APPENDIX H
TERRESTRIAL FLORA

Scientific Name	Common Name	S Rank	SARA	ESA	Wetland Indicator Rank	Invasive (Yes/No)
Abies balsamea	Balsam fir	S5			fac	No
Acer pensylvanicum	Striped maple	S5			facu	No
Acer rubrum	Red maple	S5			fac	No
Acer saccharum	Sugar maple	S4S5			facu	No
Actaea rubra	Red baneberry	S5			fac	No
Alnus incana	Speckled alder	S5			facw	No
Amauropelta noveboracensis	New York fern	S5			fac	No
Anaphalis margaritacea	Pearly everlasting	S5			upl	No
Anthoxanthum odoratum	Large sweet vernal grass	SNA			facu	No
Aralia nudicaulis	Wild sarsaparilla	S5			fac	No
Betula alleghaniensis	Yellow birch	S5			fac	No
Betula papyrifera	Paper birch	S5			facu	No
Betula populifolia	Gray birch	S5			fac	No
Cardamine pensylvanica	Pennsylvania bittercress	S5			obl	No
Carex brunnescens	Brownish sedge	S5			fac	No
Carex crinita	Fringed sedge	S5			obl	No
Carex echinata	Star sedge	S5			obl	No
Carex folliculata	Northern long sedge	S5			obl	No
Carex gracillima	Graceful sedge	S5			fac	No
Carex gynandra	Nodding sedge	S5			facw	No
Carex leptalea	Bristly-stalked sedge	S5			facw+	No
Carex novae-angliae	New England sedge	S5			facu	No
Carex stipata	Awl-fruited sedge	S5			obl	No
Carex trisperma	Three-seeded sedge	S5			obl	No
Carex vesicaria	Inflated sedge	S4			obl	No
Centaurea nigra	Black knapweed	SNA			fac	Yes
Chelone glabra	White turtlehead	S5			facw+	No
Chrysosplenium americanum	American golden saxifrage	S5			obl	No
Cicuta maculata	Spotted water-hemlock	S5			obl	No
Claytosmunda claytoniana	Interrupted fern	S5			fac	No
Clintonia borealis	Yellow bluebead lily	S5			fac	No
Convolvulus arvensis	Field bindweed	SNA			upl	Yes
Coptis trifolia	Goldthread	S5			fac	No
Cornus canadensis	Bunchberry	S5			fac	No
Corylus cornuta	Beaked hazelnut	S5			fac	No

Scientific Name	Common Name	S Rank	SARA	ESA	Wetland Indicator Rank	Invasive (Yes/No)
Cypripedium acaule	Pink lady's-slipper	S5			fac	No
Daucus carota	Queen Anne's lace	SNA			facu	No
Dendrolycopodium dendroideum	Round-branched tree-clubmoss	S5			fac	No
Dennstaedtia punctilobula	Eastern hay-scented fern	S5			fac	No
Deparia acrostichoides	Silvery glade fern	S4			fac	No
Doellingeria umbellata	Hairy flat-top white aster	S5			fac	No
Dryopteris campyloptera	Mountain wood fern	S5			fac	No
Dryopteris cristata	Crested wood fern	S5			facw	No
Dryopteris intermedia	Evergreen wood fern	S5			fac	No
Epipactis helleborine	Helleborine	SNA			fac	No
Equisetum arvense	Field horsetail	S5			fac	No
Equisetum sylvaticum	Woodland horsetail	S5			fac	No
Fagus grandifolia	**American beech**	**S3S4**			**upl**	**No**
Fragaria virginiana	Wild strawberry	S5			fac	No
Frangula alnus	Glossy buckthorn	SNA			fac	Yes
Fraxinus americana	White ash	S4			fac	No
Fraxinus nigra	**Black ash**	**S1S2**	**T**	**T**	**facw**	**No**
Galium palustre	Common marsh bedstraw	S5			facw+	No
Glyceria canadensis	Canada manna grass	S5			obl	No
Hieracium maculatum	Spotted hawkweed	SNA				No
Ilex mucronata	Mountain holly	S5			fac	No
Ilex verticillata	Common winterberry	S5			facw+	No
Impatiens capensis	Spotted jewelweed	S5			fac	No
Juncus effusus	Soft rush	S5			facw	No
Lactuca biennis	Tall blue lettuce	S5			facu	No
Leucanthemum vulgare	Oxeye daisy	SNA			fac	No
Linnaea borealis	Twinflower	S5			fac	No
Lonicera canadensis	Canada fly honeysuckle	S5			fac	No
Luzula multiflora	Common woodrush	S5			facu	No
Lycopus uniflorus	Northern water horehound	S5			facw+	No
Lysimachia borealis	Northern starflower	S5			fac	No
Maianthemum canadense	Wild lily-of-the-valley	S5			fac	No
Medeola virginiana	Cucumber root	S5			facu	No
Moneses uniflora	One-flowered wintergreen	S4S5			fac	No

Scientific Name	Common Name	S Rank	SARA	ESA	Wetland Indicator Rank	Invasive (Yes/No)
Nabalus trifoliolatus	Three-leaved rattlesnakeroot	S5			fac	No
Onoclea sensibilis	Sensitive fern	S5			facw	No
Osmundastrum cinnamomeum	Cinnamon fern	S5			fac	No
Ostrya virginiana	Ironwood	S4S5			facu	No
Oxalis montana	Common wood sorrel	S5			fac	No
Oxalis stricta	Common yellow woodsorrel	S5			fac-	No
Phalaris arundinacea	Reed canary grass	S5			facw	Yes
Phegopteris connectilis	Northern beech fern	S5			fac	No
Picea rubens	Red spruce	S5			fac	No
Pilosella aurantiaca	Orange hawkweed	SNA			facu	No
Pinus strobus	Eastern white pine	S5			fac	No
Polystichum acrostichoides	Christmas fern	S5			facu	No
Potentilla simplex	Old field cinquefoil	S5			upl	No
Prunus pensylvanica	Pin cherry	S5			facu	No
Prunus virginiana	Chokecherry	S5			fac	No
Pteridium aquilinum	Bracken fern	S5			facu	No
Ranunculus acris	Common buttercup	SNA			fac	No
Ranunculus repens	Creeping buttercup	SNA			fac	Yes
Ribes lacustre	Bristly black currant	S5			facw	No
Rosa nitida	Shining Rose	S4S5			obl	No
Rosa multiflora	Multiflora Rose	SNA			facu	Yes
Rosa virginiana	Virginia rose	S5			fac	No
Rubus allegheniensis	Alleghaney Blackberry	S5			facu	No
Rubus canadensis	Smooth blackberry	S5			facu	No
Rubus hispidus	Bristly dewberry	S5			facw	No
Rubus idaeus	Red raspberry	S5			fac	No
Rubus pubescens	Dwarf red raspberry	S5			fac	No
Rumex acetosella	Sheep sorrel	SNA			upl	No
Salix bebbiana	Bebb's willow	S5			fac	No
Sambucus racemosa	Red elderberry	S5			facu	No
Scirpus atrocinctus	Black-girdled bulrush	S5			fac	No
Scirpus cyperinus	Common woolly bulrush	S5			facw	No
Scirpus microcarpus	Small-fruited bulrush	S5			obl	No
Scytinium subtile	Appressed jellyskin lichen	S3S4				No
Solidago canadensis	Canada goldenrod	S4S5			fac	No

Scientific Name	Common Name	S Rank	SARA	ESA	Wetland Indicator Rank	Invasive (Yes/No)
Solidago rugosa	Rough-stemmed goldenrod	S5			fac	No
Sonchus arvensis	Field sow thistle	SNA			fac	Yes
Sorbus americana	American mountain ash	S5			fac	No
Spinulum annotinum	Stiff clubmoss	S5			fac	No
Spiraea alba	White meadowsweet	S5			fac	No
Streptopus lanceolatus	Rose twisted-stalk	S5			fac	No
Thelypteris palustris	Eastern marsh fern	S5			obl	No
Trifolium pratense	Red clover	SNA			facu	No
Trillidium undulatum	Painted trillium	S5			fac	No
Tsuga canadensis	Eastern hemlock	S4			facu	No
Tussilago farfara	Colt's foot	SNA			fac	Yes
Typha latifolia	Broad-leaved cattail	S5			obl	No
Veronica officinalis	Common speedwell	SNA			facu	No
Viburnum cassinoides	Northern wild raisin	S5			fac	No
Vicia cracca	Tufted vetch	SNA			fac	No
Viola cucullata	Marsh blue violet	S5			fac	No

Photo 1: Representative photo of VP1.

Photo 2: Representative photo of VP2.

Photo 3: Representative photo of VP3.

Photo 4: Representative photo of VP4.

Photo 5: Representative photo of VP5.

Photo 6: Representative photo of VP6.

Photo 7: Representative photo of VP7.

Photo 8: Representative photo of VP8.

Photo 9: Representative photo of VP9.

Photo 10: Representative photo of VP10.

Photo 11: Representative photo of VP11.

Photo 12: Representative photo of VP12.

Photo 13: Representative photo of VP13.

Photo 14: Representative photo of VP14.

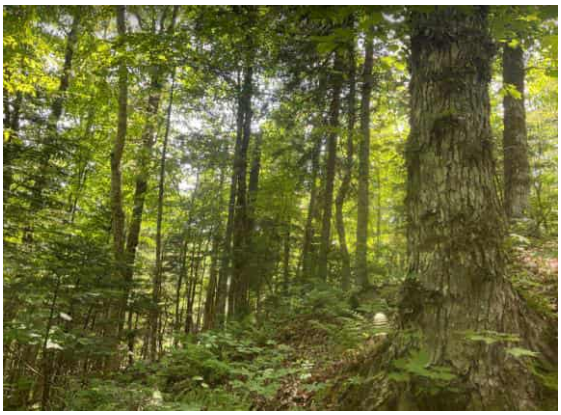

Photo 15: Representative photo of VP15.

APPENDIX I
TERRESTRIAL FAUNA

Photo 1: White-tailed deer (*Odocoileus virginianus*) photographed at 15:26 on August 3, 2025, by trail camera 78 located within the Project Area.

Photo 2: White-tailed deer photographed at 06:55 on August 12, 2025, by trail camera 73 located within the Project Area.

Photo 3: Bobcat (*Lynx rufus*) photographed at 19:20 on May 5, 2025, by trail camera 78 located within the Project Area.

Photo 4: Black bear (*Ursus americanus*) photographed at 19:42 on May 9, 2025, by trail camera 78 located within the Project Area.

APPENDIX J
AVIFAUNA

ATLAS DES OISEAUX NICHEURS DES MARITIMES
BREEDING BIRD ATLAS

Square Summary (20NR13)

#species (1st atlas)				#species (2nd atlas)				#hours		#pc done	
poss	prob	conf	total	poss	prob	conf	total	1st	2nd	road	offrd
1	0	0	1	27	27	39	93	0	85.9	17	0

Region summary (#21: Cobequid)

#squares	#sq with data		#species		#pc done	target #pc
	1st	2nd	1st	2nd		
67	62	65	146	167	508	251

Target number of point counts in this square: 14 road side, 1 off road (1 in Young forest). Please try to ensure that each off-road station is located such that the entire 100m radius circle is within the prescribed habitat.

SPECIES	Code		%		SPECIES	Code		%		SPECIES	Code		%	
	1st	2nd	1st	2nd		1st	2nd	1st	2nd		1st	2nd	1st	2nd
Canada Goose		FY	0	53	Northern Harrier		FY	46	76	North Saw-whet Owl		T	11	36
Wood Duck		H	20	52	Sharp-shinned Hawk			22	38	Common Nighthawk †		H	29	55
Gadwall ‡			0	3	Northern Goshawk			12	20	Chimney Swift †			32	23
Eurasian Wigeon ‡			0	0	Broad-winged Hawk		H	32	55	Ruby-thr Hummingbird		FY	61	100
American Wigeon			12	26	Red-tailed Hawk		P	46	72	Belted Kingfisher		H	51	93
American Black Duck		FY	66	81	Virginia Rail †			6	9	Yellow-bellied Sapsucker		N	50	83
Mallard			9	60	Sora		T	16	52	Downy Woodpecker		H	48	89
Blue-winged Teal			27	26	Common Gallinule †			3	1	Hairy Woodpecker		NY	54	87
Northern Shoveler ‡			3	4	American Coot †			4	0	Am Three-toed Woodpecker †			0	0
Northern Pintail			8	1	Semipalmated Plover †			6	0	Black-back Woodpecker			20	26
Green-winged Teal		H	24	56	Piping Plover †			3	3	Northern Flicker		AE	80	98
Ring-necked Duck		P	32	72	Killdeer		T	56	64	Pileated Woodpecker		H	45	80
Greater Scaup †			0	0	Spotted Sandpiper		P	50	70	American Kestrel		FY	50	75
Common Eider ‡§			0	1	Greater Yellowlegs †			0	3	Merlin			16	47
Hooded Merganser		FY	9	50	Willet			14	24	Olive-sided Flycatcher †		S	38	66
Common Merganser			25	55	Wilson's Snipe		S	62	73	Eastern Wood-Pewee		S	56	70
Red-breast Merganser			4	7	American Woodcock		S	22	81	Yellow-bellied Flycatcher		S	30	56
Gray Partridge			6	4	Ring-billed Gull ‡§			0	0	Alder Flycatcher		S	79	100
Ring-necked Pheasant		S	20	69	Herring Gull §			8	10	Willow Flycatcher †			1	1
Ruffed Grouse		FY	58	86	Great Black-backed Gull §			8	6	Least Flycatcher		S	59	84
Spruce Grouse			20	30	Common Tern §			9	12	Eastern Phoebe		NB	12	58
Common Loon			29	35	Arctic Tern ‡§			1	0	Gr Crested Flycatcher			6	4
Pied-billed Grebe		NE	24	30	Black Guillemot ‡§			0	3	Eastern Kingbird			45	47
Double-crest Cormorant §			8	12	Rock Pigeon		AE	59	78	Blue-headed Vireo		NB	61	92
American Bittern		D	22	55	Mourning Dove		P	27	95	Philadelphia Vireo ‡			1	3
Great Blue Heron §			29	13	Black-billed Cuckoo			9	26	Red-eyed Vireo		CF	82	100
Turkey Vulture ‡¤			0	0	Great Horned Owl	H	P	40	63	Gray Jay			45	58
Osprey			22	50	Barred Owl		D	35	69	Blue Jay		FY	70	96
Bald Eagle ¤			27	83	Short-eared Owl †			1	1	American Crow		AE	87	100

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ATLAS DES OISEAUX NICHEURS DES MARITIMES
BREEDING BIRD ATLAS

Square Summary (20NR23)

#species (1st atlas)				#species (2nd atlas)				#hours		#pc done	
poss	prob	conf	total	poss	prob	conf	total	1st	2nd	road	offrd
9	26	74	109	26	38	38	102	61	20.5	16	0

Region summary (#21: Cobequid)

#squares	#sq with data		#species		#pc done	target #pc
	1st	2nd	1st	2nd		
67	62	65	146	167	508	251

Target number of point counts in this square: 13 road side, 2 off road (1 in Mature coniferous, 1 in Young forest). Please try to ensure that each off-road station is located such that the entire 100m radius circle is within the prescribed habitat.

SPECIES	Code		%		SPECIES	Code		%		SPECIES	Code		%	
	1st	2nd	1st	2nd		1st	2nd	1st	2nd		1st	2nd	1st	2nd
Canada Goose		FY	0	53	Northern Harrier	NY	CF	46	76	North Saw-whet Owl	NY	FY	11	36
Wood Duck	NE	FY	20	52	Sharp-shinned Hawk	H	T	22	38	Common Nighthawk †	NE	P	29	55
Gadwall ‡			0	3	Northern Goshawk	H		12	20	Chimney Swift †	C	T	32	23
Eurasian Wigeon ‡			0	0	Broad-winged Hawk	ON	H	32	55	Ruby-thr Hummingbird	ON	T	61	100
American Wigeon			12	26	Red-tailed Hawk	P	CF	46	72	Belted Kingfisher	P	P	51	93
American Black Duck	FL	FY	66	81	Virginia Rail †			6	9	Yellow-bellied Sapsucker	FL	T	50	83
Mallard		P	9	60	Sora	H	S	16	52	Downy Woodpecker	ON	P	48	89
Blue-winged Teal			27	26	Common Gallinule †			3	1	Hairy Woodpecker	AY	FY	54	87
Northern Shoveler ‡			3	4	American Coot †			4	0	Am Three-toed Woodpecker †			0	0
Northern Pintail			8	1	Semipalmated Plover †			6	0	Black-back Woodpecker	P		20	26
Green-winged Teal		FY	24	56	Piping Plover †			3	3	Northern Flicker	NY	T	80	98
Ring-necked Duck	FL	P	32	72	Killdeer	NE		56	64	Pileated Woodpecker	T	T	45	80
Greater Scaup †			0	0	Spotted Sandpiper	NE	NE	50	70	American Kestrel	ON	NE	50	75
Common Eider ‡§			0	1	Greater Yellowlegs †			0	3	Merlin		H	16	47
Hooded Merganser		FY	9	50	Willet			14	24	Olive-sided Flycatcher †	T	S	38	66
Common Merganser	NE	P	25	55	Wilson's Snipe	NE	D	62	73	Eastern Wood-Pewee	T	S	56	70
Red-breast Merganser			4	7	American Woodcock	NE	D	22	81	Yellow-bellied Flycatcher	T	S	30	56
Gray Partridge			6	4	Ring-billed Gull ‡§			0	0	Alder Flycatcher	NE	NE	79	100
Ring-necked Pheasant			20	69	Herring Gull §			8	10	Willow Flycatcher †			1	1
Ruffed Grouse	NE	NE	58	86	Great Black-backed Gull §			8	6	Least Flycatcher	ON	T	59	84
Spruce Grouse			20	30	Common Tern §			9	12	Eastern Phoebe	H	NB	12	58
Common Loon	NE	FY	29	35	Arctic Tern ‡§			1	0	Gr Crested Flycatcher			6	4
Pied-billed Grebe	FL	FY	24	30	Black Guillemot ‡§			0	3	Eastern Kingbird	AY	H	45	47
Double-crest Cormorant §			8	12	Rock Pigeon	NE	AE	59	78	Blue-headed Vireo	NY	FY	61	92
American Bittern	P	S	22	55	Mourning Dove		NB	27	95	Philadelphia Vireo ‡			1	3
Great Blue Heron §			29	13	Black-billed Cuckoo	NY	S	9	26	Red-eyed Vireo	NE	NB	82	100
Turkey Vulture ‡¤			0	0	Great Horned Owl	ON	AE	40	63	Gray Jay	P		45	58
Osprey	ON		22	50	Barred Owl	NE	T	35	69	Blue Jay	NE	FY	70	96
Bald Eagle ¤		H	27	83	Short-eared Owl †			1	1	American Crow	FL	T	87	100

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Table 1: 2025 Habitat Descriptions - Fast Acting Natural Gas Power Generation Facility - Marshdale *Project # 25-12222*

Survey Location	Habitat Description	Habitat Type
PC1	Edge of forest and a disturbed area and clear-cut. Mixedwood forest. Mixed ages. Shrubby, thick regeneration in old clear-cut area. More clear-cuts and areas with blowdown in vicinity. Other patches of forest nearby.	Disturbed/cleared area
PC2	Forest edge near fresh clear-cut. PC in forest near edge. Mixedwood, older forest. Close to riparian area.	Edge habitat
PC3	Undisturbed forest with some blowdown in area in spots. Older forest, mixedwood with some softwood dominant pathches throughout.	Mixedwood forest
PC4	Older forest, mixedwood and slightly more softwood dominant. Hardwood dominant patches nearby. PC is near older clear-cut activity and thick, shrubby regeneration. Potential old growth trees.	Softwood forest
Breeding Bird Area Search 1	Main area of mixedwood treed swamp with understory dominated by cattail and other graminoids. Mainly ferns in other areas of wetland. Mixed-aged mixedwood forest with dense understory, hardwood young harvest regeneration, and mature mixedwood wetland in basin.	Wetland (swamp) and mixedwood forest
Breeding Bird Area Search 2	Area search started near PC4 as mixed-aged mixedwood forest. Canopy consisted of mature A. rubrum (red maple), B. allegheniensis (yellow birch), A. balsamea (Balsam fir), and P. rubens (red spruce); shrub layer sparse to abscent and mostly made up of saplings; herbaceous layer lush and dense. Occasional wet areas and small wetlands with thick A. incana growth. Meandering ravine near south border of Study Area with sections of windthrow and softwood regeneration. Some very small watercourses (< 1 m wetted bank width) leading into ravine. Softwood regeneration becomes dominant forest ecosystem as one approaches the viscinity of PC3.	Mixedwood forest
NJ1	On entrance road/ATV trail surrounded by mixedwood forest. Very shrubby, forest of mixed-ages.	Mixedwood forest
NJ2	On gravel road bordered on both sides by agricultural fields. Some rural properties about 200 m away.	Disturbed/cleared area

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Observer	Date	Survey Type	Survey Location Number (PC, DWC, etc.)	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in/near Wetland?	Inc.	Fly-by	Fly-over Height (m)	Flight Direction	Behaviour or Comments?
												<50 m	50 - 100 m	100 m +							
JL	2025-04-11	PC	PC1	7:00:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	3		x										
JL	2025-04-11	PC	PC1	7:00:00 AM	10	AMRO	American Robin	*Turdus migratorius*	4		x										
JL	2025-04-11	PC	PC1	7:00:00 AM	10	NOFL	Northern Flicker	*Colaptes auratus*	2		x										
JL	2025-04-11	PC	PC1	7:00:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	3		x										
JL	2025-04-11	PC	PC1	7:00:00 AM	10	RBNU	Red-breasted Nuthatch	*Sitta canadensis*	1		x										
JL	2025-04-11	PC	PC1	7:00:00 AM	10	CORA	Common Raven	*Corvus corax*	1		x			x							
JL	2025-04-11	PC	PC1	7:00:00 AM	10	DEJU	Dark-eyed Junco	*Junco hyemalis*	3		x										
JL	2025-04-11	PC	PC1	7:00:00 AM	10	COGR	Common Grackle	*Quiscalus quiscula*	1		x										
JL	2025-04-11	PC	PC1	7:00:00 AM	10	PAWA	Palm Warbler	*Setophaga palmarum*	1		x	x									
JL	2025-04-11	PC	PC1	7:00:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	1		x										
JL	2025-04-11	PC	PC1	7:00:00 AM	10	SOSP	Song Sparrow	*Melospiza melodia*	1		x										
JL	2025-04-11	PC	PC2		10	DEJU	Dark-eyed Junco	*Junco hyemalis*	1		x										
JL	2025-04-11	PC	PC2		10	AMCR	American Crow	*Corvus brachyrhynchos*	3		x	x	x	x							
JL	2025-04-11	PC	PC2		10	CORA	Common Raven	*Corvus corax*	1		x										
JL	2025-04-11	PC	PC2		10	BLJA	Blue Jay	*Cyanocitta cristata*	2		x										
JL	2025-04-11	PC	PC2		10	RUGR	Ruffed Grouse	*Bonasa umbellus*	1		x										
JL	2025-04-11	PC	PC2		10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	1		x										
JL	2025-04-11	PC	PC2		10	AMRO	American Robin	*Turdus migratorius*	3	x	x										
JL	2025-04-11	PC	PC2		10	CAGO	Canada Goose	*Branta canadensis*	2		x			x							
JL	2025-04-11	PC	PC2		10	BRCR	Brown Creeper	*Certhia americana*	1		x										
JL	2025-04-11	PC	PC2		10	AGOL	American Goldfinch	*Spinus tristis*	1		x										
JL	2025-04-11	PC	PC3		10	BRCR	Brown Creeper	*Certhia americana*	2		x										
JL	2025-04-11	PC	PC3		10	AMRO	American Robin	*Turdus migratorius*	2		x										
JL	2025-04-11	PC	PC3		10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	4		x										
JL	2025-04-11	PC	PC3		10	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	2	x	x										
JL	2025-04-11	PC	PC3		10	NOFL	Northern Flicker	*Colaptes auratus*	1		x										
JL	2025-04-11	PC	PC3		10	YBSA	Yellow-bellied Sapsucker	*Sphyrapicus varius*	1	x	x	x									Lots of activity and foraging evidence on trees around this survey location for YBSA.
JL	2025-04-11	PC	PC3		10	BLJA	Blue Jay	*Cyanocitta cristata*	3		x			x							
JL	2025-04-11	PC	PC3		10	RUGR	Ruffed Grouse	*Bonasa umbellus*	1		x										
JL	2025-04-11	PC	PC3		10	HAWO	Hairy Woodpecker	*Dryobates villosus*	1	x	x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	CORA	Common Raven	*Corvus corax*	2		x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	BRCR	Brown Creeper	*Certhia americana*	2		x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	DOWO	Downy Woodpecker	*Picoides pubescens*	1	x		x									
JL	2025-04-11	PC	PC4	10:15:00 AM	10	RBNU	Red-breasted Nuthatch	*Sitta canadensis*	3		x	x		x							
JL	2025-04-11	PC	PC4	10:15:00 AM	10	PAWA	Palm Warbler	*Setophaga palmarum*	2	x	x	x	x								
JL	2025-04-11	PC	PC4	10:15:00 AM	10	DEJU	Dark-eyed Junco	*Junco hyemalis*	3	x	x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	SOSP	Song Sparrow	*Melospiza melodia*	3	x	x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	AGOL	American Goldfinch	*Spinus tristis*	3		x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	PUFI	Purple Finch	*Haemorhous purpureus*	1	x	x	x									
JL	2025-04-11	PC	PC4	10:15:00 AM	10	AMRO	American Robin	*Turdus migratorius*	4	x	x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	8	x	x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	3		x										
JL	2025-04-11	PC	PC4	10:15:00 AM	10	MODO	Mourning Dove	*Zenaida macroura*	1		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	RUGR	Ruffed Grouse	*Bonasa umbellus*	3	x	x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	BLJA	Blue Jay	*Cyanocitta cristata*	8	x	x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	5	x	x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	BCCH	Black-capped Chickadee	*Poecile atricapillus*	11	x	x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	AMRO	American Robin	*Turdus migratorius*	14	x	x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	COGR	Common Grackle	*Quiscalus quiscula*	3		x								x		
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	AGOL	American Goldfinch	*Spinus tristis*	3		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	AMCR	American Crow	*Corvus brachyrhynchos*	2	x	x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	EUST	European Starling	*Sturnus vulgaris*	2		x								x		
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	RBNU	Red-breasted Nuthatch	*Sitta canadensis*	1		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	DEJU	Dark-eyed Junco	*Junco hyemalis*	4		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	SOSP	Song Sparrow	*Melospiza melodia*	1		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	UNKNOWN WOODPECKER	#N/A	#N/A	1		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	BRCR	Brown Creeper	*Certhia americana*	2		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	NOFL	Northern Flicker	*Colaptes auratus*	1		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	MODO	Mourning Dove	*Zenaida macroura*	1		x										
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	BAEA	Bald Eagle	*Haliaeetus leucocephalus*	1	x				x					x		
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	BARO	Barred Owl	*Strix varia*	1		x			x							
JL	2025-04-11	SM1	Incidentals	7:00:00 AM	240	PIGR	Pine Grosbeak	*Pinicola enucleator*	1	x											
RM	2025-05-14	PC	PC1	8:43:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	1		X		1		W						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	BHVI	Blue-headed Vireo	*Vireo solitarius*	1		X	1			Ne						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X	1			Ne						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	2	X	X	2			S						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	DEJU	Dark-eyed Junco	*Junco hyemalis*	1		X	1			Ne						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	4	X	X	2	2		E						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	RUGR	Ruffed Grouse	*Bonasa umbellus*	2		X		1		W						Drumming
RM	2025-05-14	PC	PC1	8:43:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	1		X			1	W						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	NOWA	Northern Waterthrush	*Parkesia noveboracensis*	1		X		1		W						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	2		X	2			N						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	AMRO	American Robin	*Turdus migratorius*	1		X		1		S						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	AGOL	American Goldfinch	*Spinus tristis*	2		X	2			N						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	BRCR	Brown Creeper	*Certhia americana*	1		X	1			E						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1	X		1			Sw						
RM	2025-05-14	PC	PC1	8:43:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	1		X	1			Ne						
RM	2025-05-14	PC	PC2	9:01:00 AM	10	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	2		X	2			W						
RM	2025-05-14	PC	PC2	9:01:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	2	X	X	2			Nw						
RM	2025-05-14	PC	PC2	9:01:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	2		X	1	1		S						
RM	2025-05-14	PC	PC2	9:01:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	2		X		2		E						
RM	2025-05-14	PC	PC2	9:01:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1		X			1	E						

Observer	Date	Survey Type	Survey Location Number (PC, DWC, etc.)	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in/near Wetland?	Inc.	Fly-by	Fly-over Height (m)	Flight Direction	Behaviour or Comments?
												<50 m	50 - 100 m	100 m +							
RM	2025-05-14	PC	PC2	9:01:00 AM	10	AGOL	American Goldfinch	*Spinus tristis*	1	X	X	1			W			1	0-50	Nw	
RM	2025-05-14	PC	PC2	9:01:00 AM	10	PUFI	Purple Finch	*Haemorhous purpureus*	1		X	1			S						
RM	2025-05-14	PC	PC2	9:01:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X	1			N						
RM	2025-05-14	PC	PC2	9:01:00 AM	10	BRCR	Brown Creeper	*Certhia americana*	1		X	1			S						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	1		X		1		S						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	3		X	1	2		E						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	1		X		1		E						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	2		X	2			W						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	1		X		1		Nw						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	MAWA	Magnolia Warbler	*Setophaga magnolia*	1		X	1			Sw						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X	1			Sw						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1	X		1			S						
RM	2025-05-14	PC	PC3	9:25:00 AM	10	CAGO	Canada Goose	*Branta canadensis*	5		X			5	W			5	Unknown	Unknown	Couldn't see them through trees, 5 is an estimate
RM	2025-05-14	PC	PC3	9:25:00 AM	10	BHVI	Blue-headed Vireo	*Vireo solitarius*	1		X	1			Ne						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	BHVI	Blue-headed Vireo	*Vireo solitarius*	3	X	X	3			Se						Pair observed
RM	2025-05-14	PC	PC4	9:55:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	2		X	2			Se						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	CORA	Common Raven	*Corvus corax*	1		X		1		N						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	AGOL	American Goldfinch	*Spinus tristis*	3	X	X	3			Se						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	2		X	2			S						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X	1			Sw						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	1		X		1		W						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	1		X	1			W						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	1		X	1			W						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	MAWA	Magnolia Warbler	*Setophaga magnolia*	1		X	1			E						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1	X		1			E						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	NOFL	Northern Flicker	*Colaptes auratus*	1		X		1		Se						
RM	2025-05-14	PC	PC4	9:55:00 AM	10	DEJU	Dark-eyed Junco	*Junco hyemalis*	1		X	1			E						

Common name	Scientific Name	SARA	COSEWIC	ESA	NS S-rank	Number Observed
American Crow	*Corvus brachyrhynchos*	Not Listed	Not Listed	Not Listed	S5	8
American Goldfinch	*Spinus tristis*	Not Listed	Not Listed	Not Listed	S5	13
American Robin	*Turdus migratorius*	Not Listed	Not Listed	Not Listed	S5B,S3N	28
Bald Eagle	*Haliaeetus leucocephalus*	Not Listed	Not at Risk	Not Listed	S5	1
Barred Owl	*Strix varia*	Not Listed	Not Listed	Not Listed	S5	1
Black-and-white Warbler	*Mniotilta varia*	Not Listed	Not Listed	Not Listed	S5B	4
Black-capped Chickadee	*Poecile atricapilla*	Not Listed	Not Listed	Not Listed	S5	29
Black-throated Green Warbler	*Setophaga virens*	Not Listed	Not Listed	Not Listed	S5B	5
Blue Jay	*Cyanocitta cristata*	Not Listed	Not Listed	Not Listed	S5	19
Blue-headed Vireo	*Vireo solitarius*	Not Listed	Not Listed	Not Listed	S5B	5
Brown Creeper	*Certhia americana*	Not Listed	Not Listed	Not Listed	S5	9
Canada Goose	*Branta canadensis*	Not Listed	Not Listed	Not Listed	SUB,S4N,S5M	7
Common Grackle	*Quiscalus quiscula*	Not Listed	Not Listed	Not Listed	S5B	4
Common Raven	*Corvus corax*	Not Listed	Not Listed	Not Listed	S5	5
Dark-eyed Junco	*Junco hyemalis*	Not Listed	Not Listed	Not Listed	S4S5	13
Downy Woodpecker	*Dryobates pubescens*	Not Listed	Not Listed	Not Listed	S5	1
European Starling	*Sturnus vulgaris*	Not Listed	Not Listed	Not Listed	SNA	2
Golden-crowned Kinglet	*Regulus satrapa*	Not Listed	Not Listed	Not Listed	S5	12
Hairy Woodpecker	*Dryobates villosus*	Not Listed	Not Listed	Not Listed	S5	1
Hermit Thrush	*Catharus guttatus*	Not Listed	Not Listed	Not Listed	S5B	4
Magnolia Warbler	*Setophaga magnolia*	Not Listed	Not Listed	Not Listed	S5B	2
Mourning Dove	*Zenaida macroura*	Not Listed	Not Listed	Not Listed	S5	2
Northern Flicker	*Colaptes auratus*	Not Listed	Not Listed	Not Listed	S5B	5
Northern Parula	*Setophaga americana*	Not Listed	Not Listed	Not Listed	S5B	5
Northern Waterthrush	*Parkesia noveboracensis*	Not Listed	Not Listed	Not Listed	S4B,S5M	1
Ovenbird	*Seiurus aurocapilla*	Not Listed	Not Listed	Not Listed	S5B	7
Palm Warbler	*Setophaga palmarum*	Not Listed	Not Listed	Not Listed	S5B	3
Pine Grosbeak	*Pinicola enucleator*	Not Listed	Not Listed	Not Listed	S3B,S5N,S5M	1
Purple Finch	*Haemorhous purpureus*	Not Listed	Not Listed	Not Listed	S4S5B,S3S4N,S5M	2
Red-breasted Nuthatch	*Sitta canadensis*	Not Listed	Not Listed	Not Listed	S4S5	5
Ruffed Grouse	*Bonasa umbellus*	Not Listed	Not Listed	Not Listed	S5	7
Song Sparrow	*Melospiza melodia*	Not Listed	Not Listed	Not Listed	S5B	5
Unknown Woodpecker	*N/A*	N/A	N/A	N/A	N/A	1
White-throated Sparrow	*Zonotrichia albicollis*	Not Listed	Not Listed	Not Listed	S4S5B,S5M	8
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Not Listed	Not Listed	Not Listed	S5B	1

Observer	Date	Survey Type	Survey Location Number (PC, DWC, etc.)	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in/near Wetland?	Inc.	Fly-by	Fly-over Height (m)	Flight Direction	Behaviour or Comments?
												<50 m	50 - 100 m	100 m +							
BF	2025-06-06	PC	PC1	6:35:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		X	X			NW						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X		X		S						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	2		X	X			W						
BF	2025-06-06	PC	PC1	6:35:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	1		X	X			SW						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	3		X	X			N, NE						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	MODO	Mourning Dove	*Zenaida macroura*	1		X			X	NW						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	MAWA	Magnolia Warbler	*Setophaga magnolia*	1		X	X			N						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	AMRO	American Robin	*Turdus migratorius*	1		X		X		N						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	1		X	X		X	NW						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	1		X	X			S						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	AMRE	American Redstart	*Setophaga ruticilla*	1		X	X			S						MBBA (S)
BF	2025-06-06	PC	PC1	6:35:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1		X		X		S						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	CMWA	Cape May Warbler	*Setophaga tigrina*	1		X	X			W						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	BLBW	Blackburnian Warbler	*Setophaga fusca*	1		X	X			SW						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	ALFL	Alder Flycatcher	*Empidonax alnorum*	1		X		X		N						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	1		X		X		N						Calls/flight calls
BF	2025-06-06	PC	PC2	6:54:00 AM	10	MODO	Mourning Dove	*Zenaida macroura*	1		X			X	NW						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		X	X			N						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	1		X		X		N						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	1		X	X			N						Alarm calls
BF	2025-06-06	PC	PC2	6:54:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	1		X	X			W						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	1		X	X			E						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	AMRO	American Robin	*Turdus migratorius*	1		X		X		N						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	BRCR	Brown Creeper	*Certhia americana*	1		X		X		SE						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	COYE	Common Yellowthroat	*Geothlypis trichas*	1		X		X		NE						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	MAWA	Magnolia Warbler	*Setophaga magnolia*	1		X	X			NE						MBBA (S)
BF	2025-06-06	PC	PC2	6:54:00 AM	10	CSWA	Chestnut-sided Warbler	*Setophaga pensylvanica*	1		X	X			NE						MBBA (S)
BF	2025-06-06	PC	45.26.592'N 62.44.601'W	8:10:00 AM	Incidental	CAWA	Canada Warbler	*Cardellina canadensis*	1		X	X			W	X	X				MBBA (S): Song heard from mixedwood treed swamp with an understory dominated by cattail and other graminoids/ferns.
BF	2025-06-06	PC	PC4	8:18:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X	X			SW						MBBA (S)
BF	2025-06-06	PC	PC4	8:18:00 AM	10	SWTH	Swainson's Thrush	*Catharus ustulatus*	1		X	X			NW						MBBA (S)
BF	2025-06-06	PC	PC4	8:18:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1		X	X			N						MBBA (S)
BF	2025-06-06	PC	PC4	8:18:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		X		X		S						MBBA (S)
BF	2025-06-06	PC	PC4	8:18:00 AM	10	YBFL	Yellow-bellied Flycatcher	*Empidonax flaviventris*	1		X		X		SW						MBBA (S)
BF	2025-06-06	PC	PC4	8:18:00 AM	10	AMRO	American Robin	*Turdus migratorius*	1		X		X		SW						Calls/flight calls
BF	2025-06-06	PC	PC4	8:18:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	1		X		X		S						MBBA (S)
BF	2025-06-06	PC	PC4	8:18:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	1		X		X		NE						MBBA (S)
BF	2025-06-06	PC	PC3	8:40:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	1		X	X			S						MBBA (S)
BF	2025-06-06	PC	PC3	8:40:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	2		X	X			SE						MBBA (S)
BF	2025-06-06	PC	PC3	8:40:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	1		X	X			N						Calls/flight calls
BF	2025-06-06	PC	PC3	8:40:00 AM	10	MAWA	Magnolia Warbler	*Setophaga magnolia*	2		X	X			SW						MBBA (S)
BF	2025-06-06	PC	PC3	8:40:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X	X			W						MBBA (S)
BF	2025-06-06	PC	PC3	8:40:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		X	X			SW						MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	BTNW	Black-throated Green Warbler	*Setophaga virens*	9		X					1					MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	4		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	MAWA	Magnolia Warbler	*Setophaga magnolia*	3		X					1					MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	BRCR	Brown Creeper	*Certhia americana*	1		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	AMRO	American Robin	*Turdus migratorius*	5		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	NOFL	Northern Flicker	*Colaptes auratus*	1		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	BAWW	Black-and-white Warbler	*Mniotilta varia*	3		X					1					MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	REVI	Red-eyed Vireo	*Vireo olivaceus*	6	2	X					3					MBBA (S)(4), MBBA (P) one pair observed in suitable habitat.
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	OVEN	Ovenbird	*Seiurus aurocapilla*	6		X					1					MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	NOPA	Northern Parula	*Setophaga americana*	5		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	1		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	CEDW	Cedar Waxwing	*Bombycilla cedrorum*	6	4	X					2					MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	SWTH	Swainson's Thrush	*Catharus ustulatus*	1		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	HETH	Hermit Thrush	*Catharus guttatus*	2		X					1					MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	ALFL	Alder Flycatcher	*Empidonax alnorum*	2		X					X					MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	COYE	Common Yellowthroat	*Geothlypis trichas*	1		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	AGOL	American Goldfinch	*Spinus tristis*	3		X										Flight call
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	BCCH	Black-capped Chickadee	*Poecile atricapillus*	3		X										Alarm call
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	SWTH	Swainson's Thrush	*Catharus ustulatus*	1		X										MBBA (S)
BF	2025-06-06	BBS Area Search	Area Search 1	8:52:00 AM	90	SWSP	Swamp Sparrow	*Melospiza georgiana*	1		X					X					MBBA (S)
SC	2025-07-03	PC	PC1	5:24:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	2		X			2	NW, SE						
SC	2025-07-03	PC	PC1	5:24:00 AM	10	VEER	Veery	*Catharus fuscescens*	1		X			1	N						
SC	2025-07-03	PC	PC1	5:24:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	2		X		1	1	N, SW						
SC	2025-07-03	PC	PC1	5:24:00 AM	10	MODO	Mourning Dove	*Zenaida macroura*	1		X		1		W						

Observer	Date	Survey Type	Survey Location Number (PC, DWC, etc.)	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in/near Wetland?	Inc.	Fly-by	Fly-over Height (m)	Flight Direction	Behaviour or Comments?
												<50 m	50 - 100 m	100 m +							
SC	2025-07-03	PC	PC1	5:24:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	3		X	1	2		NW, N, W						
SC	2025-07-03	PC	PC1	5:24:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	3		X	2		1	S, W, N						
SC	2025-07-03	PC	PC1	5:24:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	2		X		2		SW, N						
SC	2025-07-03	PC	PC1	5:24:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	2		X			2	NW, SE						
SC	2025-07-03	PC	PC1	5:24:00 AM	10	CAWA	Canada Warbler	*Cardellina canadensis*	1		X		1		N	Y					One individual singing repeatedly for about 3 minutes. Flew deeper into wetland surrounding the PC and then stopped singing. See Survey123 for audio recording and spectogram.
SC	2025-07-03	PC	PC1	5:24:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X		1		NE						
SC	2025-07-03	PC	PC1	5:24:00 AM	10	AMRE	American Redstart	*Setophaga ruticilla*	1		X	1			SE						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	1		X			1	S						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	BHVI	Blue-headed Vireo	*Vireo solitarius*	2		X	1		1	S, W						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	2		X			2	SW, SE						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	1		X			1	W						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	2		X			2	W, NW						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	RBNU	Red-breasted Nuthatch	*Sitta canadensis*	1		X		1		SW						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	AMRO	American Robin	*Turdus migratorius*	3		X		3		SW, W, S						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	2		X	1	1		SW, SE						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	CHSP	Chipping Sparrow	*Spizella passerina*	1		X		1		SE						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	1		X	1			SE						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	COYE	Common Yellowthroat	*Geothlypis trichas*	1		X	1			NE						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	1		X	1			NW						
SC	2025-07-03	PC	PC2	5:48:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	2	X	X						X				Performing DD through loud chirping and hopping in low canopy branches near surveyor. Tan-stripe and white-stripe morph spotted together, so likely an active breeding pair.
SC	2025-07-03	PC	PC3	6:17:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	2		X			2	NW, SE						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	NOFL	Northern Flicker	*Colaptes auratus*	1		X			1	E						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	AMRO	American Robin	*Turdus migratorius*	2		X			2	S, NE						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	1		X			1	SW						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	BHVI	Blue-headed Vireo	*Vireo solitarius*	1		X			1	SW						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	MODO	Mourning Dove	*Zenaida macroura*	1		X			1	SW						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	2		X		1	1	W, S						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	2		X		2		SE, SW						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	2		X		2		SE, NW						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	SWTH	Swainson's Thrush	*Catharus ustulatus*	1		X			1	S						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	EAWP	Eastern Wood-Pewee	*Contopus virens*	1		X			1	NE	X	X				Originally heard and reported as incidental while travelling through wetland between PCs 2 and 3. Recording in incidental avifauna form to provide geolocation of wetland where first detected. Believed to be the same individual moving around site.
SC	2025-07-03	PC	PC3	6:17:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	1	X	X	1			W						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	1						NW						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	COYE	Common Yellowthroat	*Geothlypis trichas*	1		X	1			SE						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X	1			S						
SC	2025-07-03	PC	PC3	6:17:00 AM	10	BLBW	Blackburnian Warbler	*Setophaga fusca*	1		X						X				
SC	2025-07-03	PC	PC3	6:17:00 AM	10	CEDW	Cedar Waxwing	*Bombycilla cedrorum*	2		X							X	50	SW	
SC	2025-07-03	PC	PC4	6:48:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	1		X			1	E						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	PIWO	Pileated Woodpecker	*Dryocopus pileatus*	1		X			1	E						Drumming on tree, so potential foraging or breeding behaviour as drumming is used to defend territory and excavate nest.
SC	2025-07-03	PC	PC4	6:48:00 AM	10	LEFL	Least Flycatcher	*Empidonax minimus*	1		X		1		E						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	EAWP	Eastern Wood-Pewee	*Contopus virens*	1		X			1	SW						Likely same individual that was heard incidentally and at PC3.
SC	2025-07-03	PC	PC4	6:48:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	2		X	1	1		W, NE						

Observer	Date	Survey Type	Survey Location Number (PC, DWC, etc.)	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in/near Wetland?	Inc.	Fly-by	Fly-over Height (m)	Flight Direction	Behaviour or Comments?
												<50 m	50 - 100 m	100 m +							
SC	2025-07-03	PC	PC4	6:48:00 AM	10	AMRO	American Robin	*Turdus migratorius*	3		X		3		E, SE, N						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1		X		1		S						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X		1		SW						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	BHVI	Blue-headed Vireo	*Vireo solitarius*	1		X		1		SW						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	2		X	1	1		W						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	2		X		1		N, NW						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	BRCR	Brown Creeper	*Certhia americana*	1		X		1		N						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	CEDW	Cedar Waxwing	*Bombycilla cedrorum*	1		X	1			E						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	BLBW	Blackburnian Warbler	*Setophaga fusca*	1	X	X	1			E						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		X	1			NW						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	1		X	1			W						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	COYE	Common Yellowthroat	*Geothlypis trichas*	1		X	1			W						
SC	2025-07-03	PC	PC4	6:48:00 AM	10	AGOL	American Goldfinch	*Spinus tristis*	1		X							X	50	NW	
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	AGOL	American Goldfinch	*Spinus tristis*	5		X							X	50	SE	Heard arriving as flock. Some members of flock sounded like they stopped to perch and sing briefly before continueing on. Both flight song and perched song heard.
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	AMRO	American Robin	*Turdus migratorius*	2	X	X	2			N						DD. Highly aggravated pair making alarm call and calling at observers. Responded aggressively to pishing.
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	CORA	Common Raven	*Corvus corax*	1		X			1	E						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	REVI	Red-eyed Vireo	*Vireo olivaceus*	2	X	X	2			W						DD. Aggravated pair flitting around observers and calling.
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	WIWR	Winter Wren	*Troglodytes hiemalis*	3		x	1	1	1	S, NE						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	AMRE	American Redstart	*Setophaga ruticilla*	1	X		1			W						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	NOPA	Northern Parula	*Setophaga americana*	2	X			2		SW						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	BTNW	Black-throated Green Warbler	*Setophaga virens*	2		X	1	1		SW						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	HETH	Hermit Thrush	*Catharus guttatus*	4		X	1	1	2	N, E, S						One FY flushed while hiking.
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	BHVI	Blue-headed Vireo	*Vireo solitarius*	2		X		2		S, SW						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	LEFL	Least Flycatcher	*Empidonax minimus*	1	X	X	1			S						Calling incessantly.
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	AMCR	American Crow	*Corvus brachyrhynchos*	2		X			2	E						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	OVEN	Ovenbird	*Seiurus aurocapilla*	5		X	1		4	W, S, E						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	2		X	1	1		S, NE						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	SWTH	Swainson's Thrush	*Catharus ustulatus*	2		X		2		S						
SC	2025-07-03	BBS Area Search	Area Search 2	7:00:00 AM	80	BAWW	Black-and-white Warbler	*Mniotilta varia*	2		X	2			E						

Table 5: 2025 Breeding Bird Survey Summary - Fast Acting Natural Gas Power Generation Facility - Marshdale *Project # 25-12222*

Common Name	Scientific Name	SARA	COSEWIC	ESA	NS S-rank	Number Observed
Alder Flycatcher	*Empidonax alnorum*	Not Listed	Not Listed	Not Listed	S5B	3
American Crow	*Corvus brachyrhynchos*	Not Listed	Not Listed	Not Listed	S5	5
American Goldfinch	*Spinus tristis*	Not Listed	Not Listed	Not Listed	S5	9
American Redstart	*Setophaga ruticilla*	Not Listed	Not Listed	Not Listed	S5B	3
American Robin	*Turdus migratorius*	Not Listed	Not Listed	Not Listed	S5B,S3N	18
Black-and-white Warbler	*Mniotilta varia*	Not Listed	Not Listed	Not Listed	S5B	11
Blackburnian Warbler	*Setophaga fusca*	Not Listed	Not Listed	Not Listed	S4B,S5M	3
Black-capped Chickadee	*Poecile atricapilla*	Not Listed	Not Listed	Not Listed	S5	5
Black-throated Green Warbler	*Setophaga virens*	Not Listed	Not Listed	Not Listed	S5B	19
Blue Jay	*Cyanocitta cristata*	Not Listed	Not Listed	Not Listed	S5	6
Blue-headed Vireo	*Vireo solitarius*	Not Listed	Not Listed	Not Listed	S5B	6
Brown Creeper	*Certhia americana*	Not Listed	Not Listed	Not Listed	S5	3
Canada Warbler	*Cardellina canadensis*	Threatened	Special Concern	Endangered	S3B	2
Cape May Warbler	*Setophaga tigrina*	Not Listed	Not Listed	Not Listed	S3B,SUM	1
Cedar Waxwing	*Bombycilla cedrorum*	Not Listed	Not Listed	Not Listed	S5B	9
Chestnut-sided Warbler	*Setophaga pensylvanica*	Not Listed	Not Listed	Not Listed	S5B	1
Chipping Sparrow	*Spizella passerina*	Not Listed	Not Listed	Not Listed	S4B,S5M	1
Common Raven	*Corvus corax*	Not Listed	Not Listed	Not Listed	S5	1
Common Yellowthroat	*Geothlypis trichas*	Not Listed	Not Listed	Not Listed	S5B	5
Eastern Wood-pewee	*Contopus virens*	Special Concern	Special Concern	Vulnerable	S3S4B	2
Golden-crowned Kinglet	*Regulus satrapa*	Not Listed	Not Listed	Not Listed	S5	3
Hermit Thrush	*Catharus guttatus*	Not Listed	Not Listed	Not Listed	S5B	14
Least Flycatcher	*Empidonax minimus*	Not Listed	Not Listed	Not Listed	S4S5B,S5M	2
Magnolia Warbler	*Setophaga magnolia*	Not Listed	Not Listed	Not Listed	S5B	7
Mourning Dove	*Zenaida macroura*	Not Listed	Not Listed	Not Listed	S5	4
Northern Flicker	*Colaptes auratus*	Not Listed	Not Listed	Not Listed	S5B	2
Northern Parula	*Setophaga americana*	Not Listed	Not Listed	Not Listed	S5B	14
Ovenbird	*Seiurus aurocapilla*	Not Listed	Not Listed	Not Listed	S5B	26
Pileated Woodpecker	*Dryocopus pileatus*	Not Listed	Not Listed	Not Listed	S5	1
Red-breasted Nuthatch	*Sitta canadensis*	Not Listed	Not Listed	Not Listed	S4S5	1
Red-eyed Vireo	*Vireo olivaceus*	Not Listed	Not Listed	Not Listed	S5B	17
Swainson's Thrush	*Catharus ustulatus*	Not Listed	Not Listed	Not Listed	S4B,S5M	6
Swamp Sparrow	*Melospiza georgiana*	Not Listed	Not Listed	Not Listed	S5B	1
Veery	*Catharus fuscescens*	Not Listed	Not Listed	Not Listed	S4B	1
White-throated Sparrow	*Zonotrichia albicollis*	Not Listed	Not Listed	Not Listed	S4S5B,S5M	18
Winter Wren	*Troglodytes hiemalis*	Not Listed	Not Listed	Not Listed	S5B	3
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Not Listed	Not Listed	Not Listed	S4B,S5M	1

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Observer	Date	Survey Type	Survey Location Number (PC, DWC, etc.)	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in/near Wetland?	Inc.	Fly-by	Fly-over Height (m)	Flight Direction	Behaviour or Comments?
												<50 m	50 - 100 m	100 m +							
SC	2025-06-04	Nightjar	NJ1	20:23	10	AMRO	American Robin	*Turdus migratorius*	1								x				
SC	2025-06-04	Nightjar	NJ1	20:23	10	HETH	Hermit Thrush	*Catharus guttatus*	2								x				
SC	2025-06-04	Nightjar	NJ1	20:23	10	AGOL	American Goldfinch	*Spinus tristis*	3								x				
SC	2025-06-04	Nightjar	NJ1	20:23	10	BDOW	Barred Owl	*Strix varia*	1								x				
SC	2025-06-04	Nightjar	NJ2	20:37	10	AMRO	American Robin	*Turdus migratorius*	1								x				
SC	2025-06-04	Nightjar	NJ2	20:37	10	ATSP	Tree Swallow	*Tachycineta bicolor*	2								x				
SC	2025-06-04	Nightjar	NJ2	20:37	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	1								x				
SC	2025-07-02	Nightjar	NJ1	22:17	10	HETH	Hermit Thrush	*Catharus guttatus*	1								x				
SC	2025-07-02	Nightjar	NJ2	22:33	10	No Birds	N/A	*N/A*	N/A												

Common Name	Scientific Name	SARA	COSEWIC	ESA	NS S-rank	Number Observed
American Robin	*Turdus migratorius*	Not Listed	Not Listed	Not Listed	S5B,S3N	2
American Goldfinch	*Spinus tristis*	Not Listed	Not Listed	Not Listed	S5	3
Barred Owl	*Strix varia*	Not Listed	Not Listed	Not Listed	S5	1
Hermit Thrush	*Catharus guttatus*	Not Listed	Not Listed	Not Listed	S5B	3
Tree Swallow	*Tachycineta bicolor*	Not Listed	Not Listed	Not Listed	S4B	2
White-throated Sparrow	*Zonotrichia albicollis*	Not Listed	Not Listed	Not Listed	S4S5B,S5M	1

Observer	Date	Survey Type	Survey Location Number (PC, DWC, etc.)	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in/near Wetland?	Inc.	Fly-by	Fly-over Height (m)	Flight Direction	Behaviour or Comments?
												<50 m	50 - 100 m	100 m +							
LL	2025-08-21	PC	PC1	7:31:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		1		1								
LL	2025-08-21	PC	PC1	7:31:00 AM	10	CORA	Common Raven	*Corvus corax*	1		1		1								
LL	2025-08-21	PC	PC1	7:31:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	4	4		4									
LL	2025-08-21	PC	PC1	7:31:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1	1		1									
LL	2025-08-21	PC	PC1	7:31:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	1	1		1									
LL	2025-08-21	PC	PC1	7:31:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	1	1		1									
LL	2025-08-21	PC	PC1	7:31:00 AM	10	CAWA	Canada Warbler	*Cardellina canadensis*	1	1		1									
LL	2025-08-21	PC	PC2	8:01:00 AM	10	AMRO	American Robin	*Turdus migratorius*	1	1		1									
LL	2025-08-21	PC	PC2	8:01:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	2	2			2								
LL	2025-08-21	PC	PC2	8:01:00 AM	10	MAWA	Magnolia Warbler	*Setophaga magnolia*	2	2			2								
LL	2025-08-21	PC	PC2	8:01:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	3	3			3								
LL	2025-08-21	PC	PC2	8:01:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	2	2		2									
LL	2025-08-21	PC	PC2	8:01:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	2	2		2									
LL	2025-08-21	PC	PC4	8:27:00 AM	10	RUGR	Ruffed Grouse	*Bonasa umbellus*	1		1		1								
LL	2025-08-21	PC	PC4	8:27:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		1	1									
LL	2025-08-21	PC	PC4	8:27:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	2	1	1	2									
LL	2025-08-21	PC	PC4	8:27:00 AM	10	NOPA	Northern Parula	*Setophaga americana*	2	1	1	2									
LL	2025-08-21	PC	PC4	8:27:00 AM	10	YBSA	Yellow-bellied Sapsucker	*Sphyrapicus varius*	1		1	1									
LL	2025-08-21	PC	PC4	8:27:00 AM	10	BTNW	Black-throated Green Warbler	*Setophaga virens*	1		1	1									
LL	2025-08-21	PC	PC4	8:27:00 AM	10	CEDW	Cedar Waxwing	*Bombycilla cedrorum*	2		2	2									
LL	2025-08-21	PC	PC4	8:27:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	2	1	1	1	1								
LL	2025-08-21	PC	PC3	9:10:00 AM	10	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	1		1	1									
LL	2025-08-21	PC	PC3	9:10:00 AM	10	OVEN	Ovenbird	*Seiurus aurocapilla*	1		1	1									
LL	2025-08-21	PC	PC3	9:10:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	2	1	1	2									
LL	2025-08-21	PC	PC3	9:10:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		1	1									
LL	2025-08-21	PC	PC3	9:10:00 AM	10	COYE	Common Yellowthroat	*Geothlypis trichas*	1		1	1									
LL	2025-08-21	PC	PC3	9:10:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	1		1	1									
LL	2025-08-21	PC	PC3	9:10:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1		1	1									
SC	2025-09-17	PC	PC1	8:11:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	1	X	X			1	NE						
SC	2025-09-17	PC	PC1	8:11:00 AM	10	DEJU	Dark-eyed Junco	*Junco hyemalis*	1		X		1		E						
SC	2025-09-17	PC	PC1	8:11:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X		1		S						
SC	2025-09-17	PC	PC1	8:11:00 AM	10	HETH	Hermit Thrush	*Catharus guttatus*	1		X		1		SW						
SC	2025-09-17	PC	PC1	8:11:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	2		X			1	S		1				
SC	2025-09-17	PC	PC1	8:11:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	2		X			1	S		1				
SC	2025-09-17	PC	PC1	8:11:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	2		X			2	W						
SC	2025-09-17	PC	PC1	8:11:00 AM	10	SOSP	Song Sparrow	*Melospiza melodia*	1		X		1		NW						
SC	2025-09-17	PC	PC1	8:11:00 AM	10	DOWO	Downy Woodpecker	*Picoides pubescens*	1	X	X	1			SE						
SC	2025-09-17	PC	PC1	8:11:00 AM	10	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	2	X	X						X				
SC	2025-09-17	PC	PC1	8:11:00 AM	10	GRCA	Gray Catbird	*Dumetella carolinensis*	1		X						X				
SC	2025-09-17	PC	PC1	8:11:00 AM	10	MODO	Mourning Dove	*Zenaida macroura*	1	X	X						X				
SC	2025-09-17	PC	PC2	8:29:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	3		X			3	SW, S						
SC	2025-09-17	PC	PC2	8:29:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	2		X		1	1	W, SW						
SC	2025-09-17	PC	PC2	8:29:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	1		X			3	NW, E						
SC	2025-09-17	PC	PC2	8:29:00 AM	10	COYE	Common Yellowthroat	*Geothlypis trichas*	2		X		1	1	N, S						
SC	2025-09-17	PC	PC2	8:29:00 AM	10	AGOL	American Goldfinch	*Spinus tristis*	2		X			2	NE						
SC	2025-09-17	PC	PC2	8:29:00 AM	10	CHSP	Chipping Sparrow	*Spizella passerina*	3		X	2	1		NE, NW, SW						
SC	2025-09-17	PC	PC2	8:29:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	3	X	X	2	1		NE, W						
SC	2025-09-17	PC	PC2	8:29:00 AM	10	DEJU	Dark-eyed Junco	*Junco hyemalis*	1		X	1			S						
SC	2025-09-17	PC	PC3	8:49:00 AM	10	BARO	Barred Owl	*Strix varia*	2		X			2	S, W						Hooting back and forth to each other. Probably a breeding pair.
SC	2025-09-17	PC	PC3	8:49:00 AM	10	AMCR	American Crow	*Corvus brachyrhynchos*	1		X			1	W						
SC	2025-09-17	PC	PC3	8:49:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	3	X	X			2	SE, N			1	25	W	
SC	2025-09-17	PC	PC3	8:49:00 AM	10	PIWO	Pileated Woodpecker	*Dryocopus pileatus*	1		X			1	N						
SC	2025-09-17	PC	PC3	8:49:00 AM	10	BCCH	Black-capped Chickadee	*Poecile atricapillus*	1		X		1		SW						
SC	2025-09-17	PC	PC3	8:49:00 AM	10	BAWW	Black-and-white Warbler	*Mniotilta varia*	1		X		1		NE						
SC	2025-09-17	PC	PC3	8:49:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	1		X		1		E						
SC	2025-09-17	PC	PC3	8:49:00 AM	10	AMRO	American Robin	*Turdus migratorius*	1		X	1			SW						
SC	2025-09-17	PC	PC3	8:49:00 AM	10	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	2		X	2			E, SW						
SC	2025-09-17	PC	PC3	8:49:00 AM	10	YRWA	Yellow-rumped Warbler	*Setophaga coronata*	2		X	2			N						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	RBNU	Red-breasted Nuthatch	*Sitta canadensis*	1		X			1	SW						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	BLJA	Blue Jay	*Cyanocitta cristata*	2		X		1	1	NW, S						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	NOFL	Northern Flicker	*Colaptes auratus*	1		X			1	E						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	REVI	Red-eyed Vireo	*Vireo olivaceus*	2		X		2		W, S						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	CORA	Common Raven	*Corvus corax*	1		X		1		W						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	YRWA	Yellow-rumped Warbler	*Setophaga coronata*	2		X		2		NW						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	DEJU	Dark-eyed Junco	*Junco hyemalis*	2		X		2		NE						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	SOSP	Song Sparrow	*Melospiza melodia*	1		X		1		E						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	AMRO	American Robin	*Turdus migratorius*	1		X	1			SW						
SC	2025-09-17	PC	PC4	9:11:00 AM	10	GCKI	Golden-crowned Kinglet	*Regulus satrapa*	1		X	1			N						

Table 9: 2025 Fall Migration Survey Summary - Fast Acting Natural Gas Power Generation Facility - Marshdale *Project # 25-12222*

Common Name	Scientific Name	SARA	COSEWIC	ESA	NS S-rank	Number Observed
American Crow	*Corvus brachyrhynchos*	Not Listed	Not Listed	Not Listed	S5	4
American Goldfinch	*Spinus tristis*	Not Listed	Not Listed	Not Listed	S5	2
American Robin	*Turdus migratorius*	Not Listed	Not Listed	Not Listed	S5B,S3N	3
Barred Owl	*Strix varia*	Not Listed	Not Listed	Not Listed	S5	2
Black-and-white Warbler	*Mniotilta varia*	Not Listed	Not Listed	Not Listed	S5B	3
Black-capped Chickadee	*Poecile atricapilla*	Not Listed	Not Listed	Not Listed	S5	13
Black-throated Green Warbler	*Setophaga virens*	Not Listed	Not Listed	Not Listed	S5B	4
Blue Jay	*Cyanocitta cristata*	Not Listed	Not Listed	Not Listed	S5	13
Canada Warbler	*Cardellina canadensis*	Threatened	Special Concern	Endangered	S3B	1
Cedar Waxwing	*Bombycilla cedrorum*	Not Listed	Not Listed	Not Listed	S5B	2
Chipping Sparrow	*Spizella passerina*	Not Listed	Not Listed	Not Listed	S4B,S5M	3
Common Raven	*Corvus corax*	Not Listed	Not Listed	Not Listed	S5	2
Common Yellowthroat	*Geothlypis trichas*	Not Listed	Not Listed	Not Listed	S5B	3
Dark-eyed Junco	*Junco hyemalis*	Not Listed	Not Listed	Not Listed	S4S5	4
Downy Woodpecker	*Dryobates pubescens*	Not Listed	Not Listed	Not Listed	S5	1
Golden-crowned Kinglet	*Regulus satrapa*	Not Listed	Not Listed	Not Listed	S5	4
Grey Catbird	*Dumetella carolinensis*	Not Listed	Not Listed	Not Listed	S4B	1
Hermit Thrush	*Catharus guttatus*	Not Listed	Not Listed	Not Listed	S5B	4
Magnolia Warbler	*Setophaga magnolia*	Not Listed	Not Listed	Not Listed	S5B	2
Mourning Dove	*Zenaida macroura*	Not Listed	Not Listed	Not Listed	S5	1
Northern Flicker	*Colaptes auratus*	Not Listed	Not Listed	Not Listed	S5B	1
Northern Parula	*Setophaga americana*	Not Listed	Not Listed	Not Listed	S5B	6
Ovenbird	*Seiurus aurocapilla*	Not Listed	Not Listed	Not Listed	S5B	1
Pileated Woodpecker	*Dryocopus pileatus*	Not Listed	Not Listed	Not Listed	S5	1
Red-breasted Nuthatch	*Sitta canadensis*	Not Listed	Not Listed	Not Listed	S4S5	1
Red-eyed Vireo	*Vireo olivaceus*	Not Listed	Not Listed	Not Listed	S5B	10
Ruffed Grouse	*Bonasa umbellus*	Not Listed	Not Listed	Not Listed	S5	1
Song Sparrow	*Melospiza melodia*	Not Listed	Not Listed	Not Listed	S5B	2
White-throated Sparrow	*Zonotrichia albicollis*	Not Listed	Not Listed	Not Listed	S4S5B,S5M	4
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Not Listed	Not Listed	Not Listed	S5B	1
Yellow-rumped Warbler	*Setophaga coronata*	Not Listed	Not Listed	Not Listed	S5B	4

Table 10: Avian Incidental Data - Fast Acting Natural Gas Power Generation Facility - Marshdale ***Project # 25-12222***

Common Name	Scientific Name	SARA	COSEWIC	ESA	ACCDC S-ranks	Count
American Crow	*Corvus brachyrhynchos*	Not Listed	Not Listed	Not Listed	S5	2
American Goldfinch	*Spinus tristis*	Not Listed	Not Listed	Not Listed	S5	3
American Robin	*Turdus migratorius*	Not Listed	Not Listed	Not Listed	S5B,S3N	14
Bald Eagle	*Haliaeetus leucocephalus*	Not Listed	Not at Risk	Not Listed	S5	1
Barred Owl	*Strix varia*	Not Listed	Not Listed	Not Listed	S5	1
Black-capped Chickadee	*Poecile atricapilla*	Not Listed	Not Listed	Not Listed	S5	11
Blue Jay	*Cyanocitta cristata*	Not Listed	Not Listed	Not Listed	S5	8
Broad-winged Hawk	*Buteo platypterus*	Not Listed	Not Listed	Not Listed	S5B	1
Brown Creeper	*Certhia americana*	Not Listed	Not Listed	Not Listed	S5	2
Common Grackle	*Quiscalus quiscula*	Not Listed	Not Listed	Not Listed	S5B	3
Dark-eyed Junco	*Junco hyemalis*	Not Listed	Not Listed	Not Listed	S4S5	4
European Starling	*Sturnus vulgaris*	Not Listed	Not Listed	Not Listed	SNA	2
Golden-crowned Kinglet	*Regulus satrapa*	Not Listed	Not Listed	Not Listed	S5	5
Mourning Dove	*Zenaida macroura*	Not Listed	Not Listed	Not Listed	S5	1
Northern Flicker	*Colaptes auratus*	Not Listed	Not Listed	Not Listed	S5B	1
Pine Grosbeak	*Pinicola enucleator*	Not Listed	Not Listed	Not Listed	S3B,S5N,S5M	1
Red-breasted Nuthatch	*Sitta canadensis*	Not Listed	Not Listed	Not Listed	S4S5	1
Ruffed Grouse	*Bonasa umbellus*	Not Listed	Not Listed	Not Listed	S5	3
Song Sparrow	*Melospiza melodia*	Not Listed	Not Listed	Not Listed	S5B	1
Unknown woodpecker spp.	*N/A*	N/A	N/A	N/A	N/A	1

APPENDIX K
PROJECT TEAM CVS

Meghan Johnston, B.Sc. (Bio), MES
Vice President - Environmental Assessment & Approvals, Partner
Total Experience: 25 years

AREAS OF SPECIALIZATION

- Environmental Assessment Practitioner
- Regulatory Engagement
- Indigenous Engagement
- Project Management
- Species At Risk
- Environmental Screening
- Environmental Approvals
- Wetland and Watercourse Assessments and Permitting

EDUCATION

- Masters in Environmental Studies, York University, Toronto, ON (1999)
- Bachelor of Science (Biology), Dalhousie University, Halifax, NS (1997)
- Bachelor of Arts (Political Science), Honours, Dalhousie University, Halifax, NS (1997)

TRAINING

- Standard First Aid, AED, CPR (C) (2023)
- Wetland Construction: Principles, Planning, and Design, Rutgers (2016)
- Wetland Functional Assessment Training Workshop, NSE (2013)
- Urban Wetland Restoration: A Watershed Approach (2012)
- Nova Scotia Advanced Wetlands Delineation and Evaluation Course (2009)
- Water Management and Wetland Restoration Training Course (2009)
- Identifying and Delineating Wetlands for Nova Scotia (2008)

RELEVANT EXPERIENCE

Ms. Johnston oversees, manages, and executes regulatory and environmental projects. She is a member of NS Wetland Delineation, Maritime College of Forest Technology and holds a NS Advanced Wetlands Delineator and Evaluator certification. She provides project management for federal and provincial environmental assessment (EA) processes and is an experienced EA practitioner. Ms. Johnston manages and completes environmental baseline surveys including habitat surveys, species at risk and wildlife surveys, botany and bird surveys, wetland and watercourse delineations, characterizations, and functional assessment, fish habitat evaluation, harmful alteration, disruption, and destruction (HADD) authorizations, and bat hibernacula identification. Ms. Johnston also completes watershed evaluations, and guides clients through the environmental and permitting stages of mining, industrial, alternative energy, and development projects.

Ms. Johnston supports clients through provincial and federal environmental assessment requirements and supports project teams to identify and evaluate project environmental risk. She has completed multiple provincial environmental assessment registration documents in the past five years in NS and NL, two Initial Project Description (IPD) documents for the Impact Assessment Agency of Canada (IAAC) in 2025 in NS and was the project manger for the submission of a CEAA 2012 Environmental Impact Statement (EIS) for a mining project in NS in 2021 to IAAC. Ms. Johnston consults regularly with federal and provincial regulatory agencies, First Nation communities, and local landowners and stakeholder groups.

Ms. Johnston regularly completes applications for wetland and watercourse alteration and HADD authorizations across Atlantic Canada, and has developed and implemented wetland compensation programs, fish habitat offsetting projects, and wetland and fish habitat restoration projects. Ms. Johnston is a trained wetland evaluator, biologist, and restoration professional. Ms. Johnston regularly implements species at risk, habitat and biodiversity mitigation planning, permitting, monitoring plans, and offsetting programs.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Assessment, Goldboro Gold Project, Goldboro, NS, 2017-Present – Project Director: As part of the Environmental Assessment Registration Document (EARD), Ms. Johnston, acting as project director, has overseen the completion of baseline wetland and watercourse delineation, fish habitat identification, rare plant, rare lichen, habitat and wildlife, avian, and species at risk surveys within a 1200 hectare Study Area in Goldboro NS. Strum was also responsible for the baseline and effects assessment reporting for all biophysical components of the EARD for this gold mining project. Following EA approval in 2022, Strum completed biophysical permitting requirements including the federal *Fisheries Act* Authorization Application, associated offsetting, wetland and watercourse permitting including

wetland compensation, development of monitoring plans, the Metal and Diamond Mine Effluent Regulation (MDMER) Schedule 2 process for deposition of deleterious substance into a fisheries resource, and biodiversity offsetting.

Environmental Assessment, Antrim Gypsum Project, Antrim, NS, 2021-Present – Project Director: As part of the EARD, Ms. Johnston, acting as project director, has overseen the completion of baseline wetland and watercourse delineation, fish habitat identification, rare plant, rare lichen, habitat and wildlife, avian, and species at risk surveys within a 600 hectare Study Area in Antrim, NS. Strum was also responsible for the baseline and effects assessment reporting for all biophysical components of the EARD for this gypsum project. Following EA approval in 2024, Strum has commenced biophysical permitting requirements including the federal *Fisheries Act* offsetting plan, wetland permitting including wetland compensation and development of monitoring plans.

Environmental Assessment, Botwood Green Hydrogen Project, Botwood, NL, 2024-Present – Project Director: Ms. Johnston is the project director for the EA Registration for this 3.5 GW wind to green hydrogen and ammonia project (30,000 ha) in Central Newfoundland. The project includes over 500 wind turbines, a 150 MW solar farm, 900 km transmission and collection lines, 400 km access roads, industrial water withdrawal, and hydrogen and ammonia production plants with capacity of 1,000,000 tonnes of ammonia per year. Strum developed the relevant biophysical studies (avifauna, flora, terrestrial, aquatic, fish habitat, hydrology) that were required for the EA Registration, and implemented multiple years of the field monitoring programs. This included noise monitoring of several locations, the deployment of over 50 wildlife cameras, 80 fish habitat assessments, over 120 bird point count surveys, and water sampling at several locations. Strum submitted the EA Registration and is currently conducting the analysis of the data and compiling the EIS report in support of an EA approval.

Environmental Assessment, Gold Mining Projects (4), Eastern Shore, NS, 2014-Present – Senior Project Manager: Ms. Johnston has, and continues to support, the 15 Mile Minerals and Renewables Ltd. project team with their four mine locations in Nova Scotia since 2014. Strum has completed regulatory work and environmental permitting through all mining stages: local and regional exploration (planning and permitting support); pre-permitting baseline studies (wildlife, fish, species at risk, birds, wetlands, surface water) at Fifteen Mile and Cochrane Hill proposed mine locations; permitting (CEAA EIS Submission: Team and Regulatory Lead) for the Beaver Dam and Fifteen Mile projects; and permitting (provincial and federal), monitoring and offsetting (fish and wetlands) to support construction, operations, and decommissioning at the Touquoy Mine.

Wetland Compensation and Construction Support, Highway 104 Twinning, Dexter Nova Alliance, Antigonish County, NS, 2020-Present – Project Director: Ms. Johnston, acting as the project director, is responsible for the wetland compensation requirements, fisheries monitoring, and fish rescues for the twinning of NSPW Highway 104 in Antigonish County, NS. Ms. Johnston oversaw the site identification, design and construction of four wetland restoration projects over a three year period, with long term monitoring of these sites ongoing. Strum also completed pre-construction surveys for wood turtles, bats and nesting birds. Strum completed numerous fish rescues to support culvert and bridge installation and is also responsible for the design and implementation of the Fisheries Effectiveness Monitoring Program (FEMP) which is on-going.

Environmental Permitting, Black Point Quarry and Marine Terminal, Guysborough County, NS, 2023-Present – Senior Project Manager: Ms. Johnston is responsible for the *Fisheries Act* authorization permit submission (freshwater and marine) and associated offsetting plan and industrial approval, and wetland and watercourse permitting and associated wetland compensation for the Black Point Quarry and Marine Terminal, located in Guysborough County, NS.

Environmental Permitting, Route 332 NSPW, *Fisheries Act* Authorization and Wetland Permitting, Lunenburg County, NS, 2020-2022 – Project Director: Ms. Johnston was the project director for NSPW in 2020 to identify and assess impacts of the Route 332 Widening Project in Lunenburg County on freshwater and marine habitats. Strum submitted wetland alteration applications for impacts to both tidal and non-tidal wetlands, including implementation of associated wetland compensation. Freshwater and tidal fish habitat assessments resulted in the submission of a Request for Review (RfR) and eventual *Fisheries Act* Authorization application to Fisheries and Oceans Canada (DFO), and implementation of associated fish habitat offsetting.

Melanie Juurlink, MREM
Senior Ecology Lead, Partner
Environmental Assessments & Approvals
Total Experience: 21 years

AREAS OF SPECIALIZATION

- Environmental Assessments
- Fish community & habitat assessments
- Fish rescues
- Wetland delineation and functional assessment
- Species at Risk Evaluation
- Flora and Fauna surveys
- Avian surveys
- Public Consultation

EDUCATION

- Masters of Resource and Environmental Management, Dalhousie University, Halifax, NS (2011)
- Bachelor of Science (Advanced Major in Biology & Interdisciplinary Studies in Aquatic Resources), St. Francis Xavier University, Antigonish, NS (2005)

TRAINING

- Standard First Aid, AED, CPR (A) (2023)
- Joint Occupational Health and Safety Committee Level 1 (2023)
- Avian Nest Sweeps & Monitoring (2021)
- Fish Habitat Restoration, In-stream Techniques (2021)
- Fish Habitat Assessments (2019)
- eDNA Methods (2019)
- Freshwater & Diadromous Fishes of New England (2019)
- Field Hike Leader Certification, Basic and Winter Modules, Outdoor Council of Canada (2015 & 2018)
- Wetland Ecosystem Services Protocol (WESP-AC) (2017)
- WHMIS (2017)
- Electrofishing Crew Leader (2015)
- Wetland Delineation Certification (2013)
- Small Vessel Operator Proficiency & Marine Emergency Duties A3 Certified (2006)

RELEVANT EXPERIENCE

Ms. Juurlink is a Senior Environmental Scientist, with the role of Project Manager and the Ecology Lead of Environmental Assessments & Approvals. She is highly skilled at completing ecological habitat assessments via geospatial desktop review (GIS) and implementation of field studies. She has an in-depth knowledge of NS flora and fauna which has provided her with the tools to determine habitat uniqueness and ecological sensitivity.

Before joining Strum, Melanie was the Senior Ecologist at McCallum Environmental Ltd., in NS. In that role, Melanie coordinated all McCallum field biologists required to complete all environmental baseline and ecological inventory programs for Provincial and Federal Environmental Assessment registration. She has been responsible for the implementation of environmental baseline programs in mining, quarry development, and energy sector development projects in advance of environmental assessment registration. In addition, Melanie has been responsible for communicating the results of baseline environmental conditions to industry and project-related stakeholders. Her effective communication skills, broad technical knowledge, and personability have furthered her involvement in public consultation sessions and community engagement.

Melanie held previous positions as the Environmental Specialist and Area Environmental Lead for the Shell/Albian Sands Expansion and the Regulatory and Environmental Specialist for the Canadian Natural Resources, Ltd. both in Fort McMurray, AB. Melanie is a volunteer hike leader and trail steward in the Blue Mountain Birch Cove Lakes Wilderness Area.

REPRESENTATIVE PROJECTS

Environmental Assessment, Clydesdale Ridge Wind Project, NS, 2024 – Project Manager: Completed environmental baseline surveys and Environmental Assessment Registration Document for the Clydesdale Wind Project, consisting of a proposed 18 wind turbine generators and all associated infrastructure. As the Project Manager, Strum implemented all of the field programs, and prepared the EARD for submission to NSECC in August 2024.

Environmental Impact Statement, Wejipek Wind Project, PEI, 2024 – Project Manager: Completed environmental baseline surveys and Environmental Impact Statement document for the Clydesdale Wind Project, consisting of a proposed three wind turbine generators and all associated infrastructure. As the Project Manager, Strum implemented all of the field programs, and prepared the EIS for submission to PEI Energy, Environment and Climate Action.

WESP-AC Functional Assessment Training, MCFT, NS, 2023-2024 – Trainer: Invited by the Maritime College of Forest Technology (MCFT) to lead the Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC) training in Amherst, Nova Scotia. Provided training to a multi-disciplinary group of practitioners from all four maritime provinces. Provided training on WESP-AC internally to McCallum Environmental Ltd. and Strum personnel since 2018 as well.

Fish Rescues, NS, 2020-2024 – Project Manager: Completed more than 75 fish rescues in the past four years to support various transportation projects throughout Nova Scotia. Acted as both field crew and Project Manager, depending on the specific Project.

Fish & Fish Habitat Assessment, NS, 2019-2024 – Project Manager: Completed detailed evaluation of effects to fish and fish habitat to support application for Harmful Alteration, Disruption, and Destruction of Fish Habitat for one provincially approved gold project. This involved detailed fish habitat assessment, fish community structure evaluation, effects assessment based on direct impact and flow reduction, and compensation for residual effects.

Herpetology Field Programs – 2015-2024 – Environmental Scientist & Project Manager: Developed and implemented multiple targeted surveys for herpetofauna, specifically wood turtle, bandings turtle, and ribbonsnake, for EAS and development related permitting projects. Completed field programs and regulatory consultation to clearly communicate Project implications of rare species and their habitats.

Environmental Baseline Surveys, NS, 2013-2024 – Project Manager and Environmental Scientist: Completion of environmental baseline surveys for multiple provincial environmental assessments for various wind power projects and quarries. This involves detailed desktop and constraints analyses to determine required field assessments, implementation of all field programs, interpretation and reporting of results, across multiple taxa and habitat types.

Avian Surveys, NS, 2012-2024 – Environmental Scientist: Completion of avian surveys, including baseline studies, post-construction studies and pre-construction nest searches for over ten projects, such as mines, quarries, wind power projects and residential development. Implemented and completed avian surveys from 2015-2018. From 2018-2024, guided implementation of programs and interpretation of results.

Wetland Delineation, Functional Assessments, NS, 2011-2024 – Environmental Scientist & Trainer: Completed wetland delineation and functional assessment for over 1000 wetlands in support of multiple development projects in both permitting and environmental assessments. Instructed wetland delineation training with Fern Hills institute, and internally within both McCallum Environmental Ltd. and Strum Consulting. Wetland delineation and instruction includes teaching botany identification and habitat association, soil ecology, and hydrology.

Lighthouse Trail Re-Route – Botanical Survey – 2023 – Project Manager: Liaised with the prime consultant, Parks Canada, and our field biologists to safely execute a botanical assessment along a proposed re-route of the Lighthouse Trail in Louisbourg, Nova Scotia. The re-route was required due to extensive damage from Hurricane Fiona. Our team provided a report to Parks Canada identifying results of a botanical survey to be used to advise trail re-route design and construction.

Environmental Baseline Surveys, Mining, NS, 2016-2023 – Environmental Scientist & Project Manger: Completion of environmental baseline surveys for the federal and provincial environmental assessment process for proposed development of four separate gold mines in eastern Nova Scotia. This involved collection of baseline data and effects assessment for terrestrial habitats (flora and fauna), avifauna, wetlands, fish and fish habitats, including completion of the Cumulative Effects Assessments for those projects within the federal process.

Baseline Studies, WESP-AC Calibration Study, NS, 2018 – Environmental Scientist: Completed baseline studies on 125 wetlands across the province to implement a new wetland functional assessment technique (WESP-AC) to the Nova Scotian regulatory landscape.

Ryan Hearn, BSc. (Hons), MSc.
Senior Project Manager
Environmental Assessments & Approvals
Total Experience: 12 years

AREAS OF SPECIALIZATION

- Project Management
- Environmental Assessment
- Due Diligence
- Public and Regulatory Consultation
- Environmental and Regulatory Permitting
- Renewable Energy Project Development Planning

RELEVANT EXPERIENCE

Mr. Hearn is a Senior Project Manager on our Environmental Assessments & Approvals Team. He has been in the environmental and energy industry for more than 12 years, with experience as both a consultant and a renewable energy developer.

Before joining Strum, Ryan worked as a Project Manager for a Canadian renewable energy developer, specializing in environmental management, consultation, and regulatory policy and permitting for industrial scale wind, solar and battery storage projects. Ryan has worked in several Canadian and US jurisdictions, including Nova Scotia.

EDUCATION

- Master of Science, University of Calgary, Calgary, AB (2018)
- Bachelor of Science (Honours in Biology), Mount Saint Vincent University, Halifax, NS (2010)

TRAINING

- Standard First Aid, AED, CPR (A) (2024)
- WHMIS (2024)
- Bear Awareness Training (2024)
- Project Success Method Training (2022)

PUBLICATIONS

- Comparative Analysis of Environmental Assessment Regulatory Frameworks for Wind Energy Development in Canada, University of Calgary, Capstone Research Project, 2018
- Stable isotopes reveal that little brown bats have a broader dietary niche than northern long-eared bats, Acta Chiropterologica, 16(2): 315-325, 2014

Ryan completed his undergraduate studies in 2010, receiving his Honours Bachelor of Science degree from Mount Saint Vincent University where he studied Atlantic Canadian bat populations. After more than five years working in environmental consulting, Ryan returned to school to obtain his Master of Science degree from the University of Calgary in 2018 where he focussed his studies on the regulation of renewable energy development in Canada.

REPRESENTATIVE PROJECTS

Higgins Mountain Wind Project, Nova Scotia, 2024-Present – Project Manager: Management of the environmental monitoring program for the ongoing construction of the 100 MW Higgins Mountain Wind Project near Wentworth, Nova Scotia.

Weavers Mountain Wind Project, Nova Scotia, 2024- Present– Project Manager: Ongoing support to the Project developer during the construction of the 96 MW Weavers Mountain Wind Project in Pictou/Antigonish County, Nova Scotia.

Ellershouse 3 Wind Project, NS, 2022-2024 – Environment and Consultation Manager: Oversaw the environmental assessment process for a 66 MW expansion project to the existing 23.5 MW Ellershouse Wind Farm. Also represented the developer on the CLC group and managed public consultation efforts. Ellershouse 3 received EA approval in July 2023**.**

Stirling Wind Project, Alberta, 2022-2023 – Owner Environmental Representative: Provided oversight for the construction team and EPC, ensured the Stirling Wind Project was constructed according to environmental conditions and regulatory requirements. He regularly consulted with the construction teams and corrected potential compliance issues on site. The 113 MW Stirling Wind Project began operation in 2023.

Regulatory and Permitting Manager, Alberta, 2019-2024: Ryan engaged with various provincial and federal regulatory agencies to acquire and maintain compliance with permits for the construction and operation of over 1000 MW of industrial-scale wind and solar developments as well as transmission lines and battery storage facilities.

Alex Scott, MIT, EPt
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 3 years

PROFESSIONAL ASSOCIATIONS

- Association of Professional Geoscientists of Nova Scotia (member-in-training)
- Eco Canada (Environmental Professional in-training)

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment and Delineations
- Wildlife Surveys
- Surface and Groundwater
- Climate Change and GHG Assessments
- Industrial Approvals
- Environmental Approvals

EDUCATION

- Bachelor of Science (Environmental Science), Saint Mary's University, Halifax, NS (2022)

TRAINING

- Wetland Delineation and Classification Training (2023) – Fern Hill Institution of Plant Classification
- Wetland Ecosystem Services Protocol Atlantic Canada (WESP-AC) Training (2023) – Maritime College of Forestry Technology
- Backpack Electrofishing Training (2023) – Maritime College of Forestry Technology
- Standard First Aid Level C CPR & AED (2022) – St John's Ambulance
- ATV Training Course (2022) – Canadian Safety Council
- Pilot Certificate – Small Remotely Piloted Aircraft System (RPAS), Visual line-of-sight (VLOS) (2022) – Transports Canada

RELEVANT EXPERIENCE

Mr. Scott joined the Strum team in 2022 and is working as a Junior Environmental Scientist with the Environmental Assessment and Approvals Group. Mr. Scott is experienced in many components of Environmental Assessments, including field surveys, delineations, avian radar analysis, wildlife acoustic analysis, and GHG quantification. In an industrial setting, Mr. Scott has experience managing projects and ensuring regulatory compliance and successful approvals. Mr. Scott is experienced in groundwater monitoring, groundwater development, sampling, and conducting aquifer testing and interpreting results.

Mr. Scott has completed fieldwork and report writing to support wetland permitting, Environmental Management Plans and Environmental Assessments for numerous projects across Nova Scotia. Additionally, Mr. Scott has been involved in fieldwork, report writing, and analysis concerning projects throughout the province relating to Level I/II Groundwater Assessments for Subdivisions, groundwater withdrawal approvals, and groundwater monitoring plan programs.

REPRESENTATIVE PROJECTS AND ROLES

Municipal Groundwater Supply Assessment, NS, 2023 – Junior Environmental Scientist: Worked with a team of groundwater experts to analyze well logs, available pump tests and well chemistry data to inform municipal planning around groundwater supply development. This assessment involved determining the depth and stratification of sediments, yields and water quality to understand the yield and safety of a potential groundwater supply.

Groundwater Monitoring Program, Canso, NS, 2023 – Junior Environmental Scientist: Ongoing groundwater monitoring work (following approval of the groundwater monitoring plan), including developing groundwater wells, groundwater sampling, aquifer testing and analysis. The purpose of the monitoring plan is to avoid/mitigate potential impacts to nearby environmental receptors throughout the lifespan of the Project.

Greenhouse Gas Inventories, NS, 2023 – Present – Junior Environmental Scientist: Experienced in conducting direct and indirect GHG emission inventories to quantify large-scale industrial impacts and identify areas for mitigation.

Post-Approval Work, Point Tupper Green Hydrogen/Ammonia Project, NS – Phase 1, NS, 2023 – Junior Environmental Scientist: Development of the groundwater monitoring plan for the hydrogen/ammonia industrial facility as required following the EA approval. Completed fieldwork to support surface water monitoring.

Wetland Carbon Sequestration, NS, 2023 – Present – Junior Environmental Scientist: Designing methods and procedures for fieldwork and subsequent analysis to quantify carbon stored in wetland soils.
Wetland Delineation and Permitting, NS, 2023 – Present – Junior Environmental Scientist: Completed wetland delineations, functional assessments, and permitting applications for pre-construction wetland alterations.

Groundwater Geothermal Heating and Cooling Systems Review and Permitting, NS, 2023 – Present – Junior Environmental Scientist: Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.

Nesting Bird Searches, NS, 2023 – Junior Environmental Scientist: Surveyed areas pre-construction for the presence of nesting bird activity. Collected field data related to observations and flagged off buffer areas surrounding nesting bird species.

Wind Power Environmental Assessments, NS, 2022 – Present – Junior Environmental Scientist: Conducted watercourse, wetland, fish/fish habitat, wildlife and avian assessments, and environmental assessment reporting. Quantified greenhouse gas and climate change impacts of the projects on the environment.

Level I/II Groundwater Assessments, NS, 2022—Present—Junior Environmental Scientist: Completed desktop assessments to determine the viability of sustainable groundwater withdrawals. Conducted drilling and pump test supervision. Sampled water to compare with drinking water guidelines and analyzed aquifer test data to determine adequate safe yields for groundwater users.

Radar and Avian Acoustic Assessments NS, 2022 – Present – Junior Environmental Scientist: Built and ran remote radar and acoustic monitor assemblies to record the passage of avian migrant species. The radar and acoustic data were processed and analyzed to determine the patterns of avian migration. The acoustics were analyzed with machine-learning software and manually verified for accuracy.

Various Management and Leadership Roles, NS, 2018- 2022 – Self-Employed: Competed internationally for Canada in Sprint Kayaking. This required creating sponsorship proposals, developing relationships with sponsors and stakeholders, and managing travel and shipping logistics. Part of this role required public speaking engagements, client receptions, and providing mentorship.

Amber Stoffer, MREM
Aquatic Specialist
Environmental Assessment & Approvals
Total Experience: 11 years

AREAS OF SPECIALIZATION

- Fish community & habitat assessments
- Fish rescues
- Fisheries offsetting and restoration
- Wetland and watercourse assessments, research and permitting
- Fisheries permitting
- Environmental assessments

EDUCATION

- Master of Resource and Environmental Management, Dalhousie University (2015)
- Bachelor of Science (Honours, Biology), University of Ottawa (2013)

TRAINING

- Fish Habitat Restoration – Instream Techniques (2025)
- Fish Habitat Restoration – Prescription Development (2023)
- Standard First Aid (2023)
- Technical Writing for Professionals (2019)
- Fish and Fish Habitat Characterization (2019)
- Backpack Electrofishing (2018)
- Wetland Delineation and WESP-AC (2017)
- Watercourse Installers Certification for Aquatic Restoration (2017)
- Pleasure Craft Operator's License (2016)
- Marine Emergency Duties – A1 (2014)
- WHMIS (2013)

RELEVANT EXPERIENCE

Ms. Stoffer has worked in environmental consulting and research since 2014. She has worked on both project and research-related field assessments in Nova Scotia, Alberta, and Quebec. Specializing in fish and fish habitat sciences, Ms. Stoffer has a range of experience in the planning and implementation of aquatic field programs and restoration projects. She is experienced with provincial and federal environmental impact assessments, regulatory permitting, technical reporting, and fish habitat restoration to support federal offsetting requirements. She has worked as a field biologist responsible for conducting a variety of biophysical assessments including wetland delineation and functional assessments, flora surveys, avian surveys, and species at risk evaluations. She has also performed environmental monitoring for a variety of large and small-scale development and exploration initiatives across Nova Scotia.

REPRESENTATIVE PROJECTS AND ROLES

Fisheries Offsetting, NS, 2022-Present – Technical Specialist: Led the scoping and implementation of freshwater and marine fisheries offsetting programs, including identification, design, baseline data collection, data processing and reporting. Projects involve engagement with local restoration specialists, regulators (e.g. Fisheries and Oceans Canada), stakeholders (e.g. watershed groups) and landowners. Prepared offsetting plans to support *Fisheries Act* Authorization permitting process.

Fish Rescues, NS, 2020-Present – Technical Specialist and Field Crew: Assisted more than 75 fish rescues in the past four years in support of various transportation projects throughout Nova Scotia. Acted as both field crew and Project Manager, depending on the specific Project.

***Fisheries Act* Authorization, Fishermans Harbour, NS, 2024 – Project Coordinator:** Field coordination, preparation of the application, senior review, client and regulatory liaison.

Fish & Fish Habitat Assessments and *Fisheries Act* Authorization, NS, 2022-2023 – Technical Specialist: Completed detailed evaluation of effects to fish and fish habitat to support the *Fisheries Act* Authorization application for one provincially approved gold project. This involved detailed fish habitat assessment, fish community structure evaluation, effects assessment based for direct and indirect impacts, and offsetting for residual effects. Lead author of application.

***Fisheries Act* Request for Review, Purcells Cove, NS, 2022 – Project Coordinator:** Field scoping and coordination, preparation of the RFR, and client and regulator liaison for a shoreline alteration project.

***Fisheries Act* Request for Review, Route 332 Widening Project, Lunenburg, NS, 2021 – Technical Specialist:** Field scoping and coordination, preparation of the RFR.

Environmental Monitoring, NS, 2019-2021 – Environmental Monitor: Acted as an environmental monitor for exploratory and geotechnical drilling along the eastern shore. Completed regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring, and regulatory reporting.

Environmental Baseline Surveys, Mining, NS, 2017-2023 – Environmental Scientist & Technical Specialist: Completion and coordination of biophysical baseline data collection, reporting, and effects assessments for multiple gold mine environmental assessment projects (provincial and federal), including terrestrial habitats (flora and fauna), avifauna, wetlands, and fish and fish habitats. Provide technical review, specifically relating to qualifying direct and indirect impacts of open pit mining developments on fish and fish habitat.

Environmental Baseline Surveys, Wind and Quarries, NS, 2018-2023 – Environmental Scientist & Technical Specialist: Completion of environmental baseline surveys for multiple provincial environmental assessments for various wind power projects and quarries. Field lead for aquatic surveys, including scoping, implementation of field programs, and interpretation and reporting of results.

Fish Passage Restoration and Habitat Enhancement, Annapolis River, NS, 2016-2017 – Fisheries Lead: Coordination of field teams and scoping of field surveys, preparation of watershed plans, fish passage and fish habitat assessments, regulatory permitting and community outreach, implementation of fish passage restoration and habitat enhancement projects.

Marine Mammal Monitoring, QC, 2014 - Field Crew: Completed land and boat-based surveillance and enumeration of beluga whales in the St. Lawrence River.

Carrie Jardine, MSc. B.Sc. H
Senior Ecology Lead, Project Manager
Environmental Assessment & Approvals
Total Experience: 19 years

AREAS OF SPECIALIZATION

- Fish and Fish Habitat (Freshwater and Marine)
- Avian Ecology
- Species at Risk
- Water Quality
- Aquatic Toxicology
- Environmental Assessment
- Project Management
- Protocol and Guideline Development

EDUCATION

- MSc., University of PEI, Charlottetown, PE (2006). Thesis: Assessing the Toxicity of Prince Edward Island Stream Sediments Using Asian medaka Embryolarval Bioassays
- BSc. (Biology, with Honours), University of PEI, Charlottetown, PE. (2003)
  Thesis: The Effects of Social Interactions on the Growth and Development of Japanese medaka (*Oryzias latipes*)

TRAINING

- WHMIS (2023)
- Standard First Aid, Level C CPR and AED with the St. John Ambulance (2022)
- Restricted Operator's Certificate (Maritime)
- Small Non-Pleasure Vessel Basic Safety A3
- Small Vessel Operator Proficiency
- Wetland Delineation and Plant Adaptations and Identification Certification, Fern Hill Institute
- Bear Awareness Training
- Wilderness Survival Course
- Backpack Electrofishing: Crew Supervisor
- ATV, ARGO, and Snowmobile Training

RELEVANT EXPERIENCE

Ms. Jardine is a Senior Environmental Scientist working in our Environmental Assessment & Approvals group. Carrie has 19 years professional experience as a biologist in Canada and Internationally. She has worked for clients in the municipal, provincial, federal, oil and gas, mining, utility, green energy, and international sectors. She obtains permits and approvals on behalf of clients and works on environmental assessments for federal, provincial, and international jurisdictions. Carrie is involved with project management, desktop analysis, research, field data collection, field logistics and coordination, data entry, report writing, and submission of regulatory applications. She works closely with federal and provincial regulators and clients. Carrie has extensive field experience in fish and fish habitat, avifauna, water quality, and species at risk.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Impact Assessments and Screenings

Wind Farm Environmental Assessments: Melvin Lake, Strait Crossing, Wind Farm 1 (*In Progress*), Windy Ridge, Bear Lake and Kmtnuk, NS, 2022 - Present – Roles (depending on EA): Aquatics /Avifauna / Wood Turtle Disciple Lead: Responsible for coordinating and leading field programs such as wood turtle, avifauna, fish and fish habitat, and water quality. Responsible for conducting fish habitat assessments, water quality, and wetland delineations. Lead and senior technical reviewer on the avifauna VECs. Avian acoustics lead.

Indigenous Services Canada Simple Review Supporting Surveys, NS, 2023 – **Lead Biologist**: Responsible for coordinating and leading and conducting Chimney Swift and Pileated Woodpecker surveys, and fish and fish habitat assessments. Contributing author. Client liaison.

Environmental Effects Determination (EED), Gilholmes Lake, NS, 2020-2022 – **Project Manager:** Responsible for submitting an EED in accordance with Section 82 of the IAA.

Environmental Impact Statement Review, Fifteen Mile Stream, NS, 2021 – **Reviewer:** Responsible for the fish and fish habitat review and write up. Prepared a fish and fish habitat fact sheet and slides.

Environmental and Social Impact Assessment, Electrical Services Building, Resilience of the Electricity Sector Infrastructure to Geophysical and Climate Related Hazards, St. Vincent and the Grenadines, 2021 – **Main Author:** Main Author of the ESIA and plans.

Review of the Federal Environmental Impact Statement for Beaver Dam Gold Mine, 2019 – **Fisheries Discipline Lead:** Conducted a review of impacts to fish and provided input on the EIS.

EED, Maritime Forces Atlantic Routine Exercises in the Arctic, Northern Canada, 2018-2019 – **Contributing Author:** Contributing Author of the EED, conducted interviews, client liaison.

Environmental Assessment, Highway 104 Sutherlands River to Antigonish, NS, 2018 – **Discipline Lead/Contributing Author:** Fisheries field lead, contributing author of the EA. Conducted fish and fish habitat assessments, electrofishing, and breeding bird surveys.

Environmental Impact Assessment, Proposed WWTP Upgrade, Saint John Airport, NB, 2016 – **Main Author:** Main author for the Report, VEC Analysis, and Significance Determination.

Environmental Impact Assessment, Dolphinarium Development, Turks and Caicos, Grand Turk, 2016 – **Main Author:** Main author for the Environmental Assessment Report.

Joint Federal-Provincial Environmental Assessment, Route 11, NB, 2010-2011 – **Contributing Author:** Authored the wildlife and wildlife habitat, vegetation and wetland environment, and the current use of land and resources for traditional purposes by Aboriginal persons sections of the EA.

Canadian Environmental Assessment Act Screening, Bay of Fundy Tidal Energy Project, NS, 2010 – **Biologist**: Prepared the fisheries section of the report. Prepared the avian species at risk Post Construction Plan for ECCC. Conducted fish habitat assessments, bird surveys, wetland classification, and vegetation surveys.

Environmental Baseline Assessment Study, Proposed Casino Mine, Yukon, 2010 – **Wildlife Biologist:** Conducted wildlife snow tracking Developed the initial habitat model for the American marten.

Baseline Environment Assessment, Proposed Izok Mine, Nunavut, 2008 – **Fisheries Biologist:** Conducted fish sampling in lakes and streams; inserted radio transmitters in fish; radio-telemetry; PIT tagging; removing fish otoliths; taking tissue samples; lake bathymetry, and water sampling.

Regulatory Permitting and Compliance

***Fisheries Act* Request for Review and Letter of Advice Sydney Harbour, NS, 2025. Project Manager.** Fisheries disciple lead and main author on the RFR. Client and regulatory liaison.

***Fisheries Act (*Marine and Freshwater*) Black Point Quarry, Canso, NS, 2024 - Present. Fisheries Disciple Lead /Project Manager.** Fisheries disciple lead on the FAA and offsetting. Senior review and client liaison.

***Fisheries Act* (Marine) Authorization and Wetland Alteration Application - Route 207 Realignment, Lawrencetown, NS, 2024 - Present:** Project Manager – Project management, field coordination, preparation of the applications and report, client liaison, senior review.

Lake Major Wetland and Methylmercury Monitoring Year 5, Lake Major, NS, 2024 - Present – **Fisheries Discipline Lead:** Project Manager – Coordinated and managed the Year 5 wetland, water, and fish tissue methylmercury monitoring program which was developed in accordance with Condition 3.4 of the EA Approval for the Lake Major Dam Replacement Project.

Wind Farm Post Environmental Assessment Compliance and Monitoring: Mersey River, Higgins Mountain, Goose Harbour Lake, Weavers Mountain NS, 2024 - Present – **Avian Disciple Lead:** Responsible for coordinating and leading avifauna field programs, organizing and overseeing avifauna radar and acoustic reports, and senior review.

***Fisheries Act* (Marine and Freshwater) Aboiteau Replacement Design, Fish Passage and Monitoring, Avon River, NS, 2018-2023** – **Fisheries Discipline Lead:** Author of the monitoring plan for the Avon River. Conducted fish and fish habitat assessments, fisheries biologist representative at the open house, regulatory meetings, lead at DFO workshops, preparing the DFO request for review and authorization and government, client and public liaison.

***Fisheries Act* Authorization Uisce Tapa Tidal Energy Project, Parrsboro, NS, 2022-2023** – **Environmental Scientist:** Prepared DFO permit for the deployment of a tidal energy array at the FORCE site in the Bay of Fundy.

***Fisheries Act* Authorization, Wash Brook Floodwater Mitigation Project, NS, 2020-2023** – **Fisheries Discipline Lead:** Authored the Fisheries Act Authorization, attended various meetings with DFO, involved with Indigenous engagement and consultation. Preparing monitoring plans and developing the offsetting plan.

Compliance with *Fisheries Act* Authorization Halfway River, NS, 2020-2023 – **Fisheries Discipline Lead:** Responsible for developing objectives, identifying gaps, and providing recommendations. Involved with client, DFO, and team meetings. Review of MCG reports and providing feedback.

***Fisheries Act* (Marine) Port-Aux-Basque Navigation Improvement Project, NL, 2020-2021** – **Lead Biologist:** Responsible for leading and directing the wildlife habitat surveys. Senior advice on fish habitat surveys, completing the DFO HADD compensation plan under the *Fisheries Act*. Liaison with DFO/ECCC.

Watercourse Assessment & Alteration, Cape Breton Regional Hospital Expansion Project, NS, 2020 – **Project Manager Assistant**: Organized field programs, conducted a watercourse assessment, senior review and QA/QC of four watercourse alteration applications and three wetland alteration applications and reports to NSECC.

Regulatory Applications, Donkin Proposed Haul Road Phases I, II and III, NS, 2018-2020 – **Project Manager Assistant:** Prepared the fisheries report and submitted regulatory applications to DFO and NSECC. Managed field crews and the preparation of the wetlands report and regulatory application to NSECC.

***Fisheries Act* DFO Authorization Application: Summerside Port Corporation Maintenance Dredging Program, PEI, 2018-2019** – **Discipline Lead:** Prepared the fisheries authorization report and application and offsetting plan. Government and community group liaison.

Ecological Studies

Bat Habitat Assessment and Bird Surveys, Hartlen Point, NS, 2021-2023 – Avian Lead: Conducted migratory, breeding bird, owl, barn swallow roosting surveys, pileated woodpecker surveys, and barn swallow habitat surveys to support the Department of National Defence (DND) in determining if the proposed. Authored sections of the report.

Breeding Bird Surveys, Carters Beach Provincial Park, NS, 2022 – Avian Lead: Conducted breeding bird surveys to support in the development of new access trials and parking areas for Cartes Beach Provincial Park.

Environmental Services, Abegweit Connects – Phase I, PEI, 2021 – Field Lead: Responsible for wetland delineation, fish and fish habitat assessment, plant surveys, breeding bird surveys, and surveys for species at risk for the proposed active transportation facilities and support infrastructure.

Natural Systems Conservation Study, Ragged Lake Industrial Lands Reserve, NS, 2020-2021 – Fisheries Discipline Lead: Coordinated the fish field program and participated in wetlands and water quality. Established functional analysis layers with the input of the client, stakeholders, and the project team. Applied ecological values to each layer, prepared a report, and developed constraints analysis.

Range and Training Area Management Plan for Rifle and Grenade Ranges, NS/NL, 2015-2021 – Discipline Lead: Fish habitat, water quality, and wildlife field programs. Conducted field studies. Contributing author.

Ecosystem Classification Review and Assessment, Shaw Wilderness Park Forest, NS, 2020 – Project Manager: Conducted a desktop analysis using various spatial data sources, including LiDAR, multi-spectral imagery, ortho-imagery, and provincial forestry data to determine the boundaries of forest polygons and classify them based on the provincial FEC system.

Wetlands, Waterbodies, and Waterways Study, Logy Bay-Middle Cove-Outer Cove, NL, 2019-2020 – Environmental Scientist / Senior Review: Completed partial delineation of wetlands and watercourses within the boundary. Presented findings to the Town council.

Natural Resources Inventory Update, NS, 2011-2020 – Project Manager Assistant/Field Lead: Coordinated, designed, and executed the wildlife and bird surveys and aquatic field programs. Responsible for authoring sections of the reports and management plans

Ecological Assessment, North Arm of Great Slave Lake Proposed Area of Interest, NWT, 2009 – Fisheries Discipline Lead: Responsible for conducting a literature review of existing fisheries data, collecting baseline desktop information, gap analysis, and writing the fisheries section for the report.

Species at Risk Studies

Bat Habitat Assessment and SAR Surveys, NS, 2022-2023 – Biologist: Responsible for coordinating and leading and conducting Chimney Swift and Pileated Woodpecker Surveys, and bat exit surveys.

Aldershot SAR Surveys and Monitoring Year 4, BNS, 2021-2022 – Wildlife Biologist: Responsible for spring, breeding, and fall bird surveys throughout the Aldershot property. Responsible for identifying SAR.

Species at Risk Assessments, NS, 2018-2021 – Discipline Lead: Aquatics, water quality, wildlife field programs, electrofishing, fish habitat assessments, invertebrate sampling, water sampling, and bird surveys. Senior reviewer and contributing author of the reports.

Maritime Link Marine Cable Route Characterization and Constraints Analysis, NS/NL, 2015 – Biologist: Identified physical and biological (including SAR) temporal and spatial constraints and developed constraints and sensitivity mapping. Conducted literature review and main author.

Beaufort Sea Petroleum and Environmental Management Tool, 2009-2010 – Biologist: Research, government liaison, reporting on Peary caribou, beluga whale, and bowhead whale and assessed the impacts of potential oil and gas leasing options and developed sensitivity-rating criteria.

Caribou Protection Plans for Proposed Well Sites and Roads, AB, 2008 – Project Manager and Assistant: Responsible for government liaison, and preparing and organizing the caribou protection plans.

Water Quality, Aquatic and Sediment Toxicology

Marine Water Quality Monitoring, NS, 2014-2017 and 2020-2023 – Deputy Project Manager: Logistics and scheduling for the collection of water samples in NS for the Canadian Shellfish Sanitation Program.

Basewide Fish Survey: Monitoring Program, Labrador, 2013-2023 – Project Manager and Assistant: Coordinated, designed, and executed the Basewide Fish Monitoring Program in Goose Bay intermittently from 2013-2023. Collected fish for toxicology analysis, conducted analysis and observed trends over time.

Tier I Marine Waterlot Assessment, Small Craft Harbours (SCHs), NB/NS, 2022-2023 – Project Manager/Author: Assessed potential contaminant sources and helped to determine whether contaminants of potential concern in sediment at SCHs pose potential unacceptable risks to human and ecological receptors with the end goal of obtaining Site closure in accordance with the Federal Contaminated Sites Action Plan.

Abercrombie Ash Management Site Chromium VI Mitigation, NS, 2019 – Fisheries Biologist: Investigated environmental concerns at the AAM site. Conducted fish habitat assessment, electrofishing, invertebrate sampling, water quality, data analysis and reporting. Field program lead.

DFO Waterlot Assessment Risk Screening, Small Craft Harbours, NS, 2018-2019 – Project Manager: Project management of the Marine Sediment Sampling Programs, the Phase I ESAs, and the reports.

Outer False Harbour Digital Still Images at a Dredged Material Disposal Site, NS, 2017 – Project Manager: Project management of the collection of digital still images at the outer false harbour dredged material disposal site.

Marine Sediment Sampling Program for Small Craft Harbours, NL, 2017-2018 – Contributing Author: Reporting, benthic invertebrate analysis, tissue analysis, and assistance in risk analysis.

Protocols and Guidelines

Development of an Options Analysis, Evaluation of Biological Effects on Targeted Aquatic Organisms After an Oil Spill, NS, 2020 – Lead Author: Developed a list of recommended biomarkers to be part of an options analysis tool for the evaluation of biological effects on targeted aquatic species.

Belize Comprehensive National Water Quality Monitoring Program and Protocol, Belize, 2019 – Project Manager: Conducted stakeholder workshops and meetings, completed an inception report, and prepared the draft and final water quality monitoring program and protocol.

Post Deposit Monitoring Approaches for Measuring Environmental Concentrations and Effects of Drugs, Antibiotics, and Pesticides Used in the Canadian Aquaculture Industry: Part I, II, NS, 2015-2018 – Main Author: Main author of Part I and Part II of the reports and client liaison. Developed the post deposit monitoring approaches based on national and international studies and literature.

Maritime Forces Atlantic Operating Areas Management Plan: Redesign Mitigation Sheets, NS, 2013 – Author: Redesigned Mitigation Sheets for military exercises.

Emily MacLean, BASc.
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 3 years

AREAS OF SPECIALIZATION

- Fish collection and fish habitat assessments
- Wetland and watercourse delineation
- Wildlife surveys
- Data management
- Spatial analysis and creation of maps using QGIS and ARCGIS

EDUCATION

- Bachelor of Arts and Science (Climate and Environment) St. Francis Xavier University (2023)

TRAINING

- Backpack Electrofishing Certification (2024)
- Standard First Aid (2024)
- Pleasure Craft Licence (2024)
- WESP-AC (2023)
- WHMIS (2022)

RELEVANT EXPERIENCE

Ms. MacLean has gained environmental experience in Nova Scotia through environmental consulting and non-profit organizations. She has experience with environmental sampling, wildlife surveys, wetland and watercourse delineation, fish collection and habitat assessments, environmental monitoring, and data management/analysis. Ms. MacLean also completes spatial analysis and maps using ArcGIS and QGIS.

REPRESENTATIVE PROJECTS AND ROLES

Fisheries Offsetting, NS, 2024 – Environmental Scientist: Worked on a team to complete Habitat Suitability Index Assessment in watercourses to support offsetting for multiple projects. This assessment helps identify potential locations for restoration efforts.

***Fisheries Act* Authorization, Cooks Brook, NS, 2024 – Environmental Scientist:** Field lead for a detailed fish habitat assessment and fish collection program to support a *Fisheries Act* Authorization. The scope of work included detailed fish habitat assessments, trapping, and electrofishing over a period of eight weeks.

Environmental Assessment, Guysborough, NS, 2024 – Environmental Scientist: Completed wetland and watercourse field surveys to support a wind farm Environmental Assessment. The scope of work included wetland and watercourse delineation, SAR observations, and reporting.

Wood Turtle Study, Greenwood, NS, 2024 – Environmental Scientist: Worked on a team for a wood turtle survey field program. The scope of work included wood turtle surveys over a period of three weeks, data collection/ management, and final report writing.

Environmental Assessment, Cooks Brook, NS, 2023-2024 – Environmental Scientist: Worked on a team for a biophysical report and provincial gypsum mine Environmental Assessment. The scope of work included three rounds of eDNA collection to provide evidence on the presence/absence of Bioff Atlantic Salmon in watercourses surrounding mining projects, flow monitoring, detailed fish habitat assessment, and wetland and watercourse delineation.

Environmental Assessment, Trafalgar, NS, 2023-2024 – Environmental Scientist: Worked on a team for the biophysical assessments of an open pit gold mine Environmental Assessment. The scope of work included winter Mainland Moose surveys, PGI Moose surveys, surface water monitoring, flow monitoring, and species at risk (SAR) habitat observations.

Wetland Vulnerability Study, NS, 2023 – Environmental Scientist: Worked on a team to complete a wetland study as a method of wetland compensation. The scope of work included supporting field planning, executing the field program, spatial analysis and the creation of maps using QGIS, and supporting the final report. This involved developing new field forms for the purpose of the study and assessing one hundred wetlands throughout the Study Area. The final product of this Study can be used to identify which wetlands are most vulnerable to stressors and identify potential restoration opportunities.

Emma Davis, PhD
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 1 year

AREAS OF SPECIALIZATION

- Statistical and spatial analysis
- Biophysical survey design
- Impacts of climate change on natural systems
- Species conservation
- Effects of disturbance on plant communities

EDUCATION

- Doctor of Philosophy, Department of Geography, Environment & Geomatics, University of Guelph, Guelph, ON (2018). Thesis: An evaluation of constraints to treeline advance across multiple scales in the Canadian Rocky Mountains.
- Master of Science, Department of Geography, Carleton University, Ottawa, ON (2014) Thesis: The influence of vegetation and climate on wildfires in Jasper, Alberta, over the last ~3,500 years.
- Bachelor of Science, Environmental Science (Honours), Mount Allison University, Sackville, NB (2012). Thesis: Dendrochronology in the Canadian Prairies: Evaluating the Usefulness of Shelterbelt Species Now and in the Future.

TRAINING

- St. John's Ambulance First Aid & CPR/AED Level C (2025)

RELEVANT EXPERIENCE

Dr. Emma Davis is a landscape ecologist with an interest in the effects of disturbance and climate change on plant community dynamics. In particular, Emma has completed several research projects aimed at understanding how anthropogenic factors interact with natural process to cause changes in forest systems, particularly as it relates to rare and sensitive plant species and communities.

Emma completed her PhD at the University of Guelph in 2018 studying the long-term impacts of climate change on the distribution of alpine treelines in Canada's Rocky Mountain region. Her research involved combining data from a series of field experiments with greenhouse studies and dendrochronology to understand how soil characteristics, herbivory, and climate variables determine the ability of trees to establish at the edges of their distributional range.

Following the completion of her PhD, Emma held Postdoctoral Fellowships at the University of Guelph Arboretum and the University of Waterloo, where she worked with a multidisciplinary team of researchers and conservation practitioners to develop skills in conservation planning, remote sensing and spatial modelling. From 2022 to 2023, Emma held a position with the Government of Newfoundland and Labrador Wildlife Division as an Ecosystem Management Ecologist where she was responsible for drafting species recovery documents and coordinating recovery teams. Throughout her academic and professional career, Emma has enjoyed opportunities to collaborate with individuals from diverse backgrounds and areas of expertise while maintaining a strong record of publication in peer-reviewed journals.

REPRESENTATIVE PROJECTS AND ROLES

Renewable Energy and Infrastructure Environmental Assessments, NS (2025-Ongoing) – Environmental Scientist: Provided writing and editorial support during the preparation of several environmental assessment documents for proposed renewable energy projects and associated infrastructure.

Quality Control/Quality Assurance for Biophysical Field Data Collection, NS (2025-Ongoing) – Environmental Scientist: Coordinated timely reviews of incoming data from wetland and watercourse field programs to ensure the collection of complete and accurate data.

strum
CONSULTING

Emma Posluns, Msc.
Project Manager
Environmental Assessment & Approvals
Total Experience: 9 years

AREAS OF SPECIALIZATION

- Environmental Approvals
- Wetland and Watercourse Assessment and Delineations
- Wildlife Surveys
- Geospatial Data Analysis
- Wetland Permitting

EDUCATION

- Master of Science (Environmental Science), Memorial University of Newfoundland and Labrador (2013)
- Bachelor of Science (Geography), University of Victoria, Victoria, BC (2009)

TRAINING

- Watercourse Identification (2019)
- Technical Writing (2019)
- Backpack Electrofishing Certification (2018)
- At-Risk Landbird Identification Workshop (2018)
- Standard First Aid Level C CPR & AED – St John's Ambulance (2023)
- Wildlife Awareness Training (2015)
- WHMIS (2015)
- Geographic Information System (GIS) Training ESRI (2013)
- Facilitation Skills for Technical Professionals, Dalhousie University (2017)

RELEVANT EXPERIENCE

Emma Posluns is a Project Manager with the Environmental Assessment & Approvals Group, bringing nine years of experience in the field of environmental science. Her expertise spans proposal development, client engagement, field program coordination and execution. She has led and conducted a variety of wildlife surveys including wetland and watercourse surveys, winter transect surveys, avifauna assessments, botanical surveys, and species at risk surveys. Emma also has strong proficiency in geospatial data management and analysis.

In her career, Ms. Posluns has overseen the writing and submission of wetland permitting documentation, Environmental Management Plans, and provincial Environmental Assessments. She plays a key role in leading both terrestrial and aquatic biophysical component studies. She has planned and coordinated multi-team fieldwork across large projects and is knowledgeable in municipal, provincial and federal permitting and approvals processes.

REPRESENTATIVE PROJECTS AND ROLES

Wind Power Environmental Assessments, Multiple Locations, NS, 2025-Present – Project Manager: Providing project management, coordination of field work on several 100 MW+ wind farms. Coordinating the completion of field work, communicating with clients, reviewing and organizing field data. Ensuring the smooth transition from environmental assessment to project completion.

Antrim Gypsum Mine, Antrim, NS, 2022-Present – Project Coordinator: Coordinated multiple teams of field crew to conduct terrestrial and aquatic programs, including wetlands, watercourses, fishing, avifauna, lichenology, botany and habitat studies. Communicated with the client about timelines, project tasks, team safety, budgets, and field results. Answered questions and provided information to the public at a project open house. Organized the compilation and writing of four Environmental Assessment Registration Document (EARD) chapters by staff members. Supported the successful completion of an EARD. Continual support for the management of Species at Risk on the site, regulator communication, and evolving project activities.

Greenwood Wood Turtle Assessment, Greenwood, NS, 2024 – Project Manager: Facilitated a wood turtle assessment at the army base in Greenwood, requiring coordinating safety and background checks for all staff. Ensured safety and efficiency during a multi-week field assessment project. Communicated field results and updates to all stakeholders.

Six Mile Brook Pit Expansion EA Project, Pictou County, NS, 2023 – Project Manager: Coordinated multi-crew field work for various biophysical studies including wetlands, watercourses, fish and fish habitat, lichens, botany, and terrestrial habitat. Lead the compilation and writing of five reports to support the successful submission of an EARD. Successfully communicated with the client and provincial government to ensure environmental regulations followed.

Environmental Assessment, Shaw Sandpit, Middleton, NS, 2023 – Project Manager: Coordinated multi-crew field work for various biophysical studies including wetlands, watercourses, fish and fish habitat, lichens, botany, and terrestrial habitat. Lead the compilation and writing of five chapters to support the successful submission of an EARD. Successfully communicated with the client and provincial government to ensure environmental regulations followed.

Geomatics Data Analysis, Mining Projects, NS, 2023-2024 – Data Coordinator: Coordinated data organization, dissemination, and interpretation for client. Completed data analysis and map making for a mining project, sharing data and ensuring accuracy and precision of geospatial information.

Wetland Alteration Approvals, Various Locations, NS, 2023 – Project Manager: Managed the field data collection, data compilation, and reporting for over 30 wetland alteration permit submissions. Coordinated with Nova Scotia Environment and Climate Change on behalf of clients, communicated with the clients to ensure they were in compliance with government regulations. In-depth understanding of municipal and provincial environmental regulations and able to communicate that understanding to clients to help them meet their goals. Facilitated wetland compensation with clients to ensure no net loss of wetland habitat in the province.

Goldboro Gold Mine Environmental Assessments, Goldboro, NS 2020 - 2021 – Environmental Scientist: Coordinated and completed terrestrial field surveys, including wetland, watercourse, fish and fish habitat, avifauna, and habitat surveys. Arranged field crew logistics and communicated with client and project manager. Completed data QA/QC and compilation.

Environmental Baseline Surveys, Quarries and Mining, NS, 2018 - 2023 – Environmental Scientist: Completion and coordination of biophysical baseline data collection, reporting, and effects assessments for multiple gold mine environmental assessment projects (provincial and federal), including surveys of flora, fauna, habitat, avifauna, winter tracking, wetlands, fish and fish habitat.

François Gascon, P. Eng
Environmental Engineer
Environmental Assessment & Approvals
Total Experience: 12 years

PROFESSIONAL ASSOCIATIONS

- Association of Professional Engineers of Nova Scotia

AREAS OF SPECIALIZATION

- Industrial Approvals
- Environmental Approvals
- Hydrology/Hydrogeology
- Water Treatment
- Climate Change and GHG Assessments
- Dangerous Goods Assessments

EDUCATION

- Bachelor of Engineering (Environmental), Dalhousie University, Halifax, NS (2020)
- Civil/Mining Technician, Collège Boréal, Sudbury, ON (2010)

TRAINING

- Wilderness First Aid (2022)
- Standard First Aid & CPR (2021)
- WHMIS (2021)
- Confined Spaces (2021)
- Excavation and Trenching (2020)
- Pleasure Craft Operator License (2002)

RELEVANT EXPERIENCE

Mr. Gascon joined the Strum team in 2021 and leads a team with the Environmental Assessment and Approvals Group. Mr. Gascon is experienced in project management, engineering design, environmental monitoring, groundwater assessments, hazard assessments, environmental assessments, project reporting, and regulatory compliance.

Mr. Gascon has worked in various roles, from field technician to project manager, on numerous projects throughout Atlantic Canada, including various Industrial Approval applications, renewals, and amendments, dangerous goods permitting, and environmental monitoring. Additionally, he has valuable experience developing potable groundwater supplies, evaluating and treating water quality issues, and reviewing factors contributing to groundwater resource degradation at residential sites. His responsibilities lie in managing and coordinating these projects, completing various field programs, collecting, compiling, and analyzing data, developing mitigative measures/plans, and preparing reports and related regulatory paperwork.

More recently, Mr. Gascon has been developing and implementing Environmental Management Plans for a variety of small- and large-scale projects, including environmental monitoring and compliance components for groundwater, surface water, air quality, soil quality, erosion and sedimentation controls, vegetation/wildlife management, hazardous and non-hazardous waste management, spill response, remediation, and decommissioning works.

Mr. Gascon previously worked as a Research Assistant with the Centre for Water Resources Studies. His role involved researching the management and disposal options for municipal drinking water treatment plant waste residuals in the Northwest Territories.

Prior to completing his bachelor's degree, Mr. Gascon was a Mechanical Designer, developing and designing 3D renderings for heavy-duty industrial enclosures. Tasks included designing structures with computer-aided design software, formatting designs compatible with the water jet cutter, configuring assembly plans, and inspecting units for fabrication and assembly deficiencies.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Assessment, Simply Blue Group's Green Hydrogen to SAF Project, NS, 2024-Present – Environmental Engineer: On-going environmental assessment work (development of the EA Registration Document), including the development of technical and environmental component studies. Involved in coordinating the environmental considerations for the Pre-FEED.

Post-Approval Work, EverWind Point Tupper Green Hydrogen/Ammonia Project Phase 1, NS, 2023-Present – Environmental Engineer: On-going post-approval work (following approval of the EA Registration Document), including the development of environmental management and monitoring plans. These plans are developed to avoid/mitigate potential impacts to nearby environmental and residential receptors throughout the project lifespan.

Greenhouse Gas Assessments, NS and NL, 2022-Present – Environmental Engineer – Complete a greenhouse gas inventory for various projects across the Atlantic provinces. Quantifying the GHG generation/sinking potential of a project is becoming a requirement for regulatory, financial, and incentivized institutions. Understanding the GHG contributions from projects increases the requirements to offset and adapt to meet federal and provincial net-zero goals.

Waste Transfer Station Permitting, NS, 2022-Present – Intermediate Engineer: Complete regulatory outreach for the permitting of new waste transfer stations. The permitting process requires detailed engineering plans and specifications, contingency planning, air quality, noise, surface water, and groundwater management and monitoring.

Pyrolysis and Biochar Facilities, NS, 2021-Present – Intermediate Engineer: Complete field studies and key reporting requirements for Environmental Assessment and Industrial Approvals. The permitting process requires detailed engineering plans and specifications, contingency planning, air quality and dispersion modelling, and surface water and groundwater management and monitoring.

Compost Facility Environmental Monitoring Program, NS, 2021-Present – Intermediate Engineer: Monitoring groundwater and surface water sampling, data compilation, data analysis, and regulatory reporting. Prepared various approval amendment applications for submission to NSECC, direct correspondence with NSECC, and streamlined the monitoring and reporting program.

Wind Power Environmental Assessments, NS, 2021-Present – Intermediate Engineer: Conducted watercourse, wetland, fish/fish habitat, wildlife and avian assessments required, and environmental assessment reporting. Developed greenhouse gas and climate change assessment criteria for quantifying the effects or impacts of the Projects on the environment and climate change on the Projects.

Groundwater Geothermal Heating and Cooling System Review and Permitting, NS, 2021-Present – Intermediate Engineer: Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.

Municipal Compost Facility Leachate Handling System, NS, 2021-Present – Intermediate Engineer: Design, specification, and industrial approval amendment.

Level I and II Groundwater Assessments, NS, 2021-Present – Intermediate Engineer: Supervise well installation, pump testing (i.e., step and constant), sampling, analysis of aquifer characteristics, groundwater modelling, and regulatory reporting.

Groundwater Geothermal Cooling Systems, NS, 2021-Present – Intermediate Engineer: Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.

Environmental Assessment, EverWind Point Tupper Green Hydrogen/Ammonia Project, NS – Phase 1, NS, 2022 – Environmental Engineer: Completed field studies and key reporting requirements for the submission of an EA Registration Document for a green ammonia/hydrogen facility. This was the first green ammonia/hydrogen facility to be approved in both Nova Scotia and Canada.

Production Field Centre Hazardous Materials Assessment, NS, 2021 – Junior Engineer: Hazardous Materials inventory, coordinate sampling, data analysis, and reporting.

Greenhouse Gas Inventory Audit, NS, 2021 – Junior Engineer: Greenhouse Gas auditing for Fisheries and Oceans Canada (DFO) application.

Air Quality Improvement Design, Labrador, NL, 2021 – Junior Engineer: Design, specification, stack testing, data analysis, and construction of ventilation improvements.

Drinking and Wastewater Treatment Plant System Assessments, NS, 2021 – Junior Engineer: Assess water and wastewater infrastructure, establish an asset inventory, and reporting.

Municipal Groundwater Withdrawal Compliance, NS, 2021 – Junior Engineer: Review pumping rates and withdrawal volumes, spatial interferences, sustainability concerns, data analysis, and regulatory compliance.

Registered Potable Groundwater Supply Assessment, NS, 2021 – Junior Engineer: Review design specifications, well logs, water quality, data compilation, data analysis, and regulatory compliance.

Kathryn Smith, EIT
Civil Engineer-in-Training
Environmental Assessment & Approvals/Civil Engineering
Total Experience: 5 years

PROFESSIONAL ASSOCIATIONS

- Association of Engineers Nova Scotia
- Canadian Water Resources Association
- The Geological Society of America
- International Association of Hydrogeologists – Canadian National Chapter
- Canadian Geophysical Union

AREAS OF SPECIALIZATION

- Computer-Aided Design
- Hydrology and Hydrogeology
- Data Management and Analysis
- Climate Change Assessments
- Environmental Monitoring

EQUIPMENT EXPERIENCE

- GPS Equipment: RTK surveying (Emlid ReachS2+), LiDAR mapping (Matric 300 RTK), and visual and thermal imaging (Matrice 300 RTK, Matrice 210 RTK v2, and Mavic 2 Enterprise Advanced).
- Monitoring Equipment: Acoustic Doppler Current Profiler (ADCP), Distributed Temperature Sensing System (DTS), WalkTEM, GEM2, HOBO® and/or Solinst Water Level, Temperature, Dissolved Oxygen, and Conductivity Loggers, RBR Hydrodynamic Loggers, Multi-Parameter Water Quality Meter (YSI Sonde), Underwater Camera, HOBO® Weather Station, SonTek Flow Tracker 2, AquaTroll 600 (water quality monitoring).

EDUCATION

- Doctor of Philosophy in Civil Engineering, Dalhousie University, Halifax, NS (Current)
- Bachelor of Engineering (Civil), Dalhousie University, Halifax, NS (2019)
- Diploma in Engineering, St. Francis Xavier University, Antigonish, NS (2016)

TRAINING

- WHMIS (2023)
- Watercourse Alteration for Aquatic Habitat Restoration (2023)
- Critical Thinking in Aquifer Test Interpretation (2022)
- Centre for Entrupreneurship Education and Development (CEED) (2022)
- Small Remotely Piloted Aircraft System Basic Operations Pilot Certificate (2020)
- Introduction to Project Management – Procept Associates Ltd. (2019)

RELEVANT EXPERIENCE

Ms. Smith joined the Strum team in 2023 as a Civil Engineer-in-Training and is working with the Environmental Assessments & Approvals Group and Civil Engineering Group. Ms. Smith is experienced in project management, engineering design, environmental monitoring and modelling, surface water and groundwater assessments, and project reporting.

Ms. Smith will be completing her Ph.D. in Civil Engineering at Dalhousie University titled “Thermal Regime of Aquifers and Their Influences on Rivers: Patterns, Drivers, and Impacts.” Through this, she has gained valuable experience related to project management, report writing, grant writing, environmental monitoring, engineering design, water withdrawal approvals, environmental modelling, and conducting research. Her main responsibilities were to manage and coordinate several field-intensive campaigns, including but not limited to managing 5+ co-operative students, completing various field programs, collecting, compiling, and analyzing data, modelling water temperature and hydrodynamic conditions, developing recommended thermal management guidelines, and preparing reports.

Ms. Smith also has experience working as a co-operative engineering student with HALIFAX Traffic and the Province of Nova Scotia as a GIS engineering student out of the Port Hawkesbury office. More recently, she completed an 8-month internship with the Nova Scotia Salmon Association focused on the engineering design of thermal refuges in Nova Scotia rivers and the collection of thermal infrared imaging via unmanned aerial vehicles.

REPRESENTATIVE PROJECTS AND ROLES

Surface Runoff Assessment, NS, 2025-Present – Water Resources Engineer-in-Training: Surface runoff assessment to determine water quantity runoff amounts on a property in Nova Scotia for 1-20, 1-50, and 1-100 year return periods

using a HEC-HMS model. Creation and implementation of a field monitoring program for monitoring surface water levels and flows.

Surface Water Resources Assessment, NS, 2025-Present – Water Resources Engineer-in-Training: Hydrological assessment to determine water quantity amounts from a Nova Scotia lake, including the development of a high-level desktop model and analysis of groundwater, water level, and tidal data.

Surface Water Assessment, NS, 2025-Present – Water Resources Engineer-in-Training: Surface water assessment to determine implications for a proposed hydropower project.

Hydrological Assessment, Simply Blue Group's Green Hydrogen to SAF Project, NS, 2024-Present – Water Resources Engineer-in-Training: Hydrological assessment to determine sustainable yield from several lakes within Nova Scotia, including the development of high-level desktop model and water level and flow monitoring.

Hydrological Assessment and Surface Water Withdrawal Approval, EverWind Point Tupper Green Hydrogen/Ammonia Project Phase 1, NS, 2024-Present – Water Resources Engineer-in-Training: Hydrological assessment and development of a HEC-HMS and HEC-ResSim model to determine sustainable yields from Landrie Lake and Little River Reservoir. Prepared and submitted a surface water withdrawal approval to NSECC, direct correspondence with NSECC and DFO, conducted field data collection to support the approval application.

Hydrological Assessment, Botwood and Area Exploits Valley Renewable Energy Corporation Green Energy Project, NL, 2024-Present – Water Resources Engineer-in-Training: Hydrological assessment and development of a HEC-HMS model to determine sustainable yield from Peter's Pond in Botwood, NL to support the EIS submission. Preparing and executed field monitoring of surface water including flow and water level monitoring and water quality sampling.

Level I and II Groundwater Assessments, NS, 2024-Present – Water Resources Engineer-in-Training: Supervise pump testing (i.e., step and constant), sampling, analysis of aquifer characteristics, groundwater modelling, and regulatory reporting.

Hydrogeological Investigation, NS, 2024 – Hydrology/Hydrogeology Specialist: Managed field and desktop data collection and analysis of groundwater to support a Tim Horton's development agreement.

Groundwater Infiltration to Footings Assessment, NS, 2024 – Hydrology/Hydrogeology Specialist: Conduct groundwater level monitoring and determination of groundwater flow quantity and direction to a proposed underground parking lot. Preparation of groundwater dewatering estimates.

Saltwater Intrusion Assessment, NS, 2024 – Hydrology/Hydrogeology Specialist: Analyzed groundwater levels to determine saltwater intrusion risk to a mine development.

Melanie Smith, MES
Vice President – Environmental Assessment & Approvals, Partner
Total Experience: 24 years

AREAS OF SPECIALIZATION

- Project Management
- Environmental Assessment
- Ecological Assessment
- Habitat Assessment
- Regulatory Permitting, Monitoring, and Compliance Assessments
- Environmental Protection Plans
- Wetland/Watercourse Alterations
- Wetland and Fish Habitat Compensation

EDUCATION

- MES, Dalhousie University, Halifax, NS (2004)
- BSc. (Honours), Environmental Science, Acadia University, Wolfville, NS (2001)

TRAINING

- GBA+ Micro-learning Series (2022)
- Cultural Safety (2021)
- Unconscious Bias (2021)
- Emergency First Aid (2021)
- Management Development Program (2019)
- Advanced Training, *Impact Assessment Act* (2019)
- Introduction to CEAA 2012 (November 2012)
- Water Management & Wetland Restoration Training Course, University of Guelph (2010)

RELEVANT EXPERIENCE

Ms. Smith is the Vice President of Environmental Assessments and Approvals. She has a strong background in a variety of environmental program and policy areas. Ms. Smith has extensive experience leading teams, as well as building relationships and communicating with the public, regulators, the Mi'kmaq of Nova Scotia, clients, experts, and other stakeholders.

Prior to her appointment as Vice President of Environmental Assessments and Approvals at Strum, Ms. Smith held a Team Lead position with the Impact Assessment Agency of Canada. That role included the following:

- Led a team of professionals in completing federal environmental and impact assessments to support the Minister in decision making.
- Managed all aspects of assembling project teams, executing priorities, performance, deliverables, and overall quality.
- Supported the team in conducting Indigenous consultation, coordinating with federal and provincial departments, communicating with proponents, and engaging with stakeholders.
- Supported the team in the technical review of regulatory submissions under the *Canadian Environmental Assessment Act, 2022* and the *Impact Assessment Act*.
- Advised senior Agency officials on complex regulatory considerations.

Ms. Smith also held multiple roles with Nova Scotia Environment which included the following responsibilities:

- Led the development, management, and implementation of the Risk-Based Audit Project. The purpose of this corporate priority project was to modernize inspection services by using risk to maximize the allocation of limited resources while fulfilling the Department's mandate.
- Conducted extensive cross-sector collaboration within the Department, including all regions, inspectorates, divisions, and staff levels to ensure the project met the needs of working level staff and the goals of senior management.
- Provided strategic policy support and analysis for departmental programs and policies using the Regulatory Management Process.
- Conducted focus group sessions, coordinated stakeholder consultation, and provided recommendations to senior management.
- Completed inspections, responded to complaints, reviewed applications, and generated approvals related to the protection and sustainable use of air, land, and water resources in NS.

At Strum, Ms. Smith previously held progressive management roles including acting as the Team Lead during a long-term secondment of a senior manager and managed all aspects of a variety of projects within the Environment Group, including environmental assessments, watercourse alteration applications, wetland alteration applications, wetland

compensation, environmental protection plans, environmental monitoring, and ecological assessments. This also included successfully and simultaneously managing multiple provincial Environmental Assessments. Ms. Smith also has extensive experience creating budgets, schedules, staff resourcing and supervision, deliverables, and client communication. She has presented at public open houses, community liaison committee meetings, public hearings, and testified at a UARB hearing.

REPRESENTATIVE PROJECTS AND ROLES

Strum Consulting (current)

Wind Power Environmental Assessments, 2022-Present – Senior Reviewer: Providing senior review and management on several 100 MW+ wind farms in Nova Scotia.

Post-Approval Work, EverWind Point Tupper Green Hydrogen/Ammonia Project Phase 1, NS, 2023 – Senior Reviewer: On-going post-approval work (following approval of the EA Registration Document) including the development of environmental management and monitoring plans. These plans are developed to avoid/mitigate potential impacts to nearby environmental and residential receptors throughout the lifespan of the Project.

Environmental Assessment EverWind Point Tupper Green Hydrogen/Ammonia Project - Phase 1, NS, 2022 – Senior Reviewer: Completed senior review of field studies and key reporting requirements for the submission of an EA Registration Document for a green ammonia/hydrogen facility located in Cape Breton, NS. This was the first green ammonia/hydrogen facility to be approved in both Nova Scotia and Canada.

Impact Assessment Agency

Boat Harbour Remediation Project, 2018-2022 – **Team Lead:** Team Lead for the Agency's technical review of this project, as well as associated consultation with the Mi'kmaq of Nova Scotia and public engagement. This project conducted the Agency's first external technical review as part of the process.

Beaver Dam Mine Project, Fifteen Mile Stream Project, **2017-2022**– **Team Lead:** Team Lead for the Agency's technical review of these gold mining projects, as well as associated consultation with the Mi'kmaq of Nova Scotia and public engagement.

Canso Space Port, Northern Pulp Replacement Effluent Treatment System, Touquoy Mine Expansion, Goldboro Gold Mine, 2017-2021 – **Team Lead:** Team Lead for requests to the Minister for these projects to be subject to the *Impact Assessment Act*. Review and analysis involved input from federal departments and a decision package to the Minister.

Howse Property Iron Mine Project, 2018– **Team Lead:** Team Lead for the Minister's decision package for the Howse Property Iron Mine.

Strum Consulting (past)

Wind Power Environmental Assessments, 2011-2014 – Project Manager/Team Lead: Project managed and coordinated all aspects of the provincial EA process for seven wind power projects ranging in size from 4 MW to 10 MW. Project components included wetlands, watercourses, wildlife, avifauna, bats, sound, shadow flicker, visual aesthetics, socio-economic conditions, and effects assessment. Also highly involved in public engagement activities including participation at several municipal planning meetings and project open houses, as well as the preparation of presentation materials (e.g. posters, handouts, etc.).

South Canoe Wind Project, **2011-2013 – Project Manager/Team Lead:** Project managed and coordinated the completion of numerous desktop and field studies in support of a 100 MW wind power project. Studies included exclusion mapping; a desktop review of site habitat, species at risk (including flora, fauna, and avian species), and archaeological resources; a sound and shadow flicker assessment; a visual impact assessment; and field assessment for wetlands, watercourses, wildlife, and avian species. Managed the launch of the project website and completed the effects assessment for the biophysical components of the provincial environmental assessment registration document. Also developed presentation materials for and attended three public open houses and delivered multiple technical presentations to the Community Liaison Committee and as part of the Development Agreement Public Hearing process.

Polly Nguyen, MREM
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 3.5 years

AREAS OF SPECIALIZATION

- Data Management & Analysis
- Environmental Assessment
- Environmental Reporting
- Task Coordination & Management

RELEVANT EXPERIENCE

Ms. Nguyen joined the Strum team in 2023 as a Junior Environmental Scientist upon completing her coursework for her Resource and Environmental Management degree at Dalhousie University. While at Dalhousie, Ms. Nguyen engaged in a variety of interdisciplinary areas of natural resource management, including nature-based solutions, socio-ecological studies, and environmental impact assessment. Her diverse professional and academic experiences demonstrate strong adaptability to different fields and a wide breadth of skill sets.

EDUCATION

- Master of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2023)
- Bachelor of Arts, Major in International Relations and Economics – Boston University (2021)

TRAINING

- UTV Certification – Canada Safety Council (2023)
- Workplace First Aid & CPR/AED – (2023)
- WHMIS (2023)
- Trailer training (2023)
- Bear Awareness (2023)
- Wetland Ecosystem Services Protocol for Atlantic Canada Training (2024)
- Wetland Delineation Training (2024)

During her graduate studies, Polly focused on improving her strengths in socio-ecological studies while fostering her interests in natural resources management and field-based assessment. She worked as a Knowledge Mobilization Assistant for the Natural Sciences and Engineering Research Council (NSERC) – ResNet organization where she participated in researching and drafting policy briefs on climate sustainability and resiliency within the landscape of the Bay of Fundy dykelands. She engaged in various academic opportunities to build upon her experiences in natural resource management and assessment, such as drafting a policy commentary on the lack of diverse socio-economic factors within the environmental impact assessment and collaborating with multidisciplinary teams to contribute to local issues. As a culmination of her strengths and interests, Polly researched on the interconnected relationship between intersectionality and mental health in influencing environmental participation in the climate movement within Nova Scotia for her final MREM Research Project.

To further build her field-based experiences, Polly worked as a teaching assistant for introductory and advanced environmental science courses, including Field Methods in Environmental Science where Polly led field programs and guided university students with scientific field notes and report writing. Polly also completed an intensive field course during her Master's degree where she conducted forestry composition surveys, CABIN protocols, avian surveys, benthic invertebrates surveys, herpetofauna surveys, nocturnal invertebrates surveys, data analysis, and report writing. Alongside her MREM internship with NSERC ResNet, Polly collaborated with natural sciences scholars on the completion of a decadal review of natural resources and social sciences for the International Association for Society and Natural Resources (IASNR) where she liaised with editors on chapters completion and compiled qualitative data on trends within social and natural resources for the introductory chapter. Through these experiences, Polly has gained experience in adapting her skills to a diverse range of experiences and further improving her skill sets.

Polly is active in conducting environmental assessments, wetland delineations, watercourse assessments, old-growth forest surveys, avian surveys, and other ecological studies. She has experience in utilization of specialized monitoring equipment and data analysis, such as avian acoustic monitor, trail cameras, and ambient noise monitors. She is knowledgeable with provincial and federal regulations and works closely with senior staff and field leads in conducting significant fieldwork and preparing reports.

REPRESENTATIVE PROJECTS AND ROLES

Wind Power Environmental Assessments, NS, 2023-Present – **Environmental Scientist:** Conduct field work on several 100 MW+ wind farms in Nova Scotia, including wetland, watercourse, fish and fish habitat, old-growth, avian, avian radar, bat, wildlife, flora, and lichen surveys. Prepared, reviewed, and organized field data using several methods of collection. Inventoried and configured specialized monitoring gears, such as trail cameras and acoustic monitors, and regularly performed maintenance checks. Prepared EA related documents, including methodologies, effects assessments, and desktop reviews.

Radar and Acoustic Assessment, NS, 2023-Present – Environmental Scientist: Conduct radar analysis on a specialized program to collect avifauna presence on project sites. Conducted quantitative analysis on processed radar and acoustic data to support technical reports on avifauna presence and remote sensing. Lead report coordination and completion of these technical reports for wind projects and other relevant projects.

Post-Approval Works, NS, 2023-Present – **Junior Environmental Scientist:** Conduct data compilation and reports for various wind farm projects, such as Goose Harbour Lake Wind Farm, Mersey Wind Farm, and Weavers Wind Farm, to fulfill post-approval conditions, such as the creation of Wildlife Management Plans, Contingency Plans, Baseline Noise Monitoring, and Watercourse Alteration applications.

Environmental Noise Measurement, NS, 2023-Present – **Junior Environmental Scientist:** Configure noise monitors with correct data collection settings prior to field deployment. Initiated noise monitoring deployment for various projects, including the Mersey Wind Farm Project and EverWind Point Tupper Green Hydrogen/Ammonia Project, and compiled data for data analysis and completion of noise monitoring plans. Initiated proposals for baseline noise monitoring programs with appropriate field schedules, required equipment, and budget calculations. Complete a standard operating procedure for deployment procedures, data analysis, and report compilation.

Avian Surveys, NS, 2023-Present – **Junior Environmental Scientist:** Conducted diurnal watch counts, breeding bird surveys and nightjar surveys for various wind projects, including Mersey Wind Farm Project and Goose Harbour Lake Wind Farm Project.

Orbital Marine Tidal Project, NS, 2023 – Junior Environmental Scientist: Completed desktop reviews and analysis on ambient noise and environmental effects of tidal turbines on marine species within the Minas Passage of the Bay of Fundy. Helped completed a supplemental information report to be sent to relevant regulatory agencies.

Urban Nature and Infrastructure in the Face of Increasing Storm Events 2022 – MREM Tri-course Project: Worked on a multi-disciplinary team to address the biophysical, environmental law and policy, and sociopolitical challenges of urban planning and the incorporation of urban nature in the face of increasing severe storms in Nova Scotia. This involved research into the interconnected relationship between urban trees and utility infrastructure, relevant regulatory bodies and policies, and recommendations into establishing nature-based solutions and smart urban forest management within HRM and the province.

Sasha Chilibeck, BSc. (Hon)
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 1 year

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment
- Wetland Delineation & Functional Assessment
- Wildlife Surveys & Assessment
- Electrofishing & Fish Habitat Assessment
- Environmental Reporting
- Environmental Monitoring

EDUCATION

- B.Sc. Combined Honours in Environmental Science and Biology from Dalhousie University (2025)
- Certificate in Environmental Impact Assessment from Dalhousie University (2025)

TRAINING

- Remote/Wilderness First Aid – Canadian Red Cross (2025)
- Care and Use of Wildlife Certificate – Canadian Council on Animal Care (2022)
- WHMIS (GHS) Training (2022)

RELEVANT EXPERIENCE

Ms. Chilibeck joined Strum Consulting full-time in April 2025 after completing her Bachelor of Science in Environmental Science and Biology at Dalhousie University. She has previously worked in consulting during a co-op work term with McCallum Environmental Ltd. (now Strum Consulting) in 2022 and worked on-contract for Strum from July to October in 2024.

Ms. Chilibeck has a varied background in professional and academic work. She has worked for the non-profits Net Zero Atlantic (co-op term in 2023) and Birds Canada (contract in 2024); in natural resource management for Premier Tech Horticulture (co-op term in 2024); and as a teaching assistant at Dalhousie University (part-time, 2023-2025). She also completed her Honour's thesis researching the breeding biology of Leach's storm-petrel, a globally vulnerable seabird found in Atlantic Canada. These experiences have made Ms. Chilibeck well-rounded in understanding conservation management and research, community engagement, and industry practices.

Ms. Chilibeck is a member of the Environmental Assessment and Approvals group at Strum and work primarily with the avifauna team, spending much of her time contributing to the fieldwork and reporting aspects of the avifauna chapters for environmental assessments; however, her experience makes her well-suited to assisting on a variety of remote field projects across Atlantic Canada. Other work she has completed includes assisting with electrofishing, wetland delineation and assessments, and wildlife surveys. She is also experienced with driving 4x4, ATVs, and hauling heavy equipment.

REPRESENTATIVE PROJECTS AND ROLES

Wetland Delineation Fieldwork, NS, 2022-Present – Environmental Scientist: Completed wetland delineation and functional assessments at variety of project sites, including mines and wind farms.

Wetland Monitoring, NS, 2025-Present – Environmental Scientist: Responsible for conducting field assessments for several wetland monitoring programs. Field assessments included wetland delineation & functional assessment, monitoring well installment, vegetation plot monitoring, and in-situ water chemistry sampling.

Surface Water Sampling and Surface Flow Measurements, NS, 2022-Present – Environmental Scientist: Assisted with completing baseline surface water quality sampling and surface flow measurements across several projects in Nova Scotia, including three potential gold mines and one gypsum mine.

Nesting Bird Searches, NS, 2025-Present – Environmental Scientist: Surveyed prospective project areas for the presence of nesting birds to mitigate potential impacts of construction activities. Collected field data related to any observed species and reported on the findings. Flagged buffer areas for any identified species.

Avifauna Surveys, NS, 2024-Present – Environmental Scientist: Surveyed diversity of proposed projects (e.g., quarries, powerplants, wind farms, mine site) for birds throughout the spring migration, breeding bird, and fall migration seasons. Field surveys include diurnal watch counts to identify migratory corridors; breeding bird area searches to locate breeding bird activity in areas of sites that are not targeted by standardized surveys; and nightjar surveys to identify project usage by crepuscular bird species. Also contributed to analyzing and reporting findings from surveys into reports for clients.

Kerry Wallace, BSc (Hons)., Adv Dipl
Geomatics Technician
Environmental Assessment & Approvals
Total Experience: 5 years

AREAS OF SPECIALIZATION

- Geographic Information Systems (GIS)
- Location, Spatial, and Data Analytics
- Database Management
- Geoprocessing, Model Building
- Civic Addressing

COMPUTER EXPERIENCE

- GIS Software: ArcGIS Suite, QGIS
- Other Software: CorelDRAW X7
- Scripting: SQL, Python 2 & 3

EDUCATION

- Advanced Diploma in Geographic Information Systems (GIS), Centre of Geographic Sciences (COGS), Lawrencetown, NS (2020) ‘
- Bachelor of Science with Honours, Major in Geology, Saint Mary’s University, Halifax, NS (2019

TRAINING

- Emergency First Aid CPR Level ”C” & AED (2021)
- WHMIS (2023)
- Over 100 hours ESRI Academy Training (2019 – Present)

RELEVANT EXPERIENCE

Ms. Wallace is a GIS Technician working in the Environmental Assessments and Approvals group. She joined the team in early 2023 and has been helping the GIS team with data analysis and creating mapping products for environmental assessments and other projects.

Ms. Wallace received her Bachelor of Science with Honours in Geology at Saint Mary’s University in 2019. While studying at Saint Mary’s, Ms. Wallace was a research assistant, and was able to use a variety of tools to aid in the analysis of minerals and in their identification process. Ms. Wallace then went on to receive an Advanced Diploma in Geographic Information Systems at the Centre of Geographic Sciences in 2020.

Before joining Strum, Ms. Wallace worked for the Province of Nova Scotia as part of the Civic Addressing team, where she was able to continue to use GIS and was involved in the emergency management operations during Hurricane Fiona where she analysed data and created a dashboard to help the team with their planning going forward.

REPRESENTATIVE PROJECTS AND ROLES

Wind Farm Projects, NS, 2023 - Present - Geomatics Technician: Compiled and checked collected field data, performed geospatial data analysis, and completed numerous drawings as a visual aid in environmental assessments and other reports.

Detrital Mineral Provenance Analyses from the Cretaceous McMurray Formation, Alberta and the Holocene Portneuf River Delta, North Shore of Quebec (2021) – Research Assistant: Used a scanning electron microscope to determine mineral composition and to identify mineral assemblages in different offshore wells in the Scotian Basin. Supplementary graphs were created to aid in demonstrating mineral assemblages and chemical composition.

Sedimentary Petrology of the Upper Cree Member in the Cohasset A-52 Well, Scotian Basin, Offshore Nova Scotia (2020) – Research Assistant: Used a scanning electron microscope to determine mineral composition and to identify mineral assemblages in different offshore wells in the Scotian Basin. Supplementary graphs were created to aid in demonstrating mineral assemblages and chemical composition.

Electron Microprobe and Scanning Electron Microscope Mineral Analyses of Diagenetic Minerals from Lower Cretaceous Reservoir Sandstone, Scotian Basin, Offshore Nova Scotia (2019) – Research Assistant: Computer software was used to combine all backscattered electron images captured from a scanning electron microscope.

Detrital Petrology and Provenance of the Logan Canyon Formation Sandstones, Scotian Basin (2019) – Research Assistant: Analyzed petrographic information from samples using a scanning electron microscope, where mineral composition was determined using Energy dispersive spectroscopy and identification was helped with backscattered electron images using texture and brightness as a guide. Heavy mineral separation and identification was used to determine mineral assemblages and understand origins.

Peter Opra, MSc., Adv Dipl
Remote Sensing Scientist
Environmental Assessment & Approvals
Total Experience: 7 years

AREAS OF SPECIALIZATION

- Remote Sensing
- Geographic Information Systems (GIS)
- LiDAR
- Photogrammetry
- Location, spatial, and data analytics
- Geoprocessing, Model Building, and automation
- Database management
- Geomorphology
- Hydrologic Modelling

EDUCATION

- Master of Science in Applied Geomatics, Acadia University, Wolfville, NS (2021)
- Advanced Diploma in Geographic Information Systems (GIS), Centre of Geographic Sciences (COGS), Lawrencetown, NS (2020)
- Bachelor of Science, Major in Geology Saint Mary's University, Halifax, NS (2019)

TRAINING

- Standard First Aid and WHMIS (2022)
- RPAS Pilot Certification (2021)
- Over 200 hours ESRI Academy Training (2019 – Present)

COMPUTER EXPERIENCE

- Operating Systems: Windows, macOS
- GPS Software: Garmin BaseCamp, Trimble Geospatial
- GIS Software: ArcGIS Suite, QGIS, Global Mapper
- Remote Sensing Data Processing: DJI Terra, ArcGIS Pro, Trimble Inpho, POSPac MMS, LAStools
- Other Software: CorelDRAW X7
- Scripting: Python 2 & 3, SQL

RELEVANT EXPERIENCE

Mr. Opra is a GIS Specialist with Strum working in our Environmental Assessments and Approvals group. Mr. Opra specializes in Geomatics analysis and automation. He has extensive experience in implementing workflows for data analysis and processing. This experience includes trajectory processing, processing single and dual channel LiDAR data, photogrammetry, and automation of geospatial data analysis with both vector and raster data. In addition, Mr. Opra is experienced in operating a RPAS for data collection.

During his graduate studies, Mr. Opra focused on the application of remote sensing technologies in exploration geology. He investigated LiDAR as an effective means to visualize topography and in further detail, geomorphological features such as folds and glacial structures. He explored the advantages of both RPAS and airplane-acquired LiDAR while reviewing various software for processing and analysis. Mr. Opra helped support the project's RPAS surveys in Trafalgar, Nova Scotia and processed the data to produce high resolution terrain models.

Prior to and following his research contribution, Mr. Opra worked in academia as an advisor, then in the industry as a Geospatial Data Analyst and as a Remote Sensing Analyst. In academia, he assisted with an Honours thesis in developing a geospatial model to automatically detect sinkholes based on LiDAR data. He also assisted in a Master's thesis by mapping legacy gold mine tailings, and developing a survey grid for sampling. As a geospatial data analyst, he helped create new data products using multispectral imagery for precision agriculture. Through working on various LiDAR and Photogrammetry projects based throughout the Caribbean, USA, and Canada, Mr. Opra was able to apply automation to photogrammetry procedures and LiDAR processing. His commitment to data quality assurance and control allowed him to develop a deeper understanding of how data is affected by environmental and human factors. His experience in both geology and environmental science allows him to have a strategic approach for geospatial analysis in environmental consulting.

Due to the multidisciplinary nature of Geomatics, Mr. Opra developed the ability to anticipate, identify, and solve diverse geospatial problems. Mr. Opra continues to research advancements in technology to build on and develop efficient procedures for data analysis and collection.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Constraint Analysis, NB, NS, NL, 2023-Present – Remote Sensing Scientist: Land cover, landform, and hydro analysis for projects throughout the Maritimes. Using remotely sensed baseline data to create geospatial data products.

Hydrologic Modelling, NB, NS, NL, 2023-Present – Remote Sensing Scientist: Identifying stream networks and creating geospatial data products to guide project designs. Geospatial products that are created but are not limited to, Depth to Water, potential wetlands, potential watercourses, and catchment areas for various scale projects. High resolution remotely sensed data (e.g., LiDAR and Multispectral Imagery) is used to gain insights about complex hydrology.

EverWind Fuels Green Hydrogen Project, NS, 2022-Present – Geomatics Specialist: Spearheaded geospatial analysis, supported external inquiries, and integrated environmental and socioeconomic factors in the assessments.

Wind Farm Projects, NS, 2022-Present – Geomatics Specialist: Streamlining field data collection, developed in house habitat modelling, tracking applications, and performing geospatial data analysis.

Sinkhole Delineation Automation, NS, 2021-2022 – Advisor: Assisted in the development of a model within ArcGIS Pro for automating detection and delineation of sinkholes in the Karst prone areas.

LiDAR and Orthoimagery Data Production, Caribbean, USA, and Canada, 2021-2022 – Remote Sensing Analyst: Trajectory processing, LiDAR processing, automation, and creation of data products from inception to delivery.

Multispectral Vineyard Imagery Data Production, California, USA, 2020 – Geospatial Data Analyst: Assisted with the development of new proprietary geospatial products for precision agriculture.

Epiphytic Lichens as Spatial Biomonitors of Airbourne Mercury and Arsenic, 2019 – Research Intern: Used GPS to map historical mining sites, and designed survey grids for Lichen collection.

Provenance and Diagenesis of Sandstones in the Deep Wells Annapolis G-24, Balvenie B-79, Crimson F-81, Weymouth A-45, and Newburn H-23, Scotian Basin, offshore NS, 2017-2018 – Research Assistant: Creation of graphic models and diagrams using data captured by a scanning electron microscope (SEM) to further research efforts in understanding the geology of the Scotian Basin.

Petrography of Bedrock and Ice-rafted Granules, Flemish Cap, offshore Newfoundland and Labrador, 2017 – Research Assistant: Determining petrographic information of the samples using a scanning electron microscope (SEM). Energy dispersive spectroscopy (EDS) was used to determine mineral composition and backscattered electron images (BSE) where used to identify textures. Graphic design software was used to aggregate the images captured from the SEM.

CORE TEAM MEMBER

Karim Meghari, MASc., P.Eng.

GLOBAL MANAGING DIRECTOR, THERMAL POWER

Education & Qualifications

MASc, Chemical Engineering, University of Montreal, Montreal, Quebec, Canada, 1994
BEng, Mechanical Engineering, Algerian Petroleum Institute, Algiers, Algeria, 1988

Professional Affiliations

PEO - Professional Engineers of Ontario - Member (PEO # 100034364)

Experience

25+years

Specialties

Power generation, from plant planning, technical assessments and due diligence reviews, major capital project implementation from conceptual design and studies to final detailed design

Karim is passionate about his work in thermal power and brings to the team over 30 years of experience in power plant engineering design, construction, and commissioning. His vast experience keen sense of planning, execution and getting the job done on time and on budget bring significant value to thermal power projects.

Karim's professional journey started in the operation of a gas turbine compressor station, then progressed to thermal power plant development where he led numerous projects globally, including challenging captive power plant projects with weak or no grid connection.

In Eastern Canada Karim led the Life Extension and Condition Assessment of NL Hydro's Holyrood Thermal Power Plant Station, the 150 MW Avalon CT conceptual engineering design, and most recently he was the sponsor on the Avalon CT FEED study.

Karim is the global director for thermal power at Hatch with over 30 years of experience in the development and delivery of traditional and complex thermal power plant projects gained across North America, Australia, Asia, Africa, and the Middle East. Karim has delivered detailed engineering design for thermal power plants, combined cycle power plants, and cogeneration plants. He is experienced in all phases of power generation, from plant planning, technical assessments and due diligence reviews, major capital project implementation from conceptual design and studies to final detailed design, construction management, field engineering management, plant commissioning and start up. Karim also serves as project manager and business sponsor on large thermal power projects.

RELEVANT PROJECT EXPERIENCE

Holyrood 150 MW Combustion Turbine Power Plant (now known as Avalon Combustion Turbine Project) FEED Study, Newfoundland and Labrador Hydro – Holyrood, NL, Project Sponsor & Conceptual Design Lead. Front-End Engineering Design (FEED) for a 150 MW combustion turbine power plant. The power plant civil works are designed with the capability of expanding to 300 MW in the future. The combustion turbine generators (CTG) will operate primarily on light fuel oil (No. 2 Distillate Diesel Fuel) but convertible or retrofittable to operate on natural gas, hydrogen / natural gas blends, and / or biofuels. Provided overall corporate oversight and support. Sourcing of technical resources as required. Commercial advice for design team.

Manitoba Hydro, Backup Simple Cycle, Manitoba Hydro – Winnipeg, Manitoba, Project Manager/Project Sponsor. The work involved site selection, environmental review, conceptual engineering, technical specification for the purchase of a three F class gas turbines (Ge 7FA, Siemens SGT 5000F), contracting strategy, PFDs, 3D modelling, risk review, level 2 schedule, capital and operating cost estimate. The project is ongoing. Managed the execution and delivery of all project deliverables. Ensured the project was delivered on schedule and within budget.

Hell's Kitchen Geothermal Power Plant, Fuji Electric – California, United States, Project Sponsor. Controlled Thermal Resources (CTR) and Fuji Electric Corp. of America (FEA) have retained Hatch to complete detail engineering design of Hell's Kitchen single pressure condensing steam turbine generator capable of producing 49.9 MWe (net). The Power Generation Facility included the brine separator, steam scrubber and demister, rock muffler, steam turbine, condenser, gas removal system, cooling tower, BIOX system, diesel generator, power distribution E-house's and 230 kV substation, brine emergency flashing and injection systems. Maintained client relations as the project sponsor. Provided leadership, integrating all project functions, and resolved any issues that arose within the team between functions and with the client.

Holyrood Thermal Generated Station (HTGS), Condition Assessment and Life Extension Study, Newfoundland and Labrador Hydro – Holyrood, NL, Project Manager. Condition assessment and continued extension of Holyrood power station whether online in full generation mode or standby mode and study of the viability and suitability of converting the units to back up generation mode to support the island system in the event of prolonged outage of the Labrador Island link. The scope of work included technical review of the assets, review of condition assessment reports, onsite inspection, study of the modifications required to convert the power plant to fast recall, and capital plan development. Managed project execution, schedule, budget, and an interdisciplinary engineering team.

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Takoradi T 3 Repowering, Volta River Authority, Takoradi, Ghana, VRA – Takoradi, Ghana, Project Manager. Takoradi T3 is 132 MW combined cycle power plant, the plant has been in shut down since 2015, Hatch developed the condition assessment and visual inspection of combined cycle power major equipment and systems. Developed the road map for repowering the asset, EOI for EPC contractors' engagement, technical specification, technical requirement documents, and bid forms in support of VRA procurement of EPC contractor services. Managed the execution and delivery of all project deliverables. Ensured the project was delivered on schedule and within budget.

Hell's Kitchen Geothermal Power Plant, Controlled Thermal Resources (CTR) – California, United States, Project Manager. Hatch was sole sourced to perform the preliminary engineering study for Control Thermal Resource's (CTR's) geothermal power plant which will be located in the Salton Sea. The preliminary engineering Study, included PFD development, heat & mass balances, P&IDs, single line diagrams, equipment sizing and specification, technical bid evaluations, layouts (3D modelling), discipline MTO development, CAPEX and OPEX development. Managed the execution and delivery of all project deliverables. Ensured the project was delivered on schedule and within budget.

EGA ATA Power and Steam Integration Project, Hatch, Abu Dhabi – United Arab Emirates (UAE), Engineering Manager. The ATA Power and Steam Integration involved the addition of a GE9FA combustion turbine and heat recovery steam generator, as well as converting the existing simple cycle unit into combined cycle, a condensate treatment centre, a new water treatment plant, and all required utility interconnections. Responsible for detail engineering design for the Power and Steam Integration Project Management of a global engineering delivery team, with the site team in the United Arab Emirates being supported by Hatch engineering offices in South Africa.

Project Sunrise Technical Due Diligence, Actis – Axapusco, State of México, Mexico, Project Manager. Technical due diligence review of EVM Energía del Valle de México, S.A.P.I de C.V ("EVM I") Open Cycle Gas Turbine (OCGT) plant consisting of 2 LM 6000 gas turbines with a technical capacity of 99 MW and EVM Energía del Valle de México Generador, S.A.P.I de C.V ("EVM II") Combined Cycle Gas Turbine (CCGT) plant consisting of 2 GE H class gas turbines, 2 HRSG's, and one steam turbine, with a technical capacity of 850 MW. Responsible for managing the completion of all detail technical review, site visit, red flags analysis, review of project agreements including PPA, detail capital and operating cost estimates reviews and input to financial model.

CORE TEAM MEMBER

George Cooper, BScE., P.Eng.

SENIOR ENGINEER, THERMAL POWER

Education & Qualifications

BSc., Mechanical Engineering, Queen's University, 2007

Professional Affiliations

PEGNL - Professional Engineers and Geoscientists Newfoundland and Labrador - Professional Engineer

IPowerE - Institution of Power Engineers - President

PEO - Professional Engineers of Ontario - Professional Engineer

EGBC – Engineers and Geoscientists of British Colombia

Experience

18 years

Specialties

Thermal Power Generation (Reciprocating Engine, Gas Turbine, And Steam Turbine Generators), Cogeneration, And Hybrid Power System Design

George is a senior mechanical engineer with extensive experience in power plant engineering for thermal power generation and cogeneration using gas turbines, steam turbines and reciprocating engines. On previous projects, he has taken on roles performing detailed power plant engineering, condition assessments, construction monitoring, commissioning, and startup. In recent work he has lead project development activities for combustion turbine generating facilities including the IESO NS Fast Acting Generating Facility project, the NB Power RIGS project, and a FEED study for the NL Hydro 150 MW Avalon combustion turbine power plant.

George's experience in design and project delivery, and hands on experience with commissioning and startup make him a trusted technical leader for developing thermal power projects.

RELEVANT PROJECT EXPERIENCE

Holyrood 150 MW Combustion Turbine Power Plant (now known as Avalon Combustion Turbine Project) FEED Study, Newfoundland and Labrador Hydro – Holyrood, NL, Mechanical Engineer. Front-End Engineering Design (FEED) for a 150 MW simple cycle combustion turbine power plant at the Holyrood Thermal Generating (HTGS) power plant site. Hatch performed a FEED study which included Front-End Engineering Planning (FEEP), Front-End Engineering Design (FEED), with a review at the FEED 50% point and the FEED 99% point, as well as a final FEED report. The engineering work involved preliminary discipline design, for process, mechanical, piping, electrical, I&C, civil, and structural. Primary author of study proposal, scope and execution plan. Provided SME support to project team, onboarding of the team through the project kick-off site visit. Supported PFD, HMB, and P&ID development and conducted senior reviews of process and mechanical deliverables.

Holyrood Life Extension Condition Assessment, NL Hydro – Holyrood, NL, Mechanical Engineer. Assessment of the required refurbishment works and investment for future operation of the Holyrood generating station to provide backup power generation and synchronous condensing services. Assessment of OEM boiler inspections and coordination of jetty inspections, ROV inspections of the cooling water intakes, and tank coating inspections. Supported the scope development and project team mobilization to site. Supervised and supported the project site office deployment to the Holyrood site contractors' area. Onboarded key members to the project team through site visit walkdowns to ensure team members were familiar with the plant design, operation and work areas where site inspections were applicable for the site visit. Provided local support for the multidisciplinary team of Hatch subject matter experts by performing site visits and data collection. Completed assessment of black start diesel generator facilities.

Voisey's Bay Mine Expansion Project, Vale Newfoundland & Labrador Ltd. – Voisey's Bay, NL, Commissioning Engineer and Package Engineer. Development of two 19 MW combined heat and power plants and integration of gensets and major equipment into a powerhouse and heat recovery system design. Longstanding member of an integrated project team for the Voisey s Bay Mine Expansion working on detailed engineering, and commissioning for the new Eastern Deeps and Reid Brook combined heat and power plants. Spent 4 years onsite supporting the project and was engaged in the startup phase of the project, commissioning and operating the new generating units, heat recovery systems and high voltage switchgear while leading control room operations during commissioning and training the operations

team. Developed an in depth understanding of the mine sites new and existing generating assets, power and thermal energy demands, day to day operations and power and heating distribution systems.

Combined Cycle Power Plant, EMAL – United Arab Emirates, Mechanical Engineer. Phased development of a 3,000 MW combined cycle power plant comprised of 10 GE 9FA combustion turbines and 4 steam turbines for power and steam supply to an aluminum smelter and alumina production plant. Lenders engineer during project development phases 1, 2 and 3 and operations monitoring during project development loan period. As-built review of complete power plant. Site visits to review major equipment and systems and confirm compliance with the feasibility study design and documentation. Review of as-built P&IDs, heat and mass balances, purchase specifications, equipment name plates, spare parts inventory and field verification of complete and operating power plant. Operations monitoring for the Lenders while simultaneous operating, commissioning and construction activities were underway for two development phases of the project including combined cycle conversion of simple cycle CTGs for expansion and integration with alumina refinery.

Jamalco Steam Turbine Generator Project, Alcoa – Jamaica, Engineering Manager. Detailed engineering for the installation of a 45 MW backpressure steam turbine generator providing power and low pressure steam to an Alumina production plant. Engineering manager for the integration of the steam turbine generator package into a powerhouse design and the plant process steam system. Lead a multi-disciplinary team integrating vendor data into the design and completing civil, structural, mechanical, electrical, instrumentation and control engineering.

Tasiast Expansion Project, Kinross Gold Corporation – Mauritania, Mechanical Engineer. Basic engineering for a 150 MW natural gas / LFO combined cycle power plant. Developed specifications and procurement packages for the Steam Turbine, Heat Recovery Steam Generators (HRSG's), and Surface Condenser. Undertook procurement process coordination, developed power plant mechanical equipment list, and assisted with mechanical asset tagging and equipment list management.

Auxiliary Heating Steam Plant, Ontario Power Generation – Darlington, Ontario, Mechanical Engineer. Detailed engineering of a new auxiliary steam plant for a 3,512 MW nuclear power plant in Ontario, Canada. Lead the development of the Piping and Instrumentation Drawings (P&IDs), Process Flow Diagrams (PFDs), equipment lists, and asset tagging for the project and prepared mechanical equipment specification packages for auxiliary equipment. Developed commissioning work plans and commissioning reports to support commissioning to achieve available for service status. The new auxiliary steam plant will provide heating steam to the nuclear power plant during reactor outages, vacuum building outages, and emergencies, and will replace the original construction boiler house.

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CORE TEAM MEMBER

Christopher Lyons, P.Eng

AIR EMISSIONS MODELLING

Education & Qualifications
BSc, Chemical Engineering, University of New Brunswick, Fredericton, NB, Canada, 2005

Professional Affiliations
Professional Engineer, Association of Professional Engineers and Geoscientists of NB (APEGNB)

Experience
20 years

Chris has 20 years of experience in the environmental field, specifically related to the atmospheric environment in various sectors including oil and gas, mining, forest products and manufacturing. Chris has a degree in Chemical Engineering from the University of New Brunswick and is a registered professional engineer in the Provinces of New Brunswick and Ontario.

Chris has extensive experience in air quality dispersion modeling, preparation of air contaminant and GHG emissions inventories, ambient air quality monitoring, source emissions testing, and meteorological monitoring and data analysis. Further, his background also includes National Pollutant Release Inventory reporting, indoor air quality, environmental impact assessments and permitting (related to the atmospheric environment) and GHG verification.

Over his career Chris has conducted several air quality dispersion modeling studies using AERMOD (American Meteorological Society and United States Environmental Protection Agency (US EPA) Developed Regulatory Dispersion Model), CALPUFF (California Puff Model), AERSCREEN, SCREEN3 and ISC (Industrial Source Complex model). Chris has also prepared numerous emissions inventories for various facilities including mines, oil refineries, oil and gas processing facilities, tank and marine terminals, pulp and paper mills, sawmills and other forest products facilities. Chris has also conducted and taken part in several ambient air quality monitoring studies and source emissions testing campaigns, including field plan development, sample collection, data analysis and reporting. He also has experience in meteorological monitoring and data analysis and has conducted several indoor air quality studies.

Chris has been involved with various environmental impact assessments, specifically preparation of the atmospheric environment valued environmental component (VC) as well as the associated air quality technical studies for oil and gas processing and handling facilities, mining projects, a pig iron production facility and forest products facilities. Preparation of the VC and technical studies involved characterization of baseline conditions (ambient monitoring in some cases) and assessing impacts of the projects on the atmospheric environment (through development of emissions inventories and dispersion modeling to assess effects).

RELEVANT PROJECT EXPERIENCE

Nemaska Lithium Whabouchi Mine Dispersion Modelling Study, Chile, Modelling Support and Review.
The project consisted of an update of a dispersion modelling study previously conducted for the Whabouchi mine, to meet regulatory requirements and in support of permitting. The work includes development of emission inventories, dispersion modelling in accordance with Quebec regulatory requirements. Sources of concern include material handling and storage, mine operations and mining equipment.

BHP Escondida, Chile, CALPUFF Modelling.
The project involved a dispersion modelling study of emissions at the mine site using CALPUFF and computational fluid dynamics (CFD). The purpose of the modelling assessment was to support a risk assessment related to proposed process modifications at the site.

Halton Hills Generating Station Hydrogen Study Air and Noise Environmental Compliance Approval, Atura Power, Halton Hills, ON, Air Quality Lead.
The project encompassed an emissions summary and dispersion modeling study to support an environmental compliance approval amendment for a hydrogen import facility at the existing Halton Hills generating station, aimed at hydrogen fuel blending in combustion turbines.

- Developed emission inventories for the existing operation and emissions from the blending of H_2 with natural gas in the combustion turbines at combined cycle co-gen facility.
- Conducted dispersion modelling with air quality dispersion modeling.

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- Prepared emission summary and dispersion modelling report.
- Prepared air quality sections of engineering critical assessment amendment application.

Brighton Mountain Wind Project, Juniper, NB, Air Quality Engineer.
Air Quality and GHG valued component sections of the environmental impact statement for a 350 MW wind farm project in central New Brunswick.

- Developed air contaminant and GHG emission inventories (for construction and GHG offsets for operation).
- Establish baseline air quality in the assessment area through desktop analysis of ambient air quality data measured near project.
- Conducted air quality screening modelling based on air quality dispersion modelling.
- Conducted assessment of changes to air quality and GHG due to the project.

Confidential, Confidential, Canada, Air Quality Support and Review.
Assisted with preparation of design considerations for ambient air quality monitoring, source emissions testing and meteorological monitoring equipment siting, installation and access to meet test method requirements for a confidential project in Ontario.

Ohmgebirge Potash PFS Air Quality Benchmarking Study, South Harz Potash, Thuringia, Germany, Air Quality Engineer. Development of an air quality benchmarking study in support of a proposed potash mine in Thuringia, Germany.

- Prepared air contaminant emission estimates from the project based on review and analysis of similar facilities as well as expected production information and energy and fuel consumption.
- Conducted screening modelling air quality screening modelling based on air quality dispersion modelling. and a review of emission control devices typically used in potash mining operations.

World Energy, World Energy G2 Project, Stephenville, Newfoundland and Labrador, Canada, Air Quality Engineer.
Environmental assessment for a large wind farm (up to 1GW in phase 1) for electricity generation to produce green hydrogen (electrolysis) and conversion to ammonia for shipping to European markets. Chris assisted with emissions inventory development for sources of air contaminants including NH3 flaring, biodiesel fired generator and associated marine vessel traffic. The work also involved setup of the dispersion modelling (CALPUFF).

CORE TEAM MEMBER

Evangeline Bhaskar, BSc

AIR EMISSIONS MODELLING

Education and Qualifications
Bachelor, Science, University of New Brunswick, Saint John (New Brunswick), Canada, 2008

Professional Affiliations
Environmental Careers Organization of Canada — Member

Experience
16 + years

Specialties
Air Quality, Air Quality Dispersion Modelling Assessments, Environmental Permitting, Technical Research, Data Analysis, Regulatory Compliance, Environmental Assessment

Evangeline has 10 years of environmental and regulatory compliance experience, with a focus on Federal and Provincial emissions reporting including Greenhouse Gas (GHG) reporting and Output-Based Pricing Systems (OBPS), National Pollutant Release Inventory Reporting (NPRI), air quality assessments, air quality dispersion modelling and permitting in various sectors including oil and gas, coal mining, wood processing and fertilizer production. Evangeline has experience providing environmental and regulatory compliance support during the design phase of projects including project scoping, team management, budgeting, forecasting, project tracking and financial management; proposal preparation; contribution of air assessments to Environmental Assessments (EAs); review of scientific literature and applicable Federal and Provincial environmental regulations; regulatory environmental permitting and consultation; data inventories development; technical reporting; air quality modelling to determine potential impacts; and peer review of deliverables.

RELEVANT PROJECT EXPERIENCE

Mactaquac Life Achievement Project, NB Power, New Brunswick, Canada, Intermediate Environmental Specialist. The objective of the Project is to restore the generating capacity of the Mactaquac Power Generation Station (MQGS) by extending its operational life to the original intended 100-year service life (i.e., to the year 2068) using repair, rehabilitation, and replacement of the existing MQGS equipment and structures that have been affected by an alkali aggregate reaction (AAR). AAR is a reaction between materials in cement and aggregate that causes the concrete to expand, resulting in substantial cracking; leading to accelerated concrete deterioration and seepage of headpond waters through the structures; and affecting the performance of the powerhouse, water retaining structures, gates and generating units. Key responsibilities included environmental permitting tasks such as preparation of the regulatory roadmap, meeting minutes, project-specific environmental management, etc.

JD Irving-Juniper Hills Wind Farm Study, Irving Forest Products, New Brunswick, Canada, Environmental Practitioner. The project scope included an Environmental Assessment (EA) in support of a proposed 350 MW wind farm. Key responsibilities included analysis of meteorological data measured using MET mast towers and LiDAR; preparing the Atmospheric Conditions and Impact of the Environment on the Project sections of the EIA Registration; peer review of applicable Provincial regulations; use of University of Western Ontario tool to predict precipitation Intensity Duration Frequency (IDF) associated with anticipated climate change; use of Environment Canada tool and results of Preliminary Hatch Geotechnical Report to determine seismic hazards in the Project location; and supported engineering team, as required.

Port Dalhousie Wastewater Treatment Plant Waste Gas Burner System Upgrade, The Regional Municipality of Niagara, Ontario, Canada, Air Quality Specialist. This project required the design and commissioning of a waste gas burner to replace the existing waste gas burner at the facility to ensure compliance with the facility Environmental Compliance Approval (ECA) and current industry standards. Key responsibility included updating the previously submitted Emission Summary Dispersion Modelling (ESDM) Report for the ECA Amendment Application in response to a supplemental information request from the Ontario Ministry of Environment, Conservation and Parks. The update also included iterative air quality modelling to demonstrate compliance with the applicable Ontario air contaminants benchmarks and odour thresholds after the waste gas burner is upgraded.

Allardyce Bower Consulting Inc., PCEL Altares b-72-A Facility Phase 4 Expansion, British Columbia, Canada, Lead Modeller. The project involved conducting an Air Quality Dispersion Modelling Assessment in support of the proposed Phase 4 expansion to the Altares b-72-A Gas Plant in support of a Provincial Amendment Application. Key responsibilities included review of applicable British Columbia regulations and standards; review of information provided by ABC Engineers; preparation and submission of an Air Quality Dispersion Modelling Plan to the BCER; running the air quality dispersion modelling assessment, which included preparation of building input files, terrain and meteorological files, prepare emissions inventory for all facilities within 5 km of the Altares b-72-A Plant, and analysis of modelling results; collaboration with ABC and PCEL to determine options for compliance with applicable air quality standards; and support the various teams during report and application preparation.

ARC Resources Ltd., Dispersion Modelling for Various Facilities, Alberta and British Columbia, Canada, Project Manager/Technical Reviewer. These projects involved conducting Air Quality Dispersion Modelling Assessment for various ARC facilities in support of Industrial Approval Applications or in support of Front-End Engineering Design (FEED). If performing the air quality dispersion modelling assessment for the facility, key responsibilities included applicable emissions estimations; preparation of emissions inventory; preparation of Building Profile Input Program (BPIP) input files, if required; terrain and meteorological data processing; prepare and run the U.S EPA AERMOD model; analyze data for compliance with the applicable ambient air quality objectives; prepare report preparation; and coordinate the various aspects of the project.

Athabasca Minerals Inc., Silica Mining Facility - Air Qaulity Dispersion Modelling Assessment, Alberta, Canada, Technical Peer Reviewer. The project required the conducting an air quality dispersion modelling assessment in support of an EPEA application for the proposed facility. Key responsibilities included peer review of the air quality dispersion modelling which included review of Building Profile Input Program (BPIP) files; terrain and meteorological processing performed; emissions inventory prepared for the facility and other regional facilities located within 5 km of the facility as required by the Alberta Air Quality Modelling Guideline (AQMG); U.S. EPA AERMOD input files; selection of sensitive locations in the vicinity of the facility; assisted with emissions estimations of various area and volume sources using U.S. EPA AP Compilation of Emission Factors; and support for the modelling team.

CST Coal Mine, Federal and Provincial Reporting for CST Coal Mine, Grande Cache, Alberta, Canada, Project Manager. This work involved preparation of the Federal National Pollutant Release Inventory (NPRI) and Greenhouse Gas Reporting Program (GHGRP) reports as well as the Provincial Technology Innovation and Emissions Reduction (TIER) and Provincial Annual Emissions Inventory Reports (AEIRs) reports for the coal mine and coal processing plant. Responsibilities included notifying client of reporting requirements; review of facility information, applicable Federal and Provincial standards, and literature review; emissions estimations in compliance with applicable standards, etc.

Carbon Sweet Gas Plant COP Application, Calvin Consulting Group Ltd., Alberta, Canada, Project Lead. The project required the preparation of an EPEA Amendment Application that included the installation of a CO2 Plant in the facility. Key responsibilities included estimating the applicable air emission source parameters for the modelling; literature review to determine applicable limits; performing Occupational Health and Safety Modelling to determine compliance of the predicted concentrations with the applicable 15-minute Short-Term Exposure Limit (STEL), eight-hour Time Weighted Average (TWA) and 30-minute Immediately Dangerous to Life and Health (IDLH) values; support regulatory team in the preparation of the Amendment Application.

Methane Emissions Reporting, Calvin Consulting Group Ltd., Alberta, Canada, Project Manager. This work involved preparation of the Alberta Annual Methane Emissions Reports as required by the Alberta Energy Regulator (AER) Directive 60 in compliance with AER Manual 15. Responsibilities included notifying clients of minimal testing requirements to achieve compliance with upcoming regulatory reporting requirements; detailed review of multiple facility air emission sources; compilation of applicable emission inventory for each site; review of manual 15 and other applicable emission estimation standards published by AER, Canadian Association of Petroleum Producers (CAPP) and Canadian Council of Ministers of the Environment (CCME); development of emissions estimations tool; preparation and submission of annual reports using the applicable Federal and provincial Reporting portal.

NPRI Reporting for Various Facilities, Calvin Consulting Group Ltd., Alberta, Canada, Technical Reviewer. This work involved preparation of annual Federal National Pollutant Release Inventory (NPRI) Reports for all applicable facilities. Key responsibilities included technical review of emissions estimations; reviewing of all deliverables; notifying client of upcoming regulatory reporting requirements; and support report submission and liaison with client.

HATCH

CORE TEAM MEMBER

Mervyn Choy

NOISE IMPACT MODELLING

Education and Qualifications
M.Eng, University of Toronto, 2003
BaSc, University of Waterloo, 2001

Professional Affiliations
Professional Engineers of Ontario
APEGA, Alberta
Institute of Noise Control Engineering
Canadian Machinery Vibration Association (CAT 2)
Ontario RAQS – Acoustic & Vibration Specialist

Experience
19 years

Specialties
Noise and Vibration

Mervyn brings to the CNRL team his valued experience and extensive involvement with Community Noise and Vibration Impact studies of Canadian and international industrial facilities.

- Mervyn is available for the commencement of this project.
- He has expertise and specialty in environmental and occupational acoustic and vibration measurement, analysis, modeling, and reporting for power generation, industrial, commercial, and infrastructure projects.
- Performed numerous noise and vibration international guideline, bylaw, code, and standard compliance reviews as well as provided factual witness testimony.
- Has a strong background in multi-discipline project deployment including the formulation of project noise and vibration: design criteria, noise control design & specifications, technical vendor evaluation, and construction noise & vibration control plans.

RELEVANT PROJECT EXPERIENCE

KNS, Koniambo Ferronickel Project, Koniambo, North Province, New Caledonia, Noise Engineer. 5.3B capital project to design and build a 60,000 tpa nickel mine site, processing plant, refinery, power plant, wharf, 2 x 40 MW Nominal CCTGs.

- Modeled the community noise impact of the entire site (200 + noise sources).
- Reviewed, specified all noise abatement features required for the entire project including the Rolls Royce Trent 60 gas turbine noise abatement requirements.

Calpine, Whitby Co-Generation Environmental Noise Impact Study, Whitby, Ontario, Canada, Noise Technician. Noise Impact assessment of a 58 MW baseload natural gas fired cogeneration turbine, with exhaust heating a boiler feeding steam to an adjacent paper mill.

- Modelled the noise impact of the cogeneration facility.
- Identified and estimated sound powers of major noise sources including the HRSG, intakes, exhausts, and enclosure radiation.
- Evaluated the noise mitigation performance of controls including the generator enclosure and intake silencers.

Imperial Oil Esso Ltd, Nanticoke Refinery Acoustic Assessment Report (AAR), Nanticoke, Ontario, Canada, Noise Specialist. Community noise impact study of a 600-hectare oil refinery, producing approximately 112,000 barrels per day.

- Completed on site noise measurements of various refinery for noise source inputs into the model.
- Completed multiple community noise monitoring measurements to validate the noise model and to baseline the community noise environment.
- Developed a 100+ noise source model predicting the community noise impact of the refinery.
- Drafted an acoustic assessment report as per provincial standards for operational permitting.

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CORE TEAM MEMBER

Maedot (Maddie) Andargie, Ph.D.

NOISE IMPACT MODELLING

Education and Qualifications
Ph.D., Civil Eng., University of Toronto, Toronto, Ontario, Canada, 2022
M.Sc., Sustainable Critical Infrastructure, Masdar Institute in Collaboration with MIT, Abu Dhabi, UAE, 2017
B.Sc., Civil Eng., New York University, Abu Dhabi, UAE, 2015

Professional Affiliations
Canadian Acoustical Association (CAA), Member
American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Member
Canadian Machinery Vibration Association (CMVA), Member

Experience
3 years

Specialties
Noise and Vibration

Maddie is a specialist in acoustic measurement and analysis. Her acoustic experience commenced with her post-graduate thesis on communal living noise transmission and has since branched out to environmental noise modelling, industrial occupational noise assessments, evaluation of room and building acoustic parameters, and industrial noise source characterization through measurements and modelling.

Maddie is experienced in assessing compliance with regional codes and guidelines and evaluating noise exposure levels and impacts on residential and commercial occupants. Since joining Hatch, Maddie has undertaken diverse noise and vibration projects including rail noise and vibration assessments, construction community noise and vibration assessments, building acoustic assessments and occupational noise assessments.

RELEVANT PROJECT EXPERIENCE

Bloor-West Pedestrian Tunnel, Ontario, Canada
Performed PA acoustic assessment and consulted on the required sound absorption level to meet the required STI criteria
- Completed PA acoustic modelling using EASE to estimate sound transmission index (STI) and reverberation time inside the pedestrian tunnel
- Provided mitigation strategies to meet the project STI requirements

BC Hydro La Joie Dam Improvements Project, British Columbia, Canada
Completed construction noise modelling to determine the noise impact of construction activities on receptors near the dam site and provided mitigation to reduce construction and traffic noise impact
- Completed traffic noise impact assessment to estimate noise exposure levels due to increased traffic during construction
- Completed stationary site construction noise impact assessment
- Estimated blasting noise impacts due to various blasting operations
- Performed aircraft noise modeling to determine the Noise Exposure Forecast (NEF) zones due to increased airport operation as part of the construction

Red River Solutions, NEWPCC Headworks Facility Upgrade Project, Manitoba, Canada
Performed sound transmission class, noise criteria and indoor noise level calculations to assess the new facility's compliance with the project acoustic and noise criteria.
- Conducted composite sound transmission class assessments of various indoor partitions.
- Calculated occupational noise exposure due to various HVAC, mechanical and electrical equipment in various rooms.
- Provided mitigation strategies to improve the sound transmission class and reduce the noise level where the project criteria was exceeded.

Imperial Oil Sarnia and Nanticoke Facilities, Ontario, Canada
Supported the completion of annual noise audits and acoustic assessment as part of the Facility Environmental Compliance Approval application
- Performed outdoor noise modeling to determine operational noise impact on nearby receptors
- Prepared Acoustic Assessment Report for Environmental Compliance Approval
- Performed community noise measurements to identify the impact of facility noise on the community
- Performed in-plant noise measurements to identify the sound power levels of various equipment in the facility.

GO Rail Expansion - On-Corridor Works, Ontario, Canada
Modelled rail operations and construction noise and ground-borne vibration to determine impact of the project on surrounding community and nearby structures.

- Performed operational noise modelling to determine noise impact from future rail operations.
- Performed ground-borne vibration analysis to determine vibration impacts of future rail operations.
- Completed construction noise and vibration modelling and developed construction noise and vibration management plans for various construction sites and activities.
- Completed environmental noise exposure modelling for borehole and monitoring well drilling activities.
- Performed field noise level measurements of construction equipment.

TTC Russel Carhouse, Ontario, Canada
Performed construction community noise and vibration analysis to determine compliance with project noise and vibration criteria.

- Performed noise modelling to determine noise impact from construction.
- Calculated construction ground-borne vibration zone of influence to determine impacts of construction equipment on surrounding structures.
- Modelled noise and vibration mitigation strategies to reduce impacts to surrounding community and comply with project criteria.

Howard Street Tunnel, Baltimore, USA
Performed construction community noise and vibration analysis to determine compliance with federal/local and state ordinances.

- Calculated construction noise zone of influence according to Federal Transit Administrations guidelines.
- Calculated construction ground-borne vibration zone of influence according to Federal Transit Administrations guidelines.
- Provided mitigation strategies to reduce construction vibration impact where vibration limits were exceeded.

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CORE TEAM MEMBER

Mohamed Khafagy, PhD, PEng, PMP

WATER RESOURCE ASSESSMENT

Education & Qualifications
Ph.D. hydrogeology, McMaster University, Canada, 2022
M.Sc. hydrogeology, Cairo University, Egypt, 2017
B.Eng. Civil Engineering, Cairo University, Egypt, 2013

Experience
12+ years

Specialties
Hydrogeology, Numerical Modelling, Machine Learning, Coding, Water Resources Engineering and Management, Municipal/Hydraulics Engineering, Contaminant

Mohamed is an experienced Hydrogeologist, Water Resources and Municipal Engineer with a history of working in academia and industry. He is skilled in planning and designing distribution watermain, storm/sanitary sewer, stormwater management, and conducting transient analysis for transmission (waste)water lines.

Mohamed's research main focus and experience are in the area of fate and transport analyses of contaminants in the subsurface through the use of numerical modeling and machine learning.

RELEVANT PROJECT EXPERIENCE

Trail Road Battery Energy Storage System (BESS), Brookfield Renewable, Ottawa, ON, Canada, Hydrogeologist. Conducted a hydrogeological and terrain analysis to support site development planning and stormwater management design for the Trail Road Battery Energy Storage System (BESS) project. The study involved characterizing subsurface conditions using borehole data, delineating groundwater flow patterns, and mapping surficial geology units based on regional terrain models. Assessed soil infiltration capacity, groundwater elevations, and recharge conditions to evaluate site suitability for infiltration-based SWM measures.

OMC 4 Sanitary Service Connection to Metro Vancouver (GVS&DD), The City of Coquitlam and Metro Vancouver (MV), Vancouver, BC, Canada, Hydraulics Engineer. Developed a SewerGEMS model to provide the updated calculations of the sanitary load and location for sanitary servicing connections to the MV Brunette Interceptor for the TransLink OMC 4 site at 225 North Rd, Coquitlam. In addition to developing a WaterGems model to design the water servicing system for the study area.

On Corridor Works/ONxpress, Metrolinx, Greater Toronto Area, ON, Canada, Hydrogeologist. ONxpress is the largest capital infrastructure project in Ontario's historic GO Rail Expansion program. The project includes all works that facilitate train service, such as track, civil infrastructure, signalling, electrification infrastructure and electric vehicles, as well as the operations and maintenance of the GO rail network. Joined the hydrogeology team and the hydrotechnical team in this project, and the duties included fieldwork for conducting single wells response tests (SWRTs) and water quality sampling, conducting SWRT analysis using AQTESOLV, and studied/summarized the historical geotechnical reports.

Metrolinx, Scarborough Subway Extension Tunnel Design, Metrolinx, Scarborough, ON, Canada, Water Resources Engineer. Prepared a stormwater management study to examine the potential water balance, water quality, and water quantity impacts of the proposed development of the Toronto Transit Commission (TTC) Kennedy Station and summarized how each criterion will be addressed in accordance with the Toronto Region Conservation Authority (TRCA) Stormwater Management Criteria. The hydrologic modelling for the stormwater drainage system was conducted using PCSWMM model to determine existing and proposed peak runoff flow.

Rio Tinto: Vaudreuil 2022 Phase II, Rio Tinto, City of Saguenay, Quebec, Canada, Hydrogeologist. Participated in a feasibility study for the future Bauxite Residue Disposal Area (BRDA). The site is located east of Rio Tinto's Vaudreuil plant and the bauxite tailings disposal sites corresponding to lot 3 095 056 of the renovated cadastre of Quebec in the city of Saguenay. The geotechnical objective of the mandate is to determine the characteristics of the soils, the rock and the groundwater conditions in the area of the boreholes. FeFlow is used for the hydrogeological modelling.

Program Management (PM6), City of Toronto Water and Transportation Services, Toronto, ON, Canada, Municipal EIT. Designed watermain and road resurfacing, prepared plan and profile drawings using Bentley MicroStation for City of Toronto Water and Transportation Services Program Management (PM6), with a total capital budget of $145 million. The general duties were preparation, coordination, and management of preliminary and final designs for infrastructure renewal projects, including watermain, sanitary sewers, storm sewers, and culverts. Preparation and editing of AutoCAD/Civil 3D and MicroStation/InRoads design drawings as required.

Assessment of Groundwater Resources in Egypt, Ministry of Water Resources and Irrigation in Egypt, Groundwater Branch, Egypt, Hydrogeologist. Participated in a national project for assessment of groundwater resources all over Egypt by Inventorying public and private wells.

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CORE TEAM MEMBER

Warren Hoyle, P.Geo.

WATER RESOURCE ASSESSMENT

Education & Qualifications
BSc, Geology, Brock University, St. Catharines, Ontario, Canada, 1980, Honour.

Professional Affiliations
The Canadian Geotechnical Society - Member
Geological Association of Canada - Member
International Association of Hydrogeologists - Member
Association of Professional Geoscientists of Ontario – Member

Overall Experience
35+ Years

Tenure with Hatch
35+ Years

Specialties
Hydrogeology, geotechnical, groundwater, soil, bedrock, site investigations, environmental, project management

Warren is a Geotechnical Lead and Senior Hydrogeologist with more than 35 years' experience in geotechnical and environmental site investigations projects. Warren has applied his broad background in hydrogeology, geology and geotechnical engineering to the evaluation of site conditions and assessment of groundwater quality and quantity, site remediation planning and seepage concerns associated with embankment structures and foundations. He is experienced in many phases of project execution, including site investigations, liaison with regulatory agencies, data analysis and evaluation, report preparation and project management.

Warren has carried out domestic and international programs related to water well supply and testing programs, groundwater contamination and erosion concerns associated with stormwater management. He has extensive knowledge of current regulatory requirements and is fully familiar with the latest sampling testing and QA/QC protocols. He is also an experienced auditor. He has conducted Phase One and Two environmental site assessments of industrial and commercial facilities to identify environmental and safety compliance as a QP.

RELEVANT PROJECT EXPERIENCE

City of Ottawa, Confederation Line LRT, Phase 2 (P3), Ottawa, Ontario, Canada, Hydrogeology Lead. The City of Ottawa has started Stage 2 Light Rail Transit (LRT) expansion. As QP for contaminated soil and Hydrogeology Lead for the Hydrogeology Task Force, Warren responds to Requests for Information (RFI) from business units the joint venture and allocated the appropriate resources and team members to complete tasks. RFI's are submitted for technical assistance on excavations, build designs, foundation support and environmental support. He has provided a variety of analyses to support technical requests including but not limited to; dewatering zone of influences, seepage analyses in response to excavation of stations and tunnels, groundwater quality, groundwater GAP analysis, risk management plans, and technical input on permits-to-take water and well decommissioning plans.

Ontario Power Generation, Niagara Tunnel Project (DB), Niagara Falls, Ontario, Canada, Hydrogeologist/Environmental Support. Provision of owner's representative services to Ontario Power Generation for the construction of the Niagara Tunnel facility project in Niagara Falls, ON. Services included engineering studies, preparation of design/build contract documents, design review, construction monitoring and contract administration. Warren provided environmental specialist services associated with this project including stormwater, waste rock management, wastewater, and sediment issues.

DeBeers Canada, Victor Mine Phase II Environmental Site Assessment, Attawapiskat, ON, QP/Project Hydrogeologist. As the Victor Mine is starting the mine closure process, DeBeers Canada requested a Phase II/ III Environmental Site Assessment be conducted to identify areas for remediation. Warren coordinated the semi-annual surface and groundwater monitoring program along with subsurface investigation for Phase II ESA activities including soil sampling of test pits and surficial grab samples for Victor Mine. As the Phase II ESA lead Warren coordinated the onsite investigation; organizing subcontractors' equipment, resource planning and the assessment team in ground and surface water monitoring program and soil investigations.

Metrolinx, Regional Express Rail: Phase I Environmental Site Assessment, Toronto, ON, QP/Phase I ESA Lead. Warren coordinated the day-to-day operations of Phase I Environmental Site Assessments (ESA) for four new stations being constructed along the Barrie rail corridor. Through coordination with joint venture firms and Environment task force, Warren delivered on tasks pertaining to each of the stations, meeting each deadline. Tasks included a comprehensive desktop review, preparing and organizing site visits, conducting site visits and drafting a comprehensive Phase I ESA report adhering to applicable guidelines and regulations.

Metrolinx, Lakeshore East Corridor: Phase I and Phase II Environmental Site Assessment, Toronto, ON, QP/Phase I/II ESA Lead. Warren coordinated the Phase I/II Environmental Site Assessments (ESA) for rail corridor improvements being constructed along the Lakeshore East rail corridor. Warren coordinated a team to deliver on tasks pertaining to sections along the rail corridor. Tasks included a

comprehensive desktop review, preparing and organizing site visits, preparing and executing Phase II ESA investigations and preparation of the Phase I/II ESA reports.

Metrolinx, Eglinton-Scarborough Crosstown Tunnels, Toronto, Ontario, Canada, Hydrogeologist Lead. The potential settlement caused by the dewatering for construction of the main extraction shaft (ES-3) and the potential impact on the adjacent buildings was assessed. Warren was the lead for the hydrogeology assessment of the Eglinton Crosstown West Extension project that involved an assessment of the groundwater conditions in both the overburden soil and bedrock including both groundwater flow and quality. FLAC 3D was used to model the inflow conditions for both the launch and extraction shafts. A Permit To Take Water (PTTW) application was prepared for each of the shaft locations. The potential settlement caused by the dewatering for construction of the main extraction shaft (ES-3) and the potential impact on the adjacent buildings was assessed. Warren reviewed the settlement analyses that were performed by developing an axisymmetric finite element analysis (FEA) model (using GeoStudio) to assess the settlement due to the water level drawdown. Settle 3D and RS2 (rockscience) software were used to verify results from the GeoStudio finite element model.

McMaster Innovation Park (MIP), McMaster Innovation Park Annual Monitoring Program, Hamilton, Ontario, Canada, Project Manager/ Hydrogeologist, Surface and Groundwater Sampling. McMaster Innovation Park (MIP) retained Hatch for the completion of annual groundwater and surface water monitoring for the MIP Northeast Quadrant property located at 175 Longwood Road South, Hamilton, ON.

Warren managed groundwater and surface water sampling at McMaster Innovation Park (MIP) as part of their bi-annual surface water and annual groundwater monitoring program to meet Certificate of Property Use (CPU) as issued by MECP (formerly known as MOECC). Using best practices, Warren supervises both surface water and groundwater monitoring from on-site monitoring wells following protocol for analytical methods used in the assessment of properties under part XV.1 of the EPA and applicable chain of custody procedures. An annual detailed report is prepared with analysis and recommendations for MIP to continue to meet the CPU standards. Soil quality assessments have been completed for sections of the brownfield property.

Baffinland Iron Mine Corporation, Milne Inlet Ore Dock Investigations, Baffin Island, Nunavut, Canada, Geotechnical Lead. Warren was responsible for planning and site supervision of a geotechnical investigation at the proposed ore dock site located at Milne Inlet, Nunavut. The port will facilitate shipment of iron ore from the mine site to many parts of the world. The investigations comprised of drilling holes through arctic sea ice and investigating the soil conditions for permafrost and other relevant engineering parameters. There were significant site challenges that required changes in the drilling methodology. This was followed by the preparation of geotechnical report, which served as the basis for design of a deep foundation for the dock. Warren has been involved with the on-going geotechnical investigations along the proposed rail alignment, bridge abutments and arch-plate culverts. These investigations have included various drilling techniques (sonic and rotary diamond) and geophysics (GPR and seismic) to determine the soil and bedrock conditions in a permafrost condition. Ice-rich soil and massive ground ice was found in some areas.

Block 9B Developments Ltd, ICE PATH Tunnel, Toronto, Ontario, Canada, QP/Hydrogeology Lead. Warren reviewed the dewatering operations of the ICE PATH during construction in poor quality fill and a high groundwater level. Grouting was carried out to reduce groundwater inflow to the cut and cover tunnel during the post-construction to fill voids and consolidate the loose soil. The grout program was reviewed on a daily basis in order to make adjustments in order to confirm the soil was stabilized around the tunnel area.

Peterborough Utilities, London Street Generating Station Upgrade, Peterborough, ON, Canada, Geotechnical Advisor. Warren provided worked as the Geotechnical Advisor for $30 Million dollar London Street Generating Station upgrade located in Peterborough, Ontario. He provided review of engineering designs and foundation inspection site services to Peterborough Utilities Incorporated.

Ontario Power Generation, Waba Dam Rehabilitation, Arnprior, Ontario, Canada, Project Coordinator. The assessment of the remaining primary and long-term settlement of the Waba Dam was determined to establish the amount of dam raise that will be needed to ensure that the structure has adequate freeboard and core elevation over the next 50 years. Investigations and assessment of the soft clay foundation a to further define material properties, and 2D finite element modelling was completed to predict the complex consolidation, spreading, and settlement behaviour of the soil in order to inform rehabilitation design.