	3	N	
15	3/24	1	451	110	1.5	1.5	0	10	30	40	10	0	0	10-25	0	0	5	5	1	3	N	

STREAM TYPE

FASTWATER

1. Fall
2. Cascade
3. Riffle (GR/RB)
4. Riffle (R/B)
5. Riffle (Sand)
6. Sheet (ledge)
7. Chute
8. Run
9. Rapid

POOLS

10. Midchannel
11. Convergence
12. Lateral
13. Beaver
14. Trench
15. Plunge
16. Flatwater
17. Bogan
18. Eddy
19. Gabion
20. Log Structure
21. Road Crossing
22. Wood Debris
23. Man-Made Dam
24. Natural Deadwater

CHANNEL TYPE

1. Main (if measurement refers to main area of river)

* 2. Side Channel (water diverted by islands)

* 3. Split (if river is split into various different stream types)

* 4. Bogan

* - Specify Left (L), Right (R) or Middle (M)

SUBSTRATE

1. Bedrock , Ledge
2. Boulder = > 461 mm
3. Rock = 180 - 460 mm
4. Rubble = 54 - 179 mm
5. Gravel = 2.6 - 53 mm
6. Sand = 0.06 - 2.5 mm
7. Fines = 0.0005 - 0.05 mm

FLOW TYPE

1. Survey Stream
2. Spring
3. Brook/River Trib
4. Spring Seep

POOL RATING (reverse side)

CRITERIA (NO.)

Pool Depth ∃ 1.5 m
1 - Instream Cover ∃ 30%
2 - Instream Cover < 30%

Pool Depth .5 to 1.5m
3 - Instream Cover 5 - 30%
4 - Instream Cover > 30%

% OF POOLS IN SITE (LETTER)

a - ∃ 30%
b - ∃ 10% to 30%
c - < 10%

a - ∃ 50%
b - < 50%

River: Winter Creek p1

VALLEY SLOPE	BANK HEIGHT (m)	FLOOD PLAIN WIDTH (m)	SHADE (%)	STREAM BANKS												POOL RATING		POOL TAIL			% TURBULENCE
				VEGETATION (%)				EROSION (%)													
								LEFT BANK (0-50%)			RIGHT BANK (0-50%)										
				BARE GROUND	GRASSES	SHRUBS	TREES	STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING	O_2 (Mg/l)	pH	WATER TEMP. °C	FISH SPECIES	NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	MEAN SUBSTRATE SIZE (cm)	% FINES	
L	0.5	10	70	0	20 (moss)	30	50	50	0	0	50	0	0									
L	0.5	10	60	0	20 (moss)	30	50	50	0	0	50	0	0									
L	0.5	10	70	10	50 (moss)	20	30	45	5	0	50	0	0									
L	0.5	10	60	10	50 (moss)	20	30	50	0	0	50	0	0									
L	0.5	10	70	10	50 (moss)	20	30	50	0	0	50	0	0									
L	0.5	10	40	5	50 (moss)	20	25	50	0	0	50	0	0									
L	0.5	10	40	5	50 (moss)	20	25	50	0	0	50	0	0									
L	0.5	10	40	10	50 (moss)	20	25	50	0	0	50	0	0									
L	0.5	10	60	5	25 (moss)	20	50	50	0	0	50	0	0									
L	0.5	10	60	10	10 (moss)	20	60	50	0	0	50	0	0									
L	0.5	10	60	20	0	30	60	50	0	0	50	0	0									
L	0.5	10	60	10	10 (moss)	20	60	50	0	0	50	0	0									
L	0.5	10	60	10	10 (moss)	20	60	50	0	0	50	0	0									
L	0.8	10	40	10	10 (moss)	20	60	50	0	0	50	0	0									
L	0.8	20	30	10	30 (moss)	30	30	50	0	0	45	5	0									

NOTE: * For selected site study, these columns (reverse side) should be done for a habitat assessment

WATER FLOW MEASUREMENT

RIFFLE GRADIENT			UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4		COEFFICIENT (0.9 - smooth) (0.8 - rough)	LENGTH (3m)	FLOAT TIME (sec)				FLOW Cms
LENGTH M	DROP M	GRADIENT %				1/4 way	1/2 way	3/4 way	CENTIMETERS	METERS (m)			1/4 way	1/2 way	3/4 way	AVERAGE	
			5	3	0.6	7.5	10	7	8.2	0.082	0.8	1	5.93	4.82	5.43	5.39	0.007

Formula (CMS) = W (m) x D (m) x A x L (m) / T (sec) Where: W = width, D = depth, L = length, A is a coefficient for the stream bottom

CRITERIA:

1. Chute: water depth equal to or greater than channel width
2. Riffle: GR/RB - is a riffle flowing over a gravel and/or rubble bottom
   R/B - is a riffle flowing over & through large substrates (eg. rock and /or boulder), some of which protrudes the surface
3. Side channels - treat as a separate stream type
4. Undercut Bank - % of bank overhang (above water edge for stream type. Specify left (L) or right (R)
5. Over-hanging Bank Vegetation - % of vegetation overhang for stream type. Specify L or R
6. Visual Embeddedness - % of sands or fines surrounding the larger substrates,up to 100%
7. Woody Debris - total width should be >10 cm in diameter

A= 0.8 for rough bottom

DNR&E / DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

River: Winter Creek | Start Point: | End Point : | Stream/River No.

Personnel: SC | Date: September 8th & 9th, 2004 | Stream Order No.

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					WET	BANK CHANNEL	BEDROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R				
16	3/16	1	471	20	1.2	2	0	10	10	40	20	10	0	10/20	0	0	0	0	1	2	N	
17	3	1	497	26	0.8	1.5	0	0	20	40	20	10	10	15	0	0	0	5	0	3	N	
18	16	1	506	9	2	2	0	0	10	40	30	10	10	20	0	10	10	10	0	3	N	
19	3	1	509	3	0.8	1	0	0	10	50	20	10	10	10	0	10	0	0	0	3	N	
20	10	1	513	4	1.4	2	0	0	10	50	20	10	10	20	10	0	0	0	0	3	N	
21	3	1	516	3	1	1.2	0	0	10	50	20	10	10	10	0	0	0	0	0	3	N	
22	10	1	523	7	1	1	0	0	10	50	20	10	10	25	10	0	0	0	0	3	N	
23	3/10	1	535	12	1	2	0	0	10	60	10	10	10	10-25	0	0	5	10	0	3-4	N	
24	3/16	1	547	12	1.5	2	0	0	10	60	20	10	0	10-25	0	0	0	0	0.5	3	N	
25	16	1	563	16	1.5	2	0	0	0	40	20	20	20	20	5	5	10	20	3	3	N	
26	16	1	587	24	1.5	2	0	0	0	40	20	20	20	20	5	5	50	50	2	3	N	
27	3/16	1	606	19	0.8	1	0	0	20	30	0	20	30	20	0	0	20	20	0.5	3	N	
28	3/16	1	650	44	0.5-1.0	1	0	0	30	25	0	25	20	10-20	0	0	30	30	1	3	N	
29	3	1	665	15	1	2.5	0	0	10	40	0	20	30	15	0	0	10	0	0	4	N	
30	3/16	1	701	36	1	1.5	0	5	40	35	0	0	20	5-25	5	5	10	20	1	3	N	

STREAM TYPE

FASTWATER

1. Fall
2. Cascade
3. Riffle (GR/RB)
4. Riffle (R/B)
5. Riffle (Sand)
6. Sheet (ledge)
7. Chute
8. Run
9. Rapid

POOLS

10. Midchannel
11. Convergence
12. Lateral
13. Beaver
14. Trench
15. Plunge
16. Flatwater
17. Bogan
18. Eddy
19. Gabion
20. Log Structure
21. Road Crossing
22. Wood Debris
23. Man-Made Dam
24. Natural Deadwater

CHANNEL TYPE

1. Main (if measurement refers to main area of river)
* 2. Side Channel (water diverted by islands)
* 3. Split (if river is split into various different stream types)
* 4. Bogan

* - Specify Left (L), Right (R) or Middle (M)

SUBSTRATE

1. Bedrock , Ledge
2. Boulder = > 461 mm
3. Rock = 180 - 460 mm
4. Rubble = 54 - 179 mm
5. Gravel = 2.6 - 53 mm
6. Sand = 0.06 - 2.5 mm
7. Fines = 0.0005 - 0.05 mm

FLOW TYPE

1. Survey Stream
2. Spring
3. Brook/River Trib
4. Spring Seep

POOL RATING (reverse side)

CRITERIA (NO.)

Pool Depth ∃ 1.5 m
1 - Instream Cover ∃ 30%
2 - Instream Cover < 30%

Pool Depth .5 to 1.5m
3 - Instream Cover 5 - 30%
4 - Instream Cover > 30%

% OF POOLS IN SITE (LETTER)

a - ∃ 30%
b - ∃ 10% to 30%
c - < 10%

a - ∃ 50%
b - < 50%

River: Winter Creek

VALLEY SLOPE	BANK HEIGHT (m)	FLOOD PLAIN WIDTH (m)	SHADE (%)	STREAM BANKS														POOL RATING		POOL TAIL			% TURBULENCE
				VEGETATION (%)				EROSION (%)															
								LEFT BANK (0-50%)			RIGHT BANK (0-50%)												
				BARE GROUND	GRASSES	SHRUBS	TREES	STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING	O_2 (Mg/l)	pH	WATER TEMP. °C	FISH SPECIES	NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	MEAN SUBSTRATE SIZE (cm)	% FINES	
L	0.8	20	60	10	30	20	40	50	0	0	50	0	0										
L	0.8	20	20	10	30	10	50	50	0	0	50	0	0										
L	0.5	20	60	0	30	10	60	50	0	0	40	10	0										
L	0.5	20	50	10	30	0	60	50	0	0	30	20	0										
L	0.5	20	50	10	30	0	60	30	20	0	30	20	0										
L	0.50.5	20	50	0	30	10	60	50	0	0	50	0	0										
L	0.5	20	50	0	30	10	60	50	0	0	50	0	0										
L	0.5	20	30	0	20	10	70	50	0	0	50	0	0										
L	0.5	20	30	0	20	10	70	50	0	0	50	0	0										
L	0.5	20	40	0	30	30	40	50	0	0	50	0	0										
L	0.5	20	60	0	0	90	10	50	0	0	50	0	0										
L	0.5	10	60	0	40	50	10	50	0	0	50	0	0										
L	0.8	10	70	0	40	20	40	50	0	0	50	0	0										
L	0.5	10	70	0	10	40	50	50	0	0	50	0	0										
L	0.4	20	50	5	20	15	60	50	0	0	50	0	0										

NOTE: * For selected site study, these columns (reverse side) should be done for a habitat assessment

WATER FLOW MEASUREMENT

RIFFLE GRADIENT			UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4		COEFFICIENT (0.9 - smooth) (0.8 - rough)	LENGTH (3m)	FLOAT TIME (sec)				FLOW Cms
LENGTH M	DROP M	GRADIENT %				1/4 way	1/2 way	3/4 way	CENTIMETERS	METERS (m)			1/4 way	1/2 way	3/4 way	AVERAGE	

Formula (CMS) = W (m) x D (m) x A x L (m) / T (sec) Where: W = width, D = depth, L = length, A is a coefficient for the stream bottom

CRITERIA:

1. Chute: water depth equal to or greater than channel width
2. Riffle: GR/RB - is a riffle flowing over a gravel and/or rubble bottom
   R/B - is a riffle flowing over & through large substrates (eg. rock and /or boulder), some of which protrudes the surface
3. Side channels - treat as a separate stream type
4. Undercut Bank - % of bank overhang (above water edge for stream type. Specify left (L) or right (R)
5. Over-hanging Bank Vegetation - % of vegetation overhang for stream type. Specify L or R
6. Visual Embeddedness - % of sands or fines surrounding the larger substrates,up to 100%
7. Woody Debris - total width should be >10 cm in diameter

A= 0.8 for rough bottom

DNR&E / DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

River: Winter Creek | Start Point: | End Point : | Stream/River No.

Personnel: SC | Date: September 8th & 9th, 2004 | Stream Order No.

UNIT NO.	STREAM TYPE	CHANNEL TYPE	CHAINAGE END	LENGTH (m)	AVE WIDTH (m)		SUBSTRATE (%)							AVE DEPTH - WET WIDTH (cm)	0-50% UNDERCUT BANK		0-50% OVER-HANGING BANK VEGETATION		LARGE WOODY DEBRIS IN STREAM (m)	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	INSTREAM VEGETATION	COMMENTS
					WET	BANK CHANNEL	BEDROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R				
31	3	1	708	7	0.8	1.2	0	0	60	30	0	0	10	10	0	0	5	5	0	2	2	Stream gradient increases
32	10	1	714	6	2	2	0	0	50	30	0	0	20	30	0	0	5	5	0	3	3	
33	3	1	734	20	0.8	1	0	0	60	10	0	10	20	20	5	0	30	0	0.5	2	2	
34	10	1	745	11	1	1	0	0	50	30	0	0	20	35	0	0	5	5	0	3	3	
35	3	1	762	17	0.8	1.2	0	0	60	20	0	0	20	20	0	0	5	5	1	3	3	
36	3	1	799	37	0.8	1	0	0	60	20	0	0	20	15	0	0	20	10	0.4	3	3	
37	24	1	841	42	2	2.5	0	0	20	30	0	10	40	80	0	0	30	20	1.5	4	4	Stream opens up into bog area

STREAM TYPE						CHANNEL TYPE	SUBSTRATE	FLOW TYPE	POOL RATING (reverse side)	
FASTWATER		POOLS							CRITERIA (NO.)	% OF POOLS IN SITE (LETTER)
1. Fall 2. Cascade 3. Riffle (GR/RB) 4. Riffle (R/B) 5. Riffle (Sand)	6. Sheet (ledge) 7. Chute 8. Run 9. Rapid	10. Midchannel 11. Convergence 12. Lateral 13. Beaver	14. Trench 15. Plunge 16. Flatwater 17. Bogan	18. Eddy 19. Gabion 20. Log Structure 21. Road Crossing	22. Wood Debris 23. Man-Made Dam 24. Natural Deadwater	1. Main (if measurement refers to main area of river) * 2. Side Channel (water diverted by islands) * 3. Split (if river is split into various different stream types) * 4. Bogan * - Specify Left (L), Right (R) or Middle (M)	1. Bedrock , Ledge 2. Boulder = > 461 mm 3. Rock = 180 - 460 mm 4. Rubble = 54 - 179 mm 5. Gravel = 2.6 - 53 mm 6. Sand = 0.06 - 2.5 mm 7. Fines = 0.0005 - 0.05 mm	1. Survey Stream 2. Spring 3. Brook/River Trib 4. Spring Seep	Pool Depth ∃ 1.5 m 1 - Instream Cover ∃ 30% 2 - Instream Cover < 30% Pool Depth .5 to 1.5m 3 - Instream Cover 5 - 30% 4 - Instream Cover > 30%	a - ∃ 30% b - ∃ 10% to 30% c - < 10% a - ∃ 50% b - < 50%

River: Winter Creek p3

VALLEY SLOPE	BANK HEIGHT (m)	FLOOD PLAIN WIDTH (m)	SHADE (%)	STREAM BANKS												POOL RATING		POOL TAIL			% TURBULENCE
				VEGETATION (%)				EROSION (%)						O_2 (Mg/l)	pH	WATER TEMP. °C	FISH SPECIES				
								LEFT BANK (0-50%)			RIGHT BANK (0-50%)							NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	MEAN SUBSTRATE SIZE (cm)	% FINES	
				BARE GROUND	GRASSES	SHRUBS	TREES	STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING									
L	0.4	10	40	0	30	10	60	50	0	0	50	0	0									
L	0.4	10	30	0	30	20	50	50	0	0	50	0	0									
L	0.6	10	40	0	20	40	40	50	0	0	45	0	0									
L	0.6	10	30	0	30	40	30	50	0	0	50	0	0									
L	0.6	10	30	0	20	60	20	50	0	0	50	0	0									
L	0.6	15	40	0	20	50	30	50	0	0	50	0	0									
L	0.4	40	10	0	30	60	10	50	0	0	50	0	0									

NOTE: * For selected site study, these columns (reverse side) should be done for a habitat assessment

WATER FLOW MEASUREMENT

RIFFLE GRADIENT			UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4		COEFFICIENT (0.9 - smooth) (0.8 - rough)	LENGTH (3m)	FLOAT TIME (sec)				FLOW Cms
LENGTH M	DROP M	GRADIENT %				1/4 way	1/2 way	3/4 way	CENTIMETERS	METERS (m)			1/4 way	1/2 way	3/4 way	AVERAGE	

Formula (CMS) = W (m) x D (m) x A x L (m) / T (sec) Where: W = width, D = depth, L = length, A is a coefficient for the stream bottom

CRITERIA:

1. Chute: water depth equal to or greater than channel width
2. Riffle: GR/RB - is a riffle flowing over a gravel and/or rubble bottom
   R/B - is a riffle flowing over & through large substrates (eg. rock and /or boulder), some of which protrudes the surface
3. Side channels - treat as a separate stream type
4. Undercut Bank - % of bank overhang (above water edge for stream type. Specify left (L) or right (R)
5. Over-hanging Bank Vegetation - % of vegetation overhang for stream type. Specify L or R
6. Visual Embeddedness - % of sands or fines surrounding the larger substrates,up to 100%
7. Woody Debris - total width should be >10 cm in diameter

A= 0.8 for rough bottom

06-00

DNR&E / DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

River: Winter Creek Tributary

Start Point:at ATV crossing

End Point :upstream at ATV crossing into bog

Stream/River No.

Personnel: SC

Date: September 8th, 2004

Stream Order No.

UNIT NO.	STREAM TYPE	CHANNEL TYPE	CHAINAGE END	LENGTH (m)	AVE WIDTH (m)		SUBSTRATE (%)							AVE DEPTH - WET WIDTH (cm)	0-50% UNDERCUT BANK		0-50% OVER-HANGING BANK VEGETATION		LARGE WOODY DEBRIS IN STREAM (m)	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	INSTREAM VEGETATION	COMMENTS
					WET	BANK CHANNEL	BEDROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R				
1	24	1	16	16	0.8				5	10	5	30	50	10	0	0	20	10	1	3-4	Yes	Hard bottom under couple inches of muck ATV trail @ 104m u/s of start pt.
2	Under ground flow	Covered with moss and wispy grasses from 70-104 no fish habitat	50	34																		Unit 3 discontinuous water with stagnant ponds
3	24	1	64	14	0.8	0.8			20			30	50		10 Under ground flow	10 Under ground flow	40	20	3	4	Yes	Headwater stream characteristics – ponding water shallow flow
4	24/3	1	66	2	1.0	1.0			20			30	50	20	10 Under ground flow	10 Under ground flow	30	40	3	3-4	No	Very boggy riparian area on Right Bank
5	3/8	1	120	54	0.4	0.5			40		10	20	30	10	0	0	50	50	0	3	No	Heavily vegetated with shrubs over channel
6	24	1	20		1.5	1.5	0	0	10	40	30	20	0	0.6	0	0	0	0	0	2	No	It is actually a distinct ATV trail that has been flooded by slow water
7	5	1	40		0.3	0.3					20	30	50	10	0	0	5	5	1	3	No	Hard Bottom under 2 inches of muck
8	24	1	52		1.0	1.5					20	30	50	10	0	0	5	5	1	3	No	Hard Bottom under 2 inches of muck
9	Under ground flow	1	62																			Flows Underground
10	5	1	70		0.4	0.5	0		30	10		20	40	10	0	0	0	0	2	2	No	
11	5/24	1	79		1.2	1.2		5	30			30	35	20	0	0	0	0	0.5	3	No	
12	dry	1	83		0.4	0.4			20	40	20	20			0	0	0	0	0	dry	No	
13	5/24	1	95		0.8	1.0			10	10	20	30	30	15	0	0	0	0	0.1	3	No	
14	3	1	120		0.8	1.0		10	20	25		15	30	15	0	0	0	0	0	3	No	At 109 m small natural dam on stream
15	24	1	153		1.0	1.2			5		10	30	50	10	0	0	0	0	0		No	

STREAM TYPE

FASTWATER

1. Fall
2. Cascade
3. Riffle (GR/RB)
4. Riffle (R/B)
5. Riffle (Sand)
6. Sheet (ledge)
7. Chute
8. Run
9. Rapid

POOLS

10. Midchannel
11. Convergence
12. Lateral
13. Beaver
14. Trench
15. Plunge
16. Flatwater
17. Bogan
18. Eddy
19. Gabion
20. Log Structure
21. Road Crossing
22. Wood Debris
23. Man-Made Dam
24. Natural Deadwater

CHANNEL TYPE

1. Main (if measurement refers to main area of river)
* 2. Side Channel (water diverted by islands)
* 3. Split (if river is split into various different stream types)
* 4. Bogan

* - Specify Left (L), Right (R) or Middle (M)

SUBSTRATE

1.	Bedrock , Ledge			
2.	Boulder	=	> 461 mm	
3.	Rock	=	180	- 460 mm
4.	Rubble	=	54	- 179 mm
5.	Gravel	=	2.6	- 53 mm
6.	Sand	=	0.06	- 2.5 mm
7.	Fines	=	0.0005	- 0.05 mm

FLOW TYPE

1. Survey Stream
2. Spring
3. Brook/River Trib
4. Spring Seep

POOL RATING (reverse side)

CRITERIA (NO.)

Pool Depth ∃ 1.5 m
1 - Instream Cover ∃ 30%
2 - Instream Cover < 30%

Pool Depth .5 to 1.5m
3 - Instream Cover 5 - 30%
4 - Instream Cover > 30%

% OF POOLS IN SITE (LETTER)

a - ∃ 30%
b - ∃ 10% to 30%
c - < 10%

a - ∃ 50%
b - < 50%

River: Winter Creek Tributary

VALLEY SLOPE	BANK HEIGHT (m)	FLOOD PLAIN WIDTH (m)	SHADE (%)	STREAM BANKS														POOL RATING		POOL TAIL			% TURBULENCE
				VEGETATION (%)				EROSION (%)															
								LEFT BANK (0-50%)			RIGHT BANK (0-50%)												
				BARE GROUND	GRASSES	SHRUBS	TREES	STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING	O_2 (Mg/l)	pH	WATER TEMP. °C	FISH SPECIES	NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	MEAN SUBSTRATE SIZE (cm)	% FINES	
L	0.3	15	80		30	30	40	50			50						No fish in U/S section						
L	0.3	15	80		30	30	40	50			50												
L	0.3	20	60		60 Mosses	10	30	50			50												
L	0.3	20	80		30	30	40	50			50												
L	0.3	20	90		30	60	10	50			50												
L	0.8	20	0	0	85	5	10	50	0	0	50	0	0										
L	0.3	10	70	0	50	30	20	50	0	0	50	0	0										
L	0.3	10	60	0	30	30	40	50	0	0	50	0	0										
L			100	flows	under	ground																	
L	0.1	10	40	10	30	10	50	50	0	0	50	0	0										
L-M	0.5	5	40	10	30	20	40	50			50												
M	0.5	8	40	10	30	20	40	50			50												
M	0.5	8	30	0	30	30	40	50			50												
M	0.5	8	20	0	25	25	50	50			50												
M	0.5	8	40	20	30	20	30	50			50												

NOTE: * For selected site study, these columns (reverse side) should be done for a habitat assessment

WATER FLOW MEASUREMENT

RIFFLE GRADIENT			UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4		COEFFICIENT (0.9 - smooth) (0.8 - rough)	LENGTH (3m)	FLOAT TIME (sec)				FLOW Cms
LENGTH M	DROP M	GRADIENT %				1/4 way	1/2 way	3/4 way	CENTIMETERS	METERS (m)			1/4 way	1/2 way	3/4 way	AVERAGE	

Formula (CMS) = W ___(m) x D ___(m) x A ___ x L ___(m)
T ___(sec)

Where: W = width, D = depth, L = length, A is a coefficient for the stream bottom

CRITERIA:

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3. Side channels - treat as a separate stream type

4. Undercut Bank - % of bank overhang (above water edge for stream type. Specify left (L) or right (R)
5. Over-hanging Bank Vegetation - % of vegetation overhang for stream type. Specify L or R
6. Visual Embeddedness - % of sands or fines surrounding the larger substrates,up to 100%
7. Woody Debris - total width should be >10 cm in diameter

A= 0.8 for rough bottom

DNR&E / DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

River: Winter Creek Tributary

Start Point: At ATV crossing

End Point : upstream at ATV crossing into bog

Stream/River No.

Personnel: SC

Date: September 8th, 2004

Stream Order No.

UNIT NO.	STREAM TYPE	CHANNEL TYPE	CHAINAGE END	LENGTH (m)	AVE WIDTH (m)		SUBSTRATE (%)							AVE DEPTH - WET WIDTH (cm)	0-50% UNDERCUT BANK		0-50% OVER-HANGING BANK VEGETATION		LARGE WOODY DEBRIS IN STREAM (m)	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	INSTREAM VEGETATION	COMMENTS
					WET	BANK CHANNEL	BEDROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R				
16	5/24	1	246		0.8	0.8			5		15	20	50	10-20	0	0	0	0		Not a flowing channel	No	
17	Moist mud	1	271			1.0							100		0	0	0	0	0	4	No	Flows underground in some areas – hard to follow
18	24	1	302		0.8	1.0			10	10		10	70		0	0	0	0	0	3-4	No	At 302 m flows underground to 308 m
19	Under ground		308	Flows	Under	Ground												0	0	4	No	Flows underground
20	0																					
												At 355 m	Hits	Winter	Creek							

STREAM TYPE						CHANNEL TYPE	SUBSTRATE	FLOW TYPE	POOL RATING (reverse side)	
FASTWATER		POOLS							CRITERIA (NO.)	% OF POOLS IN SITE (LETTER)
1. Fall 2. Cascade 3. Riffle (GR/RB) 4. Riffle (R/B) 5. Riffle (Sand)	6. Sheet (ledge) 7. Chute 8. Run 9. Rapid	10. Midchannel 11. Convergence 12. Lateral 13. Beaver	14. Trench 15. Plunge 16. Flatwater 17. Bogan	18. Eddy 19. Gabion 20. Log Structure 21. Road Crossing	22. Wood Debris 23. Man-Made Dam 24. Natural Deadwater	1. Main (if measurement refers to main area of river) * 2. Side Channel (water diverted by islands) * 3. Split (if river is split into various different stream types) * 4. Bogan * - Specify Left (L), Right (R) or Middle (M)	1. Bedrock , Ledge 2. Boulder = > 461 mm 3. Rock = 180 - 460 mm 4. Rubble = 54 - 179 mm 5. Gravel = 2.6 - 53 mm 6. Sand = 0.06 - 2.5 mm 7. Fines = 0.0005 - 0.05 mm	1. Survey Stream 2. Spring 3. Brook/River Trib 4. Spring Seep	Pool Depth ∃ 1.5 m 1 - Instream Cover ∃ 30% 2 - Instream Cover < 30% Pool Depth .5 to 1.5m 3 - Instream Cover 5 - 30% 4 - Instream Cover > 30%	a - ∃ 30% b - ∃ 10% to 30% c - < 10% a - ∃ 50% b - < 50%

River: Winter Creek Tributary

VALLEY SLOPE	BANK HEIGHT (m)	FLOOD PLAIN WIDTH (m)	SHADE (%)	STREAM BANKS											O_2 (Mg/l)	pH	WATER TEMP. °C	FISH SPECIES	POOL RATING		POOL TAIL			% TURBULENCE
				VEGETATION (%)				EROSION (%)											NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20% - 35% 3: 35% ≥ 50% 4: >50%	MEAN SUBSTRATE SIZE (cm)	% FINES	
				BARE GROUND	GRASSES	SHRUBS	TREES	LEFT BANK (0-50%)			RIGHT BANK (0-50%)													
								STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING											
L	0.8	8	60	5	30	10	55	50			50													
L	0.8	5	70		30 Mosses	0	70	50	0	0	50	0	0											
L	0.8	5	70		30 Mosses	0	70	50	0	0	50	0	0											
L	0	Under ground			60		40																	
L	0.4	5	20		60		40																	

NOTE: * For selected site study, these columns (reverse side) should be done for a habitat assessment

WATER FLOW MEASUREMENT

RIFFLE GRADIENT			UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4		COEFFICIENT (0.9 - smooth) (0.8 - rough)	LENGTH (3m)	FLOAT TIME (sec)				FLOW Cms
LENGTH M	DROP M	GRADIENT %				1/4 way	1/2 way	3/4 way	CENTIMETERS	METERS (m)			1/4 way	1/2 way	3/4 way	AVERAGE	

Formula (CMS) = W (m) x D (m) x A x L (m) / T (sec) Where: W = width, D = depth, L = length, A is a coefficient for the stream bottom

CRITERIA:

1. Chute: water depth equal to or greater than channel width
2. Riffle: GR/RB - is a riffle flowing over a gravel and/or rubble bottom
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3. Side channels - treat as a separate stream type
4. Undercut Bank - % of bank overhang (above water edge for stream type. Specify left (L) or right (R)
5. Over-hanging Bank Vegetation - % of vegetation overhang for stream type. Specify L or R
6. Visual Embeddedness - % of sands or fines surrounding the larger substrates,up to 100%
7. Woody Debris - total width should be >10 cm in diameter

A= 0.8 for rough bottom

APPENDIX C

Wetland Characterization – 2012 Field Assessment

Table A: Wetland Characterization – 2012 Field Assessment

Wetland ID	Wetland Type	Landscape Position	Landform	Water Flow	Soil Type	Surface/ Hydrological Conditions	Dominant Vegetation		
							Herbs	Shrubs	Trees
A – northern portions (photo 3)	Treed Swamp	Lotic Stream	Basin	Outflow	Organic	• Intermittent standing water • Saturated Surfaces • Groundwater within 10 cm	• three seeded sedge (*Carex trisperma*) • bunchberry (*Cornus canadensis*) • sheep laurel (*Kalmia angustifolia*)	• larch (*Larix laricina*) • balsam fir (*Abies balsamea*) • black spruce (*Picea mariana*)	• balsam fir (*Abies balsamea*) • black spruce (*Picea mariana*)
A – southern portions (photo 4)	Treed / Shrub Swamp	Lotic Stream	Basin	Outflow	Organic	• Saturated Surfaces • Groundwater within 10 cm	• cinnamon fern (*Osmunda cinnamomea*) • sheep laurel (*Kalmia angustifolia*) • black spruce (*Picea mariana*) • snowberry (*Gaultheria hispidula*) • Labrador tea (*Ledum groenlandicum*)	• balsam fir (*Abies balsamea*) • black spruce (*Picea mariana*) • birch *spp*[1] (*Betula* spp) • maple *spp*[1] (*Acer* spp) • speckled alder (*Alnus incana*)	• balsam fir (*Abies balsamea*) • black spruce (*Picea mariana*) • birch *spp*[1] (*Betula* spp)
B (photo 5)	Treed Swamp	Terrene (inferred)	Basin	Outflow (via drainage)	Organic on boulders	• Saturated at surface • Groundwater within 15 cm	• three seeded sedge (*Carex trisperma*) • sheep laurel (*Kalmia angustiolia*) • cinnamon fern (*Osmunda cinnamomea*)	• balsam fir (*Abies balsamea*) • maple *spp*[1] (*Acer* spp) • birch *spp*[1] (*Betula* spp)	• balsam fir (*Abies balsamea*) • maple *spp*[1] (*Acer* spp) • birch *spp*[1] (*Betula* spp)

Wetland ID	Wetland Type	Landscape Position	Landform	Water Flow	Soil Type	Surface/ Hydrological Conditions	Dominant Vegetation		
							Herbs	Shrubs	Trees
C – northern portions (photo 6)	Treed / Shrub Swamp	Lotic Stream	Basin	Outflow (inferred)	Organic	• Saturated at surface • Groundwater within 15 cm	• black spruce (*Picea mariana*) • sheep laurel (*Kalmia angustiolia*) • cinnamon fern (*Osmunda cinnamomea*)	• black spruce (*Picea mariana*)	• black spruce (*Picea mariana*)
C – southern portions (photo 7)	Shrub Bog to Graminoid Fen	Lotic Stream	Basin	Outflow (inferred)	Organic	• Saturated at surface • Groundwater within 5 cm	• Labrador tea (*Ledum groenlandicum*) • Cottongrass (*Eriophorum* spp.) • sheep laurel (*Kalmia angustiolia*) • black spruce (*Picea mariana*) • cranberry (*Vaccinium* spp.) • mayflower (*Epigaea repens*)	• black spruce (*Picea mariana*)	n/a
D – northern portions (photo 8)	Treed Swamp	Lotic Stream (inferred)	Sloped	Outflow	Organic	• Saturated at surface • Groundwater within 5 cm • Intermittent standing water	• balsam fir (*Abies balsamea*) • three seeded sedge (*Carex trisperma*) • sheep laurel (*Kalmia angustifolia*)	• balsam fir (*Abies balsamea*)	• balsam fir (*Abies balsamea*) • black spruce (*Picea mariana*)
D – southern portions (photo 9)	Treed Swamp	Lotic Stream (inferred)	Sloped	Throughflow	Organic	• Saturated at surface • Groundwater within 10 cm	• balsam fir (*Abies balsamea*) • three seeded sedge (*Carex trisperma*) • sheep laurel (*Kalmia angustifolia*)	• balsam fir (*Abies balsamea*) • black spruce (*Picea mariana*)	• balsam fir (*Abies balsamea*) • black spruce (*Picea mariana*)

Wetland ID	Wetland Type	Landscape Position	Landform	Water Flow	Soil Type	Surface/ Hydrological Conditions	Dominant Vegetation		
							Herbs	Shrubs	Trees
E (photo 10)	Treed Swamp	Lotic Stream	Basin	Outflow (inferred)	Organic	• Saturated at surface • Groundwater within 15 cm	• three seeded sedge (*Carex trisperma*) • sheep laurel (*Kalmia angustifolia*) • balsam fir (*Abies balsamea*)	• black spruce (*Picea mariana*)	• black spruce (*Picea mariana*)
F (photo 11)	Treed Swamp	Terrene	Basin	Isolated	Organic	• Saturated Surfaces • Groundwater within 15 cm	• three seeded sedge (*Carex trisperma*) • sheep laurel (*Kalmia angustifolia*) • balsam fir (*Abies balsamea*)	• black spruce (*Picea mariana*) • red maple (*Acer rubrum*)	• black spruce (*Picea mariana*) • red maple (*Acer rubrum*)
G (photo 12)	Treed Swamp	Lotic Stream	Basin	Throughflow	Organic on boulders	• Saturated at surface • Groundwater within 20 cm	• balsam fir (*Abies balsamea*)	• balsam fir (*Abies balsamea*)	• black spruce (*Picea mariana*)
H – northwestern portions (photo 13)	Treed / Shrub Swamp	Lotic Stream	Basin	Throughflow	Organic	• Saturated within 5cm • Groundwater within 20 cm	• Labrador tea (*Ledum groenlandicum*) • leatherleaf (*Chamaedaphne calyculata*) • sheep laurel (*Kalmia angustifolia*) • teaberry (*Gaultheria procumbens*)	• bog huckleberry (*Gaylussacia dumosa*) • balsam fir (*Abies balsamea*) • black spruce (*Picea mariana*)	• black spruce (*Picea mariana*) • balsam fir (*Abies balsamea*)

Wetland ID	Wetland Type	Landscape Position	Landform	Water Flow	Soil Type	Surface/ Hydrological Conditions	Dominant Vegetation		
							Herbs	Shrubs	Trees
H – southeast portions (photo 14)	Shrub Bog	Lotic Pond/Lotic Stream (inferred)	Flat	Outflow	Organic	• Saturated at surface • Groundwater within 10 cm • Intermittent standing water	• leatherleaf (*Chamaedaphne calyculata*) • pitcher plant (*Sarracenia purpurea*) • sedge s*pp*[1] (*Carex* spp) • sheep laurel (*Kalmia angustifolia*)	• sheep laurel (*Kalmia angustifolia*)	n/a
I (photo 15)	Shrub Swamp	Terrene	Basin	Isolated	Organic on boulders	• Saturated within 10 cm • Groundwater within 20 cm	• Leatherleaf (*Chamaedaphne calyculata*) • Labrador tea (*Ledum groenlandicum*) • cinnamon fern (*Osmunda cinnamomea*) • sheep laurel (*Kalmia angustifolia*) • Canada holly (*Ilex verticillata*)	• sheep laurel (*Abies balsamea*) • rhodora (*Rhododendron canadense*)	n/a

[1] *Identification of species not possible due to lack of flower*

Photo 1: Wetland 1 (AMEC).

Photo 2: Wetland 1 (AMEC), bordering Winter Creek.

Photo 3: Wetland A (northern portion).

Photo 4: Wetland A (southern portion).

Photo 5: Wetland B.

Photo 6: Wetland C (northern portion).

Photo 7: Wetland C (southern portion).

Photo 8: Wetland D (northern portion).

Photo 9: Wetland D (southern portion).

Photo 10: Wetland E.

Photo 11: Wetland F.

Photo 12: Wetland G.

Photo 13: Watercourse at northwest portion of Wetland H.

Photo 14: Wetland H (southeast portion).

Photo 15: Wetland I.

APPENDIX D

Flora Species Tables

Table D1

ACCDC Data of Recorded Observations of Flora Species Within 100 km of the Project Site

Common Name	Scientific Name	NSDNR Status[1]	COSEWIC Status[2]	SARA Status[3]	NSESA Status[4]
Acadian quillwort	*Isoetes acadiensis*	Yellow	Not Listed	Not Listed	Not Listed
alder-leaved buckthorn	*Rhamnus alnifolia*	Yellow	Not Listed	Not Listed	Not Listed
alpine bilberry	*Vaccinium uliginosum*	Yellow	Not Listed	Not Listed	Not Listed
alpine bistort	*Bistorta vivipara*	Red	Not Listed	Not Listed	Not Listed
alpine rush	*Juncus alpinoarticulatus*	Red	Not Listed	Not Listed	Not Listed
Atlantic sedge	*Carex atlantica*	Green	Not Listed	Not Listed	Not Listed
balsam groundsel	*Packera paupercula*	Green	Not Listed	Not Listed	Not Listed
bastard's toadflax	*Comandra umbellata*	Red	Not Listed	Not Listed	Not Listed
Bebb's sedge	*Carex bebbii*	Red	Not Listed	Not Listed	Not Listed
black ash	*Fraxinus nigra*	Yellow	Not Listed	Not Listed	Not Listed
bloodroot	*Sanguinaria canadensis*	Green	Not Listed	Not Listed	Not Listed
blue cohosh	*Caulophyllum thalictroides*	Red	Not Listed	Not Listed	Not Listed
blue vervain	*Verbena hastata*	Green	Not Listed	Not Listed	Not Listed
blunt-leaved pondweed	*Potamogeton obtusifolius*	Yellow	Not Listed	Not Listed	Not Listed
bog birch	*Betula pumila*	Yellow	Not Listed	Not Listed	Not Listed
bog willow	*Salix pedicellaris*	Yellow	Not Listed	Not Listed	Not Listed
boreal aster	*Symphyotrichum boreale*	Yellow	Not Listed	Not Listed	Not Listed
bristle-leaved sedge	*Carex eburnea*	Yellow	Not Listed	Not Listed	Not Listed
broad-glumed brome	*Bromus latiglumis*	Red	Not Listed	Not Listed	Not Listed
brook lobelia	*Lobelia kalmii*	Red	Not Listed	Not Listed	Not Listed
bulblet bladder fern	*Cystopteris bulbifera*	Green	Not Listed	Not Listed	Not Listed
buttonbush dodder	*Cuscuta cephalanthi*	Red	Not Listed	Not Listed	Not Listed
Canada anemone	*Anemone canadensis*	Red	Not Listed	Not Listed	Not Listed
Canada germander	*Teucrium canadense*	Yellow	Not Listed	Not Listed	Not Listed
Canada lily	*Lilium canadense*	Yellow	Not Listed	Not Listed	Not Listed
Canada violet	*Viola canadensis*	Extirpated	Not Listed	Not Listed	Not Listed
Canada wood nettle	*Laportea canadensis*	Yellow	Not Listed	Not Listed	Not Listed
climbing false buckwheat	*Fallopia scandens*	Yellow	Not Listed	Not Listed	Not Listed
clustered sanicle	*Sanicula odorata*	Red	Not Listed	Not Listed	Not Listed
common scouring-rush	*Equisetum hyemale*	Green	Not Listed	Not Listed	Not Listed
cuckoo flower	*Cardamine pratensis*	Red	Not Listed	Not Listed	Not Listed
cut-leaved coneflower	*Rudbeckia laciniata*	Yellow	Not Listed	Not Listed	Not Listed
cut-leaved moonwort	*Botrychium dissectum*	Green	Not Listed	Not Listed	Not Listed
deer-tongue panic grass	*Dichanthelium clandestinum*	Green	Not Listed	Not Listed	Not Listed
disguised St. John's-wort	*Hypericum dissimulatum*	Yellow	Not Listed	Not Listed	Not Listed
downy willowherb	*Epilobium strictum*	Yellow	Not Listed	Not Listed	Not Listed
Dudley's rush	*Juncus dudleyi*	Yellow	Not Listed	Not Listed	Not Listed
dwarf bilberry	*Vaccinium caespitosum*	Yellow	Not Listed	Not Listed	Not Listed
dwarf scouring-rush	*Equisetum scirpoides*	Green	Not Listed	Not Listed	Not Listed
early coralroot	*Corallorhiza trifida*	Green	Not Listed	Not Listed	Not Listed
Eastern white cedar	*Thuja occidentalis*	Red	Not Listed	Not Listed	Vulnerable
estuarine sedge	*Carex vacillans*	Undetermined	Not Listed	Not Listed	Not Listed
estuary beggarticks	*Bidens hyperborea*	Red	Not Listed	Not Listed	Not Listed

Common Name	Scientific Name	NSDNR Status[1]	COSEWIC Status[2]	SARA Status[3]	NSESA Status[4]
false mermaidweed	*Floerkea proserpinacoides*	Yellow	Not at Risk	Not Listed	Not Listed
Farwell's water milfoil	*Myriophyllum farwellii*	Yellow	Not Listed	Not Listed	Not Listed
Fernald's serviceberry	*Amelanchier fernaldii*	Undetermined	Not Listed	Not Listed	Not Listed
few-flowered spikerush	*Eleocharis quinqueflora*	Red	Not Listed	Not Listed	Not Listed
flat-stemmed pondweed	*Potamogeton zosteriformis*	Yellow	Not Listed	Not Listed	Not Listed
foxtail sedge	*Carex alopecoidea*	Red	Not Listed	Not Listed	Not Listed
fragrant wood fern	*Dryopteris fragrans*	Yellow	Not Listed	Not Listed	Not Listed
Fries' pondweed	*Potamogeton friesii*	Red	Not Listed	Not Listed	Not Listed
fringed blue aster	*Symphyotrichum ciliolatum*	Yellow	Not Listed	Not Listed	Not Listed
Gaspé arrowgrass	*Triglochin gaspensis*	Undetermined	Not Listed	Not Listed	Not Listed
glaucous blue grass	*Poa glauca*	Yellow	Not Listed	Not Listed	Not Listed
golden alexanders	*Zizia aurea*	Red	Not Listed	Not Listed	Not Listed
green spleenwort	*Asplenium viride*	Yellow	Not Listed	Not Listed	Not Listed
Greene's rush	*Juncus greenei*	Red	Not Listed	Not Listed	Not Listed
greenish sedge	*Carex viridula*	Green	Not Listed	Not Listed	Not Listed
ground-fir	*Lycopodium sabinifolium*	Not Listed	Not Listed	Not Listed	Not Listed
highland rush	*Juncus trifidus*	Yellow	Not Listed	Not Listed	Not Listed
hooked agrimony	*Agrimonia gryposepala*	Green	Not Listed	Not Listed	Not Listed
Hooker's orchid	*Platanthera hookeri*	Green	Not Listed	Not Listed	Not Listed
hop flatsedge	*Cyperus lupulinus*	Red	Not Listed	Not Listed	Not Listed
humped bladderwort	*Utricularia gibba*	Green	Not Listed	Not Listed	Not Listed
hyssop-leaved fleabane	*Erigeron hyssopifolius*	Yellow	Not Listed	Not Listed	Not Listed
inverted bladderwort	*Utricularia resupinata*	Red	Not Listed	Not Listed	Not Listed
Labrador bedstraw	*Galium labradoricum*	Yellow	Not Listed	Not Listed	Not Listed
lance-leaved figwort	*Scrophularia lanceolata*	Undetermined	Not Listed	Not Listed	Not Listed
large purple fringed orchid	*Platanthera grandiflora*	Green	Not Listed	Not Listed	Not Listed
large St. John's-wort	*Hypericum majus*	Red	Not Listed	Not Listed	Not Listed
Laurentian bladder fern	*Cystopteris laurentiana*	Red	Not Listed	Not Listed	Not Listed
least moonwort	*Botrychium simplex*	Yellow	Not Listed	Not Listed	Not Listed
lesser brown sedge	*Carex adusta*	Yellow	Not Listed	Not Listed	Not Listed
lesser pyrola	*Pyrola minor*	Yellow	Not Listed	Not Listed	Not Listed
lesser rattlesnake-plantain	*Goodyera repens*	Yellow	Not Listed	Not Listed	Not Listed
lesser spearwort	*Ranunculus flammula*	Green	Not Listed	Not Listed	Not Listed
limestone scurvy-grass	*Cochlearia tridactylites*	Red	Not Listed	Not Listed	Not Listed
little curlygrass fern	*Schizaea pusilla*	Green	Not Listed	Not Listed	Not Listed
livid sedge	*Carex livida*	Red	Not Listed	Not Listed	Not Listed
Loesel's twayblade	*Liparis loeselii*	Green	Not Listed	Not Listed	Not Listed
long-leaved pondweed	*Potamogeton nodosus*	Red	Not Listed	Not Listed	Not Listed
long-leaved starwort	*Stellaria longifolia*	Yellow	Not Listed	Not Listed	Not Listed
low spikemoss	*Selaginella selaginoides*	Red	Not Listed	Not Listed	Not Listed
maidenhair spleenwort	*Asplenium trichomanes*	Yellow	Not Listed	Not Listed	Not Listed
marsh bellflower	*Campanula aparinoides*	Yellow	Not Listed	Not Listed	Not Listed
marsh grass-of-Parnassus	*Parnassia palustris*	Red	Not Listed	Not Listed	Not Listed
marsh horsetail	*Equisetum palustre*	Red	Not Listed	Not Listed	Not Listed
marsh mermaidweed	*Proserpinaca palustris*	Green	Not Listed	Not Listed	Not Listed
meadow horsetail	*Equisetum pratense*	Yellow	Not Listed	Not Listed	Not Listed
meadow willow	*Salix petiolaris*	Green	Not Listed	Not Listed	Not Listed

Common Name	Scientific Name	NSDNR Status[1]	COSEWIC Status[2]	SARA Status[3]	NSESA Status[4]
Moor rush	*Juncus stygius*	Yellow	Not Listed	Not Listed	Not Listed
narrow-leaved blue-eyed-grass	*Sisyrinchium angustifolium*	Green	Not Listed	Not Listed	Not Listed
New Jersey rush	*Juncus caesariensis*	Yellow	Special Concern	Special Concern	Vulnerable
Newfoundland dwarf birch	*Betula michauxii*	Yellow	Not Listed	Not Listed	Not Listed
Northern arnica	*Arnica lonchophylla*	Red	Not Listed	Not Listed	Not Listed
Northern blueberry	*Vaccinium boreale*	Red	Not Listed	Not Listed	Not Listed
Northern bog sedge	*Carex gynocrates*	Red	Not Listed	Not Listed	Not Listed
Northern bog violet	*Viola nephrophylla*	Yellow	Not Listed	Not Listed	Not Listed
Northern burreed	*Sparganium hyperboreum*	Yellow	Not Listed	Not Listed	Not Listed
Northern clubmoss	*Diphasiastrum complanatum*	Green	Not Listed	Not Listed	Not Listed
Northern comandra	*Geocaulon lividum*	Yellow	Not Listed	Not Listed	Not Listed
Northern dewberry	*Rubus flagellaris*	Undetermined	Not Listed	Not Listed	Not Listed
Northern holly fern	*Polystichum lonchitis*	Yellow	Not Listed	Not Listed	Not Listed
Northern wild licorice	*Galium kamtschaticum*	Green	Not Listed	Not Listed	Not Listed
orange-fruited tinker's weed	*Triosteum aurantiacum*	Yellow	Not Listed	Not Listed	Not Listed
pale false manna grass	*Torreyochloa pallida*	Green	Not Listed	Not Listed	Not Listed
pale jewelweed	*Impatiens pallida*	Yellow	Not Listed	Not Listed	Not Listed
Pennsylvania smartweed	*Persicaria pensylvanica*	Green	Not Listed	Not Listed	Not Listed
Philadelphia fleabane	*Erigeron philadelphicus*	Yellow	Not Listed	Not Listed	Not Listed
pink pyrola	*Pyrola asarifolia*	Green	Not Listed	Not Listed	Not Listed
porcupine sedge	*Carex hystericina*	Red	Not Listed	Not Listed	Not Listed
pubescent sedge	*Carex hirtifolia*	Yellow	Not Listed	Not Listed	Not Listed
purple-stemmed angelica	*Angelica atropurpurea*	Green	Not Listed	Not Listed	Not Listed
purple-veined willowherb	*Epilobium coloratum*	Yellow	Not Listed	Not Listed	Not Listed
Quebec hawthorn	*Crataegus submollis*	Undetermined	Not Listed	Not Listed	Not Listed
red pigweed	*Chenopodium rubrum*	Red	Not Listed	Not Listed	Not Listed
Richardson's pondweed	*Potamogeton richardsonii*	Red	Not Listed	Not Listed	Not Listed
rock whitlow-grass	*Draba glabella*	Red	Not Listed	Not Listed	Not Listed
sage willow	*Salix candida*	Red	Not Listed	Not Listed	Not Listed
saltmarsh starwort	*Stellaria humifusa*	Yellow	Not Listed	Not Listed	Not Listed
satiny willow	*Salix pellita*	Undetermined	Not Listed	Not Listed	Not Listed
scabrous black sedge	*Carex atratiformis*	Yellow	Not Listed	Not Listed	Not Listed
seabeach ragwort	*Senecio pseudoarnica*	Yellow	Not Listed	Not Listed	Not Listed
seaside brookweed	*Samolus valerandi*	Yellow	Not Listed	Not Listed	Not Listed
sharp-fruited knotweed	*Polygonum oxyspermum*	Undetermined	Not Listed	Not Listed	Not Listed
sharp-fruited rush	*Juncus acuminatus*	Yellow	Not Listed	Not Listed	Not Listed
shining ladies'-tresses	*Spiranthes lucida*	Red	Not Listed	Not Listed	Not Listed
short-awned foxtail	*Alopecurus aequalis*	Yellow	Not Listed	Not Listed	Not Listed
showy lady's-slipper	*Cypripedium reginae*	Red	Not Listed	Not Listed	Not Listed
Siberian water milfoil	*Myriophyllum sibiricum*	Green	Not Listed	Not Listed	Not Listed
sitka clubmoss	*Diphasiastrum sitchense*	Green	Not Listed	Not Listed	Not Listed
slender beakrush	*Rhynchospora capillacea*	Red	Not Listed	Not Listed	Not Listed
slender blue flag	*Iris prismatica*	Red	Not Listed	Not Listed	Not Listed
slender cottongrass	*Eriophorum gracile*	Yellow	Not Listed	Not Listed	Not Listed

Common Name	Scientific Name	NSDNR Status[1]	COSEWIC Status[2]	SARA Status[3]	NSESA Status[4]
slim-stemmed reed grass	*Calamagrostis stricta*	Yellow	Not Listed	Not Listed	Not Listed
small burreed	*Sparganium natans*	Green	Not Listed	Not Listed	Not Listed
small round-leaved orchid	*Platanthera orbiculata*	Green	Not Listed	Not Listed	Not Listed
small-flowered woodrush	*Luzula parviflora*	Green	Not Listed	Not Listed	Not Listed
smooth cliff fern	*Woodsia glabella*	Yellow	Not Listed	Not Listed	Not Listed
smooth sweet cicely	*Osmorhiza longistylis*	Red	Not Listed	Not Listed	Not Listed
soapberry	*Shepherdia canadensis*	Yellow	Not Listed	Not Listed	Not Listed
Southern bog clubmoss	*Lycopodiella appressa*	Green	Not Listed	Not Listed	Not Listed
Southern mudwort	*Limosella australis*	Yellow	Not Listed	Not Listed	Not Listed
Southern twayblade	*Listera australis*	Red	Not Listed	Not Listed	Not Listed
sparse-flowered sedge	*Carex tenuiflora*	Red	Not Listed	Not Listed	Not Listed
spurred gentian	*Halenia deflexa*	Yellow	Not Listed	Not Listed	Not Listed
stalked bulrush	*Scirpus pedicellatus*	Undetermined	Not Listed	Not Listed	Not Listed
Steller's rockbrake	*Cryptogramma stelleri*	Red	Not Listed	Not Listed	Not Listed
sticky false asphodel	*Triantha glutinosa*	Red	Not Listed	Not Listed	Not Listed
stout smartweed	*Persicaria robustior*	Green	Not Listed	Not Listed	Not Listed
sturdy bulrush	*Bolboschoenus robustus*	Undetermined	Not Listed	Not Listed	Not Listed
swamp loosestrife	*Decodon verticillatus*	Yellow	Not Listed	Not Listed	Not Listed
swamp milkweed	*Asclepias incarnata*	Green	Not Listed	Not Listed	Not Listed
Swedish bunchberry	*Cornus suecica*	Yellow	Not Listed	Not Listed	Not Listed
sweet wood reed grass	*Cinna arundinacea*	Red	Not Listed	Not Listed	Not Listed
tender sedge	*Carex tenera*	Yellow	Not Listed	Not Listed	Not Listed
thread-leaved pondweed	*Stuckenia filiformis*	Undetermined	Not Listed	Not Listed	Not Listed
tinged sedge	*Carex tincta*	Red	Not Listed	Not Listed	Not Listed
triangle moonwort	*Botrychium lanceolatum*	Yellow	Not Listed	Not Listed	Not Listed
triangular-valve dock	*Rumex triangulivalvis*	Yellow	Not Listed	Not Listed	Not Listed
variegated horsetail	*Equisetum variegatum*	Green	Not Listed	Not Listed	Not Listed
Virginia anemone	*Anemone virginiana*	Yellow	Not Listed	Not Listed	Not Listed
water beggarticks	*Bidens beckii*	Yellow	Not Listed	Not Listed	Not Listed
water blinks	*Montia fontana*	Red	Not Listed	Not Listed	Not Listed
water pygmyweed	*Crassula aquatica*	Yellow	Not Listed	Not Listed	Not Listed
white adder's-mouth	*Malaxis monophyllos*	Red	Not Listed	Not Listed	Not Listed
white mountain saxifrage	*Saxifraga paniculata*	Yellow	Not Listed	Not Listed	Not Listed
white sea-blite	*Suaeda maritima*	Green	Not Listed	Not Listed	Not Listed
white snakeroot	*Ageratina altissima*	Red	Not Listed	Not Listed	Not Listed
white-stemmed pondweed	*Potamogeton praelongus*	Yellow	Not Listed	Not Listed	Not Listed
Wiegand's wild rye	*Elymus wiegandii*	Red	Not Listed	Not Listed	Not Listed
wild chives	*Allium schoenoprasum*	Red	Not Listed	Not Listed	Not Listed
wood anemone	*Anemone quinquefolia*	Yellow	Not Listed	Not Listed	Not Listed
yellow bartonia	*Bartonia virginica*	Green	Not Listed	Not Listed	Not Listed
yellow lady's-slipper	*Cypripedium parviflorum*	Yellow	Not Listed	Not Listed	Not Listed
yellow marsh marigold	*Caltha palustris*	Yellow	Not Listed	Not Listed	Not Listed
yellow spikerush	*Eleocharis flavescens*	Yellow	Not Listed	Not Listed	Not Listed
yellow-seeded false pimperel	*Lindernia dubia*	Green	Not Listed	Not Listed	Not Listed

[1] NSDNR, 2010; [2] COSEWIC, 2009a; [3] SARA, 2011; [4] NSESA, 2007
Source: ACCDC, 2012

Table D2

Species Observed in 2004 and 2005, Within the Optimized Layout Footprint

Common Name	Scientific Name	NSDNR Status[1]	COSEWIC Status[2]	SARA Status[3]	NSESA Status[4]
American mountain ash	*Sorbus Americana*	Green	Not listed	Not listed	Not listed
balsam fir	*Abies balsams*	Green	Not listed	Not listed	Not listed
Bartrams serviceberry	*Amelanchier bartramiana*	Green	Not listed	Not listed	Not listed
black huckleberry	*Gaylussacia baccata*	Green	Not listed	Not listed	Not listed
black spruce	*Picea mariana*	Green	Not listed	Not listed	Not listed
blue flag (harlequin blue flag)	*Iris versicolor*	Green	Not listed	Not listed	Not listed
bluejoint reed grass	*Calamagrostis Canadensis*	Green	Not listed	Not listed	Not listed
bracken fern	*Pteridium aquilinum*	Green	Not listed	Not listed	Not listed
Broom crowberry	*Corema conradii*	Green	Not listed	Not listed	Not listed
brown-fruited rush	*Juncus pelocarpus*	Green	Not listed	Not listed	Not listed
bunchberry	*Cornus canadesis*	Green	Not listed	Not listed	Not listed
chokecherry	*Prunus virginiana*	Green	Not listed	Not listed	Not listed
cinnamon fern	*Osmunda cinnamomea*	Green	Not listed	Not listed	Not listed
Clinton lily (yellow bluebead lily	*Clintonia borealis*	Green	Not listed	Not listed	Not listed
common hair-grass (wavy hair grass)	*Deschampsia flexuosa*	Green	Not listed	Not listed	Not listed
common wool-grass (common woolly bulrush)	*Scirpus cyperinus*	Green	Not listed	Not listed	Not listed
Cotton grass (rough cottongrass)	*Eriophorum tenellum*	Green	Not listed	Not listed	Not listed
creeping bent grass	*Agrostis stolonifera*	Green	Not listed	Not listed	Not listed
downy alder (green alder)	*Alnus viridis*	Green	Not listed	Not listed	Not listed
Eastern spreading wood fern (mountain wood fern)	*Dryopteris campyloptera*	Green	Not listed	Not listed	Not listed
evergreen wood fern	*Dryopteris intermedia*	Green	Not listed	Not listed	Not listed
false holly (mountain holly)	*Nemopanthus mucronatus*	Green	Not listed	Not listed	Not listed
fibrous-root sedge	*Carex communis*	Green	Not listed	Not listed	Not listed
goldthread	*Coptis trifolia*	Green	Not listed	Not listed	Not listed
green-fruited burreed	*Sparganium emersum*	Green	Not listed	Not listed	Not listed
hay-scented fern	*Dennstaedtia punctilobula*	Green	Not listed	Not listed	Not listed
heart-leaf birch	*Betula cordifolia*	Green	Not listed	Not listed	Not listed
Indian pipe	*Monotropa uniflora*	Green	Not listed	Not listed	Not listed
interrupted fern	*Osmunda claytoniana*	Green	Not listed	Not listed	Not listed
jack pine	*Pinus banksiana*	Green	Not listed	Not listed	Not listed
Common Labrador tea	*Ledum groenlandicum*	Green	Not listed	Not listed	Not listed
lady-fern	*Athyrium filix-femina*	Green	Not listed	Not listed	Not listed

leatherleaf	*Chamaedaphne calysulata*	Green	Not listed	Not listed	Not listed
lions paw	*Pernanthes trifoliata*		Not listed	Not listed	Not listed
lowbush blueberry	*Vaccinium angustifolium*	Green	Not listed	Not listed	Not listed
mountain cranberry	*Vaccinium vitis-idaee*	Green	Not listed	Not listed	Not listed
mountain fly honeysuckle	*Lonicera villosa*	Green	Not listed	Not listed	Not listed
narrow-leaved meadow-sweet (white meadowsweet)	*Spiraea alba*	Green	Not listed	Not listed	Not listed
New York fern	*Thelypteris noveboracensis*	Green	Not listed	Not listed	Not listed
Northern beech fern	*Phegopteris connectilis*	Green	Not listed	Not listed	Not listed
Northern sedge	*Carex folliculata*	Green	Not listed	Not listed	Not listed
Northern starflower	*Trientalis borealis*	Green	Not listed	Not listed	Not listed
pale laurel (pale bog laurel)	*Kalmia polifolia*	Green	Not listed	Not listed	Not listed
paper birch	*Betula papyrifera*	Green	Not listed	Not listed	Not listed
partridge berry	*Mitchella repens*	Green	Not listed	Not listed	Not listed
pin cherry	*Prunis pennsylvanica*	Green	Not listed	Not listed	Not listed
pink lady's-slipper	*Cypripedium acaule*	Green	Not listed	Not listed	Not listed
pointed wood-rush (hairy woodrush)	*Luzula acuminata*	Green	Not listed	Not listed	Not listed
red chokeberry	*Aronia arbutifolia*	Green	Not listed	Not listed	Not listed
red maple	*Acer rubrum*	Green	Not listed	Not listed	Not listed
red raspberry	*Rubum idaeus*	Green	Not listed	Not listed	Not listed
red spruce	*Picea rubens*	Green	Not listed	Not listed	Not listed
red-top grass	*Agrostis alba*		Not listed	Not listed	
rhodora	*Rhododendron canadense*	Green	Not listed	Not listed	Not listed
rose twisted-stalk	*Streptopus roseus*	Green	Not listed	Not listed	Not listed
round-leaved dogwood	*Cornus rugosa*	Green	Not listed	Not listed	Not listed
round leaved sundew	*Drosera rotundifolia*	Green	Not listed	Not listed	Not listed
rough-stemmed goldenrod	*Soilidago rusosa*	Green	Not listed	Not listed	Not listed
Savin-leaved Clubmoss (Sitka Clubmoss)	*Diphasiastrum sitchense*	Green	Not listed	Not listed	Not listed
shadbush (Canada serviceberry)	*Amelanchier Canadensis*	Green	Not listed	Not listed	Not listed
sheep laurel	*Kalmia angustifolia*	Green	Not listed	Not listed	Not listed
speckled alder	*Alnus incana*	Green	Not listed	Not listed	Not listed
sphagnum moss	*Sphagnum sp.*		Not listed	Not listed	Not listed
star sedge	*Carex echinata*	Green	Not listed	Not listed	Not listed
swamp rose	*Rosa nitida*	Green	Not listed	Not listed	Not listed
sweet gale	*Myrica gale*	Green	Not listed	Not listed	Not listed
sweet vernal grass	*Anthoxanthum odoratum*	Exotic	Not listed	Not listed	Not listed
tall white aster	*Aster umbellatus*		Not listed	Not listed	Not listed
tamarack	*Larix laricina*	Green	Not listed	Not listed	Not listed
Eastern teaberry	*Gaultheria procumbens*	Green	Not listed	Not listed	Not listed
trailing arbutus	*Epigaea repens*	Green	Not listed	Not listed	Not listed
twinflower	*Linnaea borealis*	Green	Not listed	Not listed	Not listed
two-seeded sedge	*Carex disperma*	Green	Not listed	Not listed	Not listed

velvet-leaved blueberry	*Vaccinium myrtilloides*	Green	Not listed	Not listed	Not listed
weak sedge (white-edged Sedge)	*Carex debilis*	Green	Not listed	Not listed	Not listed
white beakrush	*Rhynchospora alba*	Green	Not listed	Not listed	Not listed
white wood-sorrel	*Ozalis montana*		Not listed	Not listed	Not listed
wild lily-of-the-valley	*Maianthemum canadense*	Green	Not listed	Not listed	Not listed
wild raisin (Northern wild raisin)	*Viburnum nudum*	Green	Not listed	Not listed	Not listed
wild sarsaparilla	*Aralia nudicaulis*	Green	Not listed	Not listed	Not listed
American witch-hazel	*Hamamelis virginiana*	Green	Not listed	Not listed	Not listed
wood aster	*Aster acuminatus*		Not listed	Not listed	Not listed
yellow birch	*Betula alleghaniensis*	Green	Not listed	Not listed	Not listed

Source: AMEC, 2006

APPENDIX E

Significant Fauna Species and Habitats within 50 km of the Project Site

WLDNUM	Scientific Name	Common Name
GU898	*Odocoileus virginianus*	White-tailed Deer
GU900	*Odocoileus virginianus*	White-tailed Deer
GU921	*Odocoileus virginianus*	White-tailed Deer
GU988	*Odocoileus virginianus*	White-tailed Deer
IN102	*Odocoileus virginianus*	White-tailed Deer
IN108	*Odocoileus virginianus*	White-tailed Deer
IN109	*Odocoileus virginianus*	White-tailed Deer
IN112	*Odocoileus virginianus*	White-tailed Deer
IN113	*Odocoileus virginianus*	White-tailed Deer
IN122	*Odocoileus virginianus*	White-tailed Deer
IN123	*Odocoileus virginianus*	White-tailed Deer
IN210	*Odocoileus virginianus*	White-tailed Deer
IN285	*Glyptemys insculpta*	Wood Turtle
IN343	*Glyptemys insculpta*	Wood Turtle
IN93	*Odocoileus virginianus*	White-tailed Deer
IN94	*Odocoileus virginianus*	White-tailed Deer
IN97	*Odocoileus virginianus*	White-tailed Deer
RI241	*Halichoerus grypus*	Gray Seal
RI248	*Odocoileus virginianus*	White-tailed Deer
RI254	*Halichoerus grypus*	Gray Seal
RI256	*Odocoileus virginianus*	White-tailed Deer
RI265	*Halichoerus grypus*	Gray Seal
RI276	*Odocoileus virginianus*	White-tailed Deer
RI308	*Odocoileus virginianus*	White-tailed Deer
RI310	*Odocoileus virginianus*	White-tailed Deer
RI359	*Odocoileus virginianus*	White-tailed Deer
RI404	*Odocoileus virginianus*	White-tailed Deer
RI407	*Odocoileus virginianus*	White-tailed Deer
RI409	*Odocoileus virginianus*	White-tailed Deer
RI411	*Odocoileus virginianus*	White-tailed Deer
RI413	*Odocoileus virginianus*	White-tailed Deer
RI415	*Odocoileus virginianus*	White-tailed Deer
RI422	*Odocoileus virginianus*	White-tailed Deer
RI438	*Odocoileus virginianus*	White-tailed Deer
RI606	*Odocoileus virginianus*	White-tailed Deer
RI647	*Odocoileus virginianus*	White-tailed Deer
RI664	cave	significant area

Source: NSDNR, 2012a

APPENDIX F

Birds Species Tables

Table F1

ACCDC Data of Recorded Observations of Bird Species Within 100 km of the Project Site (2012)

Common Name	Scientific Name	NSDNR Status[1]	COSEWIC Status[2]	SARA Status[3]	NSESA Status[4]
American Bittern	*Botaurus lentiginosus*	Yellow	Not Listed	Not Listed	Not Listed
American Coot	*Fulica americana*	Undetermined	Not at Risk	Not Listed	Not Listed
American Golden-Plover	*Pluvialis dominica*	Yellow	Not Listed	Not Listed	Not Listed
American Three-toed Woodpecker	*Picoides dorsalis*	Undetermined	Not Listed	Not Listed	Not Listed
Arctic Tern	*Sterna paradisaea*	Red	Not Listed	Not Listed	Not Listed
Baltimore Oriole	*Icterus galbula*	Red	Not Listed	Not Listed	Not Listed
Bank Swallow	*Riparia riparia*	Red	Not Listed	Not Listed	Not Listed
Barn Swallow	*Hirundo rustica*	Yellow	Threatened	No Status	Not Listed
Bay-breasted Warbler	*Dendroica castanea*	Yellow	Not Listed	Not Listed	Not Listed
Bicknell's Thrush	*Catharus bicknelli*	Red	Threatened	Special Concern	Vulnerable
Black Guillemot	*Cepphus grylle*	Green	Not Listed	Not Listed	Not Listed
Black-backed Woodpecker	*Picoides arcticus*	Yellow	Not Listed	Not Listed	Not Listed
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Red	Not Listed	Not Listed	Not Listed
Black-crowned Night-heron	*Nycticorax nycticorax*	Red	Not Listed	Not Listed	Not Listed
Black-legged Kittiwake	*Rissa tridactyla*	Yellow	Not Listed	Not Listed	Not Listed
Blackpoll Warbler	*Dendroica striata*	Yellow	Not Listed	Not Listed	Not Listed
Blue-winged Teal	*Anas discors*	Red	Not Listed	Not Listed	Not Listed
Bobolink	*Dolichonyx oryzivorus*	Yellow	Threatened	No Status	Not Listed
Boreal Chickadee	*Poecile hudsonicus*	Yellow	Not Listed	Not Listed	Not Listed
Boreal Owl	*Aegolius funereus*	Undetermined	Not at Risk	Not Listed	Not Listed
Brant	*Branta bernicla*	Yellow	Not Listed	Not Listed	Not Listed
Brown-headed Cowbird	*Molothrus ater*	Green	Not Listed	Not Listed	Not Listed
Canada Warbler	*Wilsonia canadensis*	Red	Threatened	Threatened	Not Listed
Cape May Warbler	*Dendroica tigrina*	Yellow	Not Listed	Not Listed	Not Listed
Chimney	*Chaetura pelagica*	Red	Threatened	Threatened	Endangered

Swift					
Cliff Swallow	*Petrochelidon pyrrhonota*	Red	Not Listed	Not Listed	Not Listed
Common Goldeneye	*Bucephala clangula*	Green	Not Listed	Not Listed	Not Listed
Common Loon	*Gavia immer*	Red	Not at Risk	Not Listed	Not Listed
Common Nighthawk	*Chordeiles minor*	Red	Threatened	Threatened	Threatened
Common Tern	*Sterna hirundo*	Yellow	Not at Risk	Not Listed	Not Listed
Eastern Bluebird	*Sialia sialis*	Yellow	Not at Risk	Not Listed	Not Listed
Eastern Kingbird	*Tyrannus tyrannus*	Yellow	Not Listed	Not Listed	Not Listed
Eastern Phoebe	*Sayornis phoebe*	Yellow	Not Listed	Not Listed	Not Listed
Eastern Wood-Pewee	*Contopus virens*	Yellow	Not Listed	Not Listed	Not Listed
Fox Sparrow	*Passerella iliaca*	Green	Not Listed	Not Listed	Not Listed
Gray Catbird	*Dumetella carolinensis*	Red	Not Listed	Not Listed	Not Listed
Gray Jay	*Perisoreus canadensis*	Yellow	Not Listed	Not Listed	Not Listed
Great Cormorant	*Phalacrocorax carbo*	Yellow	Not Listed	Not Listed	Not Listed
Greater Yellowlegs	*Tringa melanoleuca*	Yellow	Not Listed	Not Listed	Not Listed
Harlequin Duck	*Histrionicus histrionicus*	Red	Special Concern	Special Concern	Endangered
Hudsonian Godwit	*Limosa haemastica*	Yellow	Not Listed	Not Listed	Not Listed
Hudsonian Whimbrel	*Numenius phaeopus*	Yellow	Not Listed	Not Listed	Not Listed
Indigo Bunting	*Passerina cyanea*	Undetermined	Not Listed	Not Listed	Not Listed
Killdeer	*Charadrius vociferus*	Yellow	Not Listed	Not Listed	Not Listed
Least Sandpiper	*Calidris minutilla*	Green	Not Listed	Not Listed	Not Listed
Long-eared Owl	*Asio otus*	Red	Not Listed	Not Listed	Not Listed
Northern Cardinal	*Cardinalis cardinalis*	Green	Not Listed	Not Listed	Not Listed
Northern Gannet	*Morus bassanus*	Green	Not Listed	Not Listed	Not Listed
Northern Goshawk	*Accipiter gentilis*	Green	Not at Risk	Not Listed	Not Listed
Northern Mockingbird	*Mimus polyglottos*	Green	Not Listed	Not Listed	Not Listed
Northern Pintail	*Anas acuta*	Red	Not Listed	Not Listed	Not Listed
Olive-sided Flycatcher	*Contopus cooperi*	Red	Threatened	Threatened	Not Listed
Philadelphia Vireo	*Vireo philadelphicus*	Undetermined	Not Listed	Not Listed	Not Listed
Pied-billed Grebe	*Podilymbus podiceps*	Yellow	Not Listed	Not Listed	Not Listed

Pine Grosbeak	*Pinicola enucleator*	Red	Not Listed	Not Listed	Not Listed
Pine Siskin	*Spinus pinus*	Yellow	Not Listed	Not Listed	Not Listed
Piping Plover	*Charadrius melodus*	Red	Endangered	Endangered	Endangered
Purple Martin	*Progne subis*	Red	Not Listed	Not Listed	Not Listed
Purple Sandpiper	*Calidris maritima*	Yellow	Not Listed	Not Listed	Not Listed
Red Knot	*Calidris canutus*	Red	Endangered	No Status	Endangered
Red-breasted Merganser	*Mergus serrator*	Green	Not Listed	Not Listed	Not Listed
Roseate Tern	*Sterna dougallii*	Red	Endangered	Endangered	Endangered
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Yellow	Not Listed	Not Listed	Not Listed
Rusty Blackbird	*Euphagus carolinus*	Red	Special Concern	Special Concern	Not Listed
Savannah Sparrow	*Passerculus sandwichensis*	Green	Special Concern	Special Concern	Not Listed
Scarlet Tanager	*Piranga olivacea*	Undetermined	Not Listed	Not Listed	Not Listed
Semipalmated Plover	*Charadrius semipalmatus*	Green	Not Listed	Not Listed	Not Listed
Semipalmated Sandpiper	*Calidris pusilla*	Yellow	Not Listed	Not Listed	Not Listed
Solitary Sandpiper	*Tringa solitaria*	Green	Not Listed	Not Listed	Not Listed
Spotted Sandpiper	*Actitis macularius*	Yellow	Not Listed	Not Listed	Not Listed
Tennessee Warbler	*Vermivora peregrina*	Yellow	Not Listed	Not Listed	Not Listed
Vesper Sparrow	*Pooecetes gramineus*	Red	Not Listed	Not Listed	Not Listed
Virginia Rail	*Rallus limicola*	Undetermined	Not Listed	Not Listed	Not Listed
Warbling Vireo	*Vireo gilvus*	Undetermined	Not Listed	Not Listed	Not Listed
Whip-Poor-Will	*Caprimulgus vociferus*	Red	Threatened	Threatened	Not Listed
Willet	*Tringa semipalmata*	Red	Not Listed	Not Listed	Not Listed
Willow Flycatcher	*Empidonax traillii*	Yellow	Not Listed	Not Listed	Not Listed
Wilson's Snipe	*Gallinago delicata*	Yellow	Not Listed	Not Listed	Not Listed
Wilson's Warbler	*Wilsonia pusilla*	Yellow	Not Listed	Not Listed	Not Listed
Wood Thrush	*Hylocichla mustelina*	Undetermined	Not Listed	Not Listed	Not Listed
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Yellow	Not Listed	Not Listed	Not Listed

[1] NSDNR, 2010; [2] COSEWIC, 2012; [3] SARA, 2011; [4] NSESA, 2007
Source: ACCDC, 2012

Table F2

Significant Bird Species and Habitats within 50 km of the Project Site

WLDNUM	Scientific Name	Common Name
AT436	saline pond	migratory birds
RI271	*Haliaeetus leucocephalus*	Bald Eagle
RI272	*Pandion haliaetus*	Osprey
RI273	*Sterna paradisaea*	Arctic Tern
RI703	*Pandion haliaetus*	Osprey
RI705	*Somateria mollissima*	Common Eider
RI706	*Somateria mollissima*	Common Eider
RI707	*Somateria mollissima*	Common Eider
RI708	*Somateria mollissima*	Common Eider
RI714	*Accipiter gentilis*	Northern Goshawk
RI716	*Haliaeetus leucocephalus*	Bald Eagle
RI717	*Haliaeetus leucocephalus*	Bald Eagle
RI718	*Haliaeetus leucocephalus*	Bald Eagle
RI719	*Pandion haliaetus*	Osprey
RI720	*N/A*	Tern (unclassified)
RI721	*N/A*	Tern (unclassified)
RI722	*N/A*	Tern (unclassified)
RI723	*N/A*	Tern (unclassified)
RI724	*N/A*	Tern (unclassified)
RI725	*N/A*	Tern (unclassified)
GU875	*Somateria mollissima*	Common Eider
GU876	*N/A*	significant area
GU877	*Somateria mollissima*	Common Eider
GU887	*N/A*	migratory birds
GU888	*N/A*	migratory birds
GU899	*Haliaeetus leucocephalus*	Bald Eagle
GU906	*Haliaeetus leucocephalus*	Bald Eagle
GU914	*Branta canadensis*	Canada Goose
GU915	*Somateria mollissima*	Common Eider
GU923	*Sterna dougallii*	Roseate Tern
GU938	*Sterna dougallii*	Roseate Tern
GU990	*Histrionicus histrionicus*	Harlequin Duck
GU991	*Histrionicus histrionicus*	Harlequin Duck
GU993	*Phalacrocorax auritus*	Double-crested Cormorant
GU994	*Phalacrocorax auritus*	Double-crested Cormorant
GU995	*N/A*	Tern (unclassified)
RI286	*Haliaeetus leucocephalus*	Bald Eagle
RI287	*Haliaeetus leucocephalus*	Bald Eagle
RI288	*Ardea herodias*	Great Blue Heron
RI289	*Gavia immer*	Common Loon
RI290	*Pandion haliaetus*	Osprey
RI291	*N/A*	Waterfowl (unclassified)
RI292	*Haliaeetus leucocephalus*	Bald Eagle

RI293	*Ardea herodias*	Great Blue Heron
RI294	*Haliaeetus leucocephalus*	Bald Eagle
RI295	*N/A*	Waterfowl (unclassified)
RI296	*Sterna hirundo*	Common Tern
RI297	*Somateria mollissima*	Common Eider
RI298	*Haliaeetus leucocephalus*	Bald Eagle
RI300	*N/A*	Tern (unclassified)
RI301	*Haliaeetus leucocephalus*	Bald Eagle
RI302	*Haliaeetus leucocephalus*	Bald Eagle
RI303	*Haliaeetus leucocephalus*	Bald Eagle
GU1007	*N/A*	Tern (unclassified)
GU871	*N/A*	Waterfowl (unclassified)
GU872	*Somateria mollissima*	Common Eider
GU873	*Somateria mollissima*	Common Eider
GU874	*Somateria mollissima*	Common Eider
RI261	*Haliaeetus leucocephalus*	Bald Eagle
RI262	*Gavia immer*	Common Loon
RI263	*Gavia immer*	Common Loon
RI265	*Somateria mollissima*	Common Eider
RI266	*Sterna paradisaea*	Arctic Tern
RI267	*Haliaeetus leucocephalus*	Bald Eagle
RI268	*Gavia immer*	Common Loon
RI269	*N/A*	Waterfowl (unclassified)
RI270	*N/A*	Tern (unclassified)
RI274	*Gavia immer*	Common Loon
RI275	*Pandion haliaetus*	Osprey
RI277	*Haliaeetus leucocephalus*	Bald Eagle
RI278	*Gavia immer*	Common Loon
RI279	*Haliaeetus leucocephalus*	Bald Eagle
RI280	*Ardea herodias*	Great Blue Heron
RI689	*Pandion haliaetus*	Osprey
RI694	*Haliaeetus leucocephalus*	Bald Eagle
RI695	*Haliaeetus leucocephalus*	Bald Eagle
RI696	*Haliaeetus leucocephalus*	Bald Eagle
RI697	*Pandion haliaetus*	Osprey
RI698	*Haliaeetus leucocephalus*	Bald Eagle
RI699	*Haliaeetus leucocephalus*	Bald Eagle
RI700	*Haliaeetus leucocephalus*	Bald Eagle
RI701	*Haliaeetus leucocephalus*	Bald Eagle
RI702	*Pandion haliaetus*	Osprey
GU1002	*N/A*	Tern (unclassified)
GU1004	*N/A*	Tern (unclassified)
GU1005	*N/A*	Tern (unclassified)
GU1006	*N/A*	Tern (unclassified)
GU855	*N/A*	migratory birds
GU858	*N/A*	migratory birds
GU940	*N/A*	Tern (unclassified)
GU985	*Haliaeetus leucocephalus*	Bald Eagle

GU992	*Histrionicus histrionicus*	Harlequin Duck
IN101	*Gavia immer*	Common Loon
IN121	*Sterna hirundo*	Common Tern
IN237	*N/A*	Tern (unclassified)
IN409	*Haliaeetus leucocephalus*	Bald Eagle
IN55	*Haliaeetus leucocephalus*	Bald Eagle
IN59	*Haliaeetus leucocephalus*	Bald Eagle
IN60	*Haliaeetus leucocephalus*	Bald Eagle
IN64	*Haliaeetus leucocephalus*	Bald Eagle
IN65	*Haliaeetus leucocephalus*	Bald Eagle
IN68	*Haliaeetus leucocephalus*	Bald Eagle
IN8	*Phalacrocorax auritus*	Double-crested Cormorant
RI234	*Haliaeetus leucocephalus*	Bald Eagle
RI237	*N/A*	Tern (unclassified)
RI241	*Somateria mollissima*	Common Eider
RI246	*Anas crecca*	Green-winged Teal
RI254	*Somateria mollissima*	Common Eider
RI255	*Haliaeetus leucocephalus*	Bald Eagle
RI258	*Pandion haliaetus*	Osprey
RI259	*Sterna hirundo*	Common Tern
RI281	*Haliaeetus leucocephalus*	Bald Eagle
RI282	*Bubo virginianus*	Great Horned Owl
RI283	*Gavia immer*	Common Loon
RI284	*Pandion haliaetus*	Osprey
RI285	*N/A*	Waterfowl (unclassified)
RI305	*Pandion haliaetus*	Osprey
RI306	*Haliaeetus leucocephalus*	Bald Eagle
RI307	*Gavia immer*	Common Loon
RI309	*Haliaeetus leucocephalus*	Bald Eagle
RI311	*Gavia immer*	Common Loon
RI312	*Haliaeetus leucocephalus*	Bald Eagle
RI313	*Bubo virginianus*	Great Horned Owl
RI314	*Haliaeetus leucocephalus*	Bald Eagle
RI315	*Haliaeetus leucocephalus*	Bald Eagle
RI316	*N/A*	Tern (unclassified)
RI318	*Haliaeetus leucocephalus*	Bald Eagle
RI319	*N/A*	Tern (unclassified)
RI320	*Haliaeetus leucocephalus*	Bald Eagle
RI321	*Haliaeetus leucocephalus*	Bald Eagle
RI322	*Gavia immer*	Common Loon
RI323	*Phalacrocorax auritus*	Double-crested Cormorant
RI324	*Sterna hirundo*	Common Tern
RI325	*Haliaeetus leucocephalus*	Bald Eagle
RI326	*Gavia immer*	Common Loon
RI327	*Ardea herodias*	Great Blue Heron
RI328	*Haliaeetus leucocephalus*	Bald Eagle
RI329	*Haliaeetus leucocephalus*	Bald Eagle
RI330	*Haliaeetus leucocephalus*	Bald Eagle

RI331	*Ardea herodias*	Great Blue Heron
RI332	*N/A*	Waterfowl (unclassified)
RI333	*Pandion haliaetus*	Osprey
RI334	*Pandion haliaetus*	Osprey
RI335	*Haliaeetus leucocephalus*	Bald Eagle
RI336	*Haliaeetus leucocephalus*	Bald Eagle
RI337	*Gavia immer*	Common Loon
RI338	*Haliaeetus leucocephalus*	Bald Eagle
RI339	*Pandion haliaetus*	Osprey
RI340	*N/A*	Waterfowl (unclassified)
RI341	*Haliaeetus leucocephalus*	Bald Eagle
RI342	*Ardea herodias*	Great Blue Heron
RI345	*N/A*	Tern (unclassified)
RI346	*Haliaeetus leucocephalus*	Bald Eagle
RI347	*Gavia immer*	Common Loon
RI348	*Haliaeetus leucocephalus*	Bald Eagle
RI349	*Haliaeetus leucocephalus*	Bald Eagle
RI352	*Pandion haliaetus*	Osprey
RI358	*Somateria mollissima*	Common Eider
RI360	*Sterna hirundo*	Common Tern
RI361	*Haliaeetus leucocephalus*	Bald Eagle
RI364	*N/A*	Tern (unclassified)
RI366	*Gavia immer*	Common Loon
RI367	*Numenius phaeopus*	Whimbrel
RI375	*Numenius phaeopus*	Whimbrel
RI376	*N/A*	Tern (unclassified)
RI382	*Haliaeetus leucocephalus*	Bald Eagle
RI392	*Sterna paradisaea*	Arctic Tern
RI430	*N/A*	Tern (unclassified)
RI435	*N/A*	Tern (unclassified)
RI441	*Phalacrocorax carbo*	Great Cormorant
RI442	*N/A*	Tern (unclassified)
RI445	*Phalacrocorax carbo*	Great Cormorant
RI574	*Haliaeetus leucocephalus*	Bald Eagle
RI678	*Haliaeetus leucocephalus*	Bald Eagle
RI681	*Haliaeetus leucocephalus*	Bald Eagle
RI682	*Haliaeetus leucocephalus*	Bald Eagle
RI683	*Haliaeetus leucocephalus*	Bald Eagle
RI684	*Pandion haliaetus*	Osprey
RI685	*Pandion haliaetus*	Osprey
RI686	*Haliaeetus leucocephalus*	Bald Eagle
RI687	*Pandion haliaetus*	Osprey
RI688	*Haliaeetus leucocephalus*	Bald Eagle

Source: NSDNR, 2012a

APPENDIX G

EMI Study Proposal

CLIENT | NOVA SCOTIA POWER INCORPORATED (NSPI)

RADAR and Telecommunications System Impact Assessment

Prepared by: GENIVAR Inc

GENIVAR Inc
505 René-Lévesque West, 8th floor
Montreal, Quebec, Canada
H2Z 1Y7

Phone : 418-780-0878
Fax: 418-780-4182
Email: wind@genivar.com
www.genivar.com

PROPOSAL FOR PROFESSIONAL SERVICES

JUNE 2012

APPROVALS

Written by: Barry Turner, Ph.D., ACM, Senior Meteorologist Date: June 7, 2012

Reviewed and Approved by: Alain Charette, Eng. Date: June 7, 2012

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1 TECHNICAL PROPOSAL

1.1 ORGANIZATIONAL CAPABILITIES

Providing engineering services since 1959, GENIVAR is one of North America's leading engineering companies providing both private and public-sector clients with a full range of consulting services throughout the project cycle, from planning and design to construction and maintenance. Our clients operate in various market segments, including the building, industrial, power, urban infrastructure, transportation and environmental sectors.GENIVAR is one of Canada's largest engineering services companies by number of employees, with more than 4,800 managers, professionals, technicians, technologists and support staff in some 80 offices in Canada and abroad (www.genivar.com).

In particular, GENIVAR is one of Canada's largest wind power consulting companies, with over 20 years of experience and over 30 professionals dedicated to the GENIVAR Wind group. We offer independent energy analysis, constraint analysis, electrical system design, civil design, electrical interconnection, environmental permits, financial analysis/pro forma's, contact review including interconnection, turbine supply, construction and O & M and authorization of payment certificates.

GENIVAR's head office is located in Montreal, with various regional offices including one in Dartmouth, Nova Scotia.

The analysis of potential electromagnetic interference is an important part of our constraint analysis for planned wind farms. Some clients only require a mapping of consultation zones and contacting of federal agencies according to guidelines of the Radio Advisory Board of Canada (RABC) and the Canadian Wind Energy Association (CanWEA) [1]. In some cases, GENIVAR also conducted on-site investigations to identify non-registered communication systems, handled follow-up discussions with concerned parties and conducted further propagation analysis. Precise details of studies are generally confidential, but previous electromagnetic interference studies completed by GENIVAR include work for the following companies:

Company	Study Locations
Minas Basin Pulp & Power	Nova-Scotia
Alberta Wind Energy Corp.	Alberta
Algonquin Power	Quebec
EarthFirst Canada Inc.	British Columbia
EDF Energies Nouvelles	Quebec and Ontario
Enbridge	Saskatchewan
ENEL Green Power	Newfoundland and Alberta
Finavera Wind Energy	British Columbia
Gilead Power	Ontario
Nexen Inc.	Alberta
Northland Power	Quebec
Pteragen Canada Inc	Alberta
Shear Wind Inc.	Nova Scotia, Saskatchewan and Alberta
Shell Canada	Alberta
Sky Harvest Windpower Corp.	Saskatchewan
GDF Suez Energy North America	Saskatchewan, Alberta
Suncor Energy	Ontario, Saskatchewan, Alberta

[1] Radio Advisory Board of Canada (RABC) and Canadian Wind Energy Association (CanWEA), *Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems*, *V8.0 (Draft 1)*, 2010.

1.2 TECHNICAL REQUIREMENTS

The study will analyze any potential negative impacts of the planned Canso wind farm with radio communications and radar systems

All registered communication transmissions in Canada are listed in the Technical and Administrative Frequency Lists (TAFL) database of Industry Canada. Processing this data will provide a preliminary inventory of communications activity in and around the project area. Communications will be categorized into their respective type and function, including communication distribution systems, satellite, radar, airport, broadcasting (AM, FM and TV), fixed and base stations (point-to-point and point-to-multipoint), cellular networks and microwave links. Additional information concerning airport and weather radar, and navigational beacons will be used to expand the search for potentially affected services.

Consultation zones will be calculated for each type of communication according to the guidelines of the Radio Advisory Board of Canada (RABC) and the Canadian Wind Energy Association (CanWEA). These guidelines are designed to address potential shadowing, mirror-type reflection, clutter and signal scattering effects. Effects on over-the-air television reception will also be considered.

Various agencies will need to be contacted concerning non-disclosed communication systems and monitoring systems. Responses will be gathered, as they are received, from the Canadian Coast Guard, Department of National Defence (DND), Environment Canada, NAV CANADA, Industry Canada and the Royal Canadian Mounted Police (RCMP). An initial review of any previous correspondence between Nova Scotia Power Incorporated (NSPI) and any of these agencies concerning the Canso Wind Power Project will be made to avoid duplication of efforts or confusion. NSPI will take responsibility for any of these agency consultations that continue beyond GENIVAR's involvement in the project.

An additional on-site survey will be conducted to seek out any additional unregistered communications in the area. Any visible communication systems and antennas will be photographed and posted information concerning equipment owners will be documented. This information will be cross-referenced with previously gathered information to identify any other consultation zones and concerned parties.

A preliminary report will be prepared outlining all these findings. It will include an explanation of the RABC and CanWEA guidelines, a summary of communication and monitoring systems in the area, lists and maps of consultation zones to be considered, names and contact details of stakeholders for each relevant consultation zone and a record of exchanges with the various contacted agencies.

Up to this point in the project, some uncertainty in the planned turbine layout can be accommodated. Layout updates of the preliminary report can be provided, with the analysis and mapping of consultation zones adjusted for changes in turbine type and location within the same project area. If multiple turbine layouts are under consideration at the time of agency contacts, details of the layout with the greatest potential impact will be used. If the final choice of turbine layout is different, some agencies will wish to be informed of the change. If an uncertain turbine layout is changed and finalized during our work on the project, GENIVAR will send the updated information to the concerned agencies.

GENIVAR will then contact stakeholders with consultation zones intersecting the project area and final turbine layout. Any stakeholder concerns will be discussed and documented, with a review of the extent of impact and possible mitigation measures in each case. At this stage, GENIVAR will collaborate with NSPI in exchanges with stakeholders where action may be needed.

A final report will be prepared, expanding on the preliminary report to include any additional responses from agencies, a record of contacts with stakeholders and an evaluation of remaining

issues to be addressed by NSPI. Geographical information associated with communication and monitoring systems, consultation zones and map products in the report will be made available in shapefile format (.shp, .shx, .dbf) and associated files.

1.3 IMPLEMENTATION PLAN

The project implementation will proceed in four principal phases:

1.3.1 PHASE 1: ANALYSIS AND MAPPING OF REGISTERED COMMUNICATIONS

Potential interference with radio communications will be analyzed using data available in the Industry Canada Database (TAFL) including all registered communication transmissions in Canada. Consultation zones are calculated for each type of communication.

Deliverables at the end of Phase 1 will be initial maps of consultation zones and the respective GIS files if requested at this stage.

1.3.2 PHASE 2: AGENCY CONTACTS

GENIVAR will contact various agencies to investigate proprietary communication or monitoring equipment that may not be found in the TAFL database. As they become available, responses from the agencies will be considered.

1.3.3 PHASE 3: ON-SITE REVIEW AND PRELIMINARY REPORT

An on-site review of visible communications systems will be made to identify any additional unregistered communication facilities on or near the Canso project area.

Deliverables at the end of Phase 3 will be a preliminary report to summarize potential interference and consultation zones identified in Phases 1 through Phase 3, details of any correspondence with the agencies contacted in Phase 2, contact information for potential stakeholders, and updated maps and GIS files.

The purpose of this report will be to identify stakeholders with potential interference problems and prepare for detailed correspondences with selected stakeholders for mitigation planning.

1.3.4 PHASE 4: STAKEHOLDER CONSULTATION AND FINAL REPORT

Stakeholders with consultation zones intersecting project lands will be contacted. Where there is actual potential for interference or concerns, mitigation options will be discussed.

Details of these consultations along with any recommendations for mitigation methods or further consultation will be added will be added to produce a final version of the project report.

1.3.5 IMPLEMENTATION TIMELINE

The following implementation timeline assumes a start date on July 9th, immediately after a positive notification from NSPI concerning this proposal.

Phase	Timeline
Phase 1: Analysis and Mapping of Registered Communications	9 Jul 2012 – 20 Jul 2012
Phase 2: Agency Contacts	16 Jul 2012 – 20 Jul 2012
Phase 3: On-Site Review and Preliminary Report	23 Jul 2012 – 10 Aug 2012
Phase 4: Stakeholder Consultation and Final Report	13 Aug 2012 – 31 Aug 2012

1.3.6 KEY PERSONNEL

Barry Turner, Ph.D. ACM (GENIVAR Montreal)

Barry Turner is a Senior Scientist with GENIVAR, with degrees in physics and meteorology. Before entering the wind energy field, Barry was a project manager and business analyst in the software industry. He earned his Ph.D. in Atmospheric and Oceanic Sciences from McGill University in 1999, and was a Research Associate in that department from 2001 for 2007. Back in the private sector since 2007, Barry has applied his scientific knowledge to problems in wind resource assessment and wind farm constraint analysis. He has completed examinations on risk analysis with the Society of Actuaries, and is an Accredited Consulting Meteorologist of the Canadian Meteorological and Oceanographic Society.

Field and Office Personnel **(GENIVAR Dartmouth)**

On-site review and detailed stakeholder discussion will involve personnel from the GENIVAR office in Dartmouth, Nova Scotia. This local content during the project will reduce travel costs, provide a greater understanding of the region and easier communication with stakeholders.

2 PRICE PROPOSAL

2.1 FEES

The Table below outlines GENIVAR's price proposal for this project. Fixed pricing is applied for Phase 1, Phase 2, and the preparation of the preliminary report in Phase 3. The on-site review of Phase 3 and all of Phase 4 will be charged according to time and travel expenses, since it is not possible to fully anticipate the complexity of these requirements.

Phase	Details	Price (CAD)
Phase 1: Analysis and Mapping of Registered Communications	Fixed price	$ 4,500
Phase 2: Agency Contacts	Fixed price	$ 2,000
Phase 3: On-Site Review	Time and Materials	$ 8,000
Phase 3: Preliminary Report	Fixed price ($ 2,500) for Preliminary Report. *Fixed price ($ 1,500) per Turbine Layout Update.*	$ 2,500 + *$ 1,500 per Layout Update (if required)*
Phase 4: Stakeholder Consultation and Final Report	Time and Materials	$ 10,000

2.2 PAYMENT AND WORK EXECUTION TERMS

- Fixed cost activities will be invoiced upon completion; and
- Time and materials activities will be invoiced monthly and according to rates listed in the table of the following page.

Monthly late fees of 1% will be applied to payments that exceed 30 days.

A specific phase will only be executed once we have received the client's written consent to proceed with the work. Also, budgets for Time and Materials tasks will not be exceeded prior to receiving the client's written consent.

Work Classification	*CAD Rate/Hr*
==== FIELD WORK ====	
Senior Field Engineer	$ 170.00
Field Engineer	$ 95.00
Tower Climber	$ 95.00
Senior Foreman	$ 95.00
Foreman	$ 85.00
Instrument Technician	$ 65.00
GENIVAR Assistant	$ 55.00
Meteorological Tower Coordinator	$ 80.00
==== RESOURCE ASSESSMENT ====	
Senior Wind Resource Engineer	$ 170.00
Lead Wind Resource Engineer	$ 120.00
Wind Resource Engineer	$ 95.00
Junior Wind Resource Engineer	$ 75.00
GIS Technician	$ 75.00
==== PROJECT MANAGEMENT ====	
Senior Project Development Manager	$ 195.00
Senior Project Manager	$ 120.00
Lead Project Manager	$ 110.00
Project Manager	$ 95.00
==== SPECIALISTS ====	
Principal Specialist	$ 140.00
Senior Specialist	$ 110.00
Lead Specialist	$ 95.00
Field Specialist	$ 80.00
Specialist	$ 70.00
Junior Specialist	$ 60.00
==== ADMINISTRATION ====	
Senior Administrator	$ 65.00
Administrator	$ 55.00