Annexe 6

FISH AND FISH HABITAT SURVEYS –
EIA SUPPORT FOR BOG 324W LEASE EXTENSION

PROJECT NO 161-02978

FISH AND FISH HABITAT SURVEYS – EIA SUPPORT FOR BOG #324W LEASE EXTENSION

POINTE-SAPINE, NB **OCTOBER 5, 2016**

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EXECUTIVE SUMMARY

WSP conducted fish and fish habitat surveys on August 11, and 12, and September 2, 2016 for the proposed peat harvesting development of Bog #324W. Four watercourses and one pond within the study area were assessed in the field for water quality and all watercourses were assessed for fish presence and fish habitat. The work was performed during the low flow season of summer 2016. All applicable and appropriate permits and licenses were obtained from the Department of Fisheries and Oceans (DFO) and the Kouchibouguac National Park (KNP).

Each sampling location was assessed for fish habitat characteristics including bank and channel vegetation structure, substrate, and standard widths and depths of the watercourse. A modified NBDNR/DFO Stream Assessment form was used to compile the habitat information. The water quality was tested in-situ using a YSI Multi-Parameter Water Quality Monitoring meter and water samples were collected and submitted to AGAT Laboratories for analysis of General Chemistry, Nutrients, Hardness, and Metals (Total and Dissolved).

Fish presence surveys were originally planned to be conducted with the use of an LR-24 Electrofisher, however the water temperature, and depth of channel for each watercourse was greater than the capacity to use the electrofisher. Minnow traps were set in all watercourses (with the exception of WC4) to catch fish. All fish caught were identified, measured, and released.

The field and laboratory observations indicate that the watercourses flowing away from Bog #324W are poor fish quality, with warm temperatures, low dissolved oxygen, and low pH. Although warm-water fish were observed in WC1-WC3, no sport fish (salmonids such as brook trout or Atlantic salmon) were present at the sampling locations. The habitat characteristics are also poor for salmonids with no spawning habitat noted. The watercourses appear to be beaver impacted drainage channels for the bog.

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APPENDICES

1 INTRODUCTION

WSP conducted fish and fish habitat surveys on August 11, 12, 2016 and September 2, 2016 for the proposed peat harvesting development. Four (4) watercourses and one (1) Pond were assessed in the field for water quality. All watercourses were assessed for fish presence and fish habitat. The watercourses are channels transmitting excess water out of Bog #324W (Figure 2, Appendix A). WSP also completed a water quality assessment on a Pond located on the Theriault & Hachey site (Figure 2, Appendix A). This pond was within the study area of the intact bog. The locations of the five (5) sampling locations as seen in Figure 2 (Appendix A) are summarized below in Table 1-1.

Table 1-1 Sampling Locations

Survey Location	X*	Y*	Characteristics
WC1	349280	5205155	Outlet from Pond and outflow from Bog #324W. Upper reaches were completely vegetated. Lower reaches were deep channels with low flow. Tributary to East Branch Eel River.
WC2	352330	5200606	Outflow from Bog #324W. The largest of the WC sampling locations, it had well established banks in portions, and was lined by historical beaver meadow/bog. Tributary of Riviere du Portage.
WC3	356522	5205014	Outflow from Bog #324W. The largest of the WC sampling locations, it had well established banks in portions, and was lined by historical beaver meadow/bog. Tributary of Riviere a L'anguille
WC4	356793	5204950	Outflow from Bog #324W. The largest of the WC sampling locations, it had well established banks in portions, and was lined by historical beaver meadow/bog. Tributary of Riviere a L'anguille
POND	350139	5206294	Small pond within undisturbed portion of Bog #324W. Pond has outlet that feeds WC1

*UTM NAD 83, Zone 20

The methodology for this project followed the Guidelines for Peat Mining Operations in New Brunswick set by New Brunswick Natural Resources and Energy – Minerals and Energy[1]. The field assessments were completed by WSP field personnel, Virgil D. Grecian, M.Sc. and Jessica McIntyre, Field Tech.

The fish and fish habitat surveys were completed during the low flow period of June 1- September 30 using the NBDNR/DFO Fish Habitat Survey Forms (Government of New Brunswick, 2007). A license from the Department of Fisheries and Oceans (DFO) for scientific purposes was obtained to capture fish

[1] Guidelines for Peat Mining Operations in New Brunswick; J. Thibault. New Brunswick, Natural Resources and Energy, Minerals and Energy, 1998.

with an electrofisher or minnow traps. License tags were attached to all the minnow traps. The DFO fishing Licence No. was SG-RHQ-16-090A. WSP was prepared to complete electrofishing surveys, but due to unsafe conditions and the temperature of the water, WSP could not use the electrofisher.

Water samples were collected for each sampling location and submitted to AGAT Laboratories, an accredited laboratory in Dartmouth, NS. The samples were analysed for:

- General chemistry;
- Total and Dissolved Metals;
- Nutrients;
- Total Organic Carbon;
- TSS;
- Hardness; and
- Turbidity.

Water quality was also tested in-situ using the YSI Multi-Parameter Water Quality Meter. The parameters tested in-situ included:

- Temperature;
- Conductivity;
- Total Dissolved Solids (TDS);
- Salinity;
- Dissolved Oxygen (DO); and
- pH.

The water sample results were compared to the Canadian Council of Ministers of the Environment (CCME) guidelines for the Protection of Aquatic Life and can be seen in Appendix B.

WSP obtained a permit from the Kouchibouguac National Park (KNP) to travel on a snowmobile trail inside the park boundaries in order to access remote sampling locations. WC2 in particular was difficult to reach and WSP resorted to hiring an Argo to get the sampling materials and crew over the wet and boggy terrain.

2 RESULTS OF FIELD SURVEYS

2.1 TRIBUTARY TO EAST BRANCH EEL RIVER (WC1)

Watercourse 1 (WC1) is a tributary to the East Branch Eel River and is located in an open bog. WC1 was assessed by WSP on August 12, 2016. The reaches and water quality sampling locations are shown in Figure 3, Appendix A.

2.1.1 FISH HABITAT

The upstream reach consisted of 75 m (Reach 1) and the two downstream reaches consisted of 60 m (Reach 2 and Reach 3). Reach 1 was 100% vegetated and the watercourse dispersed through the vegetation (see Photo 2).

Reach one did not have a defined channel and was 100% vegetated with a wide bank full width of 25 m. The average wetted width for Reach 1 is 15 m. Reach 2 and 3 had a defined channel of 1-3 m for the average wetted width and the bank full width. Reaches 1-3 is the main channel of a natural deadwater. The average depth of the wetted width for Reach 1 was approximately 40 cm and Reach 2 and Reach 3 was 75 cm. The substrate of each reach consisted of fines and organics with little to no flow.

Table 2-1 WC1 Field Characteristics

Reach No.	Stream Type*	Channel Type**	Length (m)	AVG. Width (m)		Substrate (%)	Avg. Depth Wet Width (cm)	0-50% Overhanging Vegetation		Large Woody Debris in Stream (m)	Flow (cm/s)
				Wet	Bank Channel	Fines / Organics		L	R		
WC1											
1	24	1	75	15	25	100	40	5	5	5	0
2	24	1	60	1	3	100	75	2	2	-	1-2
3	24	1	60	1	3	100	75	2	2	-	1-2

***Stream Type** --> 13 = Beaver; 24 = Natural Deadwater

****Channel Type** --> 1 = Main

Reach No.	Shade (%)	Stream Banks				Depth					
		Vegetation				1/4 (cm)		1/2 (cm)		3/4 (cm)	
		Bare Ground	Grasses	Shrubs	Trees	Wet	Channel	Wet	Channel	Wet	Channel
WC1											
1	0	0	80	15	5	40	5	40	5	40	5
2	0	0	85	10	5	75	5	75	95	75	15
3	0	0	85	10	5	75	5	75	95	75	15

Reaches 1-3 are dominated by grasses with some shrubs and trees. Reach 1 did not contain defined banks; however, Reach 2 and Reach 3 had stable banks on both sides. The canopy cover above each reach was 0% and Reach 1 had 5 m of woody debris. Table 2-1 above summarizes the characteristics of WC1.

Photo 1 – Looking upstream at Reach 1. WC1 disperses into the vegetation.

Photo 2 – Looking downstream at Reach 2 of WC1.

Photo 3 – Looking at the minnow trap location in Reach 2

2.1.2 WATER QUALITY

The water quality of WC1 was sampled in the field with a YSI meter. The results can be seen in Table 2-2. The pH of WC1 is below the CCME guideline, as well as the dissolved oxygen.

Table 2-2 Field Water Quality Measurements (YSI Meter)

Parameter	CCME Guideline	WC1
		12-Aug-16
Temperature (°C)		17.34
Conductivity (µs/cm)		61
TDS (mg/L)		0.041
Salinity (ppm)		0.03
Dissolved Oxygen (%)		42.7
Dissolved Oxygen (mg/L)	5	**4.08**
pH	6.5-9.0	**5.69**

WSP sampled WC1 and sent the samples to AGAT Labs for analysis. The results can be seen in Appendix B. The water samples were compared to the CCME guidelines for the Protection of Aquatic Life (freshwater) and the exceedances are as follows:

- Dissolved Cadmium;
- pH; and
- Total Iron.

The effects of cadmium on the freshwater environment can be influenced by hardness, alkalinity, pH, dissolved organic matter and temperature (CCME, 2014). This is not known to inhibit fish, however, the extended exposure to metals such as iron and cadmium are not known.

2.1.3 FISH PRESENCE

WSP deployed 3 minnow traps throughout the two downstream reaches and were allowed to fish for at least 48 hours. The fish presence captured in WC1 is summarized in Table 2-3. WSP did not observe live fish during the habitat assessment.

No fish were harmed during the surveys and all fish captured were released. WSP completed the fish identification using the UNB Inland Fish Species of New Brunswick[2].

[2] Inland Fish Species of New Brunswick; University of New Brunswick

Table 2-3 Fish Presence in WC1

Fish Survey					
WC 1		**WC 1**		**WC 1**	
Tag No.	1596	**Tag No.**	1597	**Tag No.**	1598
Fish Species	**Total**	**Fish Species**	**Total**	**Fish Species**	**Total**
Dates Fished	Aug 12-19/16	**Dates Fished**	Aug 12-19/16	**Dates Fished**	Aug 12-19/16
Ninespine Stickleback	0	Ninespine Stickleback	1	Ninespine Stickleback	0
Common Shiner	0	Common Shiner	0	Common Shiner	0
White Sucker	0	White Sucker	0	White Sucker	0
Pearl Dace	0	Pearl Dace	0	Pearl Dace	0
Blacknose Shiner	0	Blacknose Shiner	0	Blacknose Shiner	0
TOTAL	**0**	**TOTAL**	**1**	**TOTAL**	**0**

2.2 TRIBUTARY OF RIVIERE-AU-PORTAGE (WC2)

Watercourse 2 (WC2) is a tributary to Riviere-au-Portage and flows south out of Bog #324W and through the KNP. WSP field personnel completed the stream assessment on September 2, 2016. The reaches and water quality sampling locations are shown in Figure 3 (Appendix A).

2.2.1 FISH HABITAT

Three reaches were assessed on WC2 and each reach consisted of 75 m. The main channel of the tributary has a history of beaver impacts. The left bank of Reach 1 was a large wetland that extended 36 m to the tree line. The right bank of Reach 2 was wetland that extended 19 m to the tree line and the left bank of Reach 3 was a wetland that extended 36 m to the tree line. Located approximately 10 m downstream of Reach 1 was a manmade bridge used by the snowmobile trail. Beaver logs were observed under the bridge.

The average wetted width for Reach 1 is 7 m and the bank full channel average width is 36 m. The average wetted width for Reach 2 is 7 m and the bank full channel average is 19 m. The average wetted width for Reach 3 is 8 m and the bank full channel average is 31 m. The average depth of the wetted width for Reaches 1-3 was approximately 75 cm. The depth was measured from the bridge due to the depth of the water and safety protocols.

The substrate consisted of fines and organics with a flow of 2 cm/s. Reaches 1-3 are dominated by grasses with some shrubs and trees. The banks of each reach were stable. The canopy cover above Reach 1 on the left bank was 2% and the right bank was 12%. The right bank of Reach 2 had a canopy cover of 2% and the left bank had a canopy cover of 2%. The canopy cover of the right bank of Reach 3 was 6% and the left bank was 2%. There was 6-8 m of woody debris located in Reach 1; 8 m of woody debris in Reach 2; and 10 m of woody debris in Reach 3. Table 2-4 below summarizes the characteristics of WC2.

It is unlikely that WC2 supports the fish habitat quality for sport fish such as trout or salmon at this location. Water quality parameters such as the low pH are known inhibitors of cold water fish. It is likely that this slow moving, beaver impacted stream, that does not have a lot of shade, will reach temperatures beyond those suitable for cold water salmonid type fish. Further downstream within the Riviere au Portage system, trout and salmon are known (Eric Trembley, KNP Ecologist, Pers. Com.).

Table 2-4 WC2 Characteristics

Watercourse Characteristics											
Reach No.	Stream Type*	Channel Type**	Length (m)	AVG. Width (m)		Substrate (%)	Avg. Depth Wet Width (cm)	0-50% Overhanging Vegetation		Large Woody Debris in Stream (m)	Flow (cm/s)
				Wet	Bank Channel	Fines/Organics		L	R		
WC2											
1	13	1	75	8	31	100	75	2	12	7	2
2	13	1	75	7	19	100	75	2	2	8	2
3	13	1	75	7	36	100	75	2	6	10	2

***Stream Type** --> 13 = Beaver; 24 = Natural Deadwater

****Channel Type** --> 1 = Main

Reach No.	Shade (%)	Stream Banks				Depth					
		Vegetation				1/4 (cm)		1/2 (cm)		3/4 (cm)	
		Bare Ground	Grasses	Shrubs	Trees	Wet	Channel	Wet	Channel	Wet	Channel
WC2											
1	5	0	85	10	5	Avg. 75 cm across					
2	5	0	85	10	5	Avg. 75 cm across					
3	5	0	85	10	5	Avg. 75 cm across					

Photo 1 – Looking upstream at Reach 3.

Photo 2 – Looking at right bank of Reach 3.

Photo 3 – Looking at the wetland on the left bank of Reach 3.

Photo 4 – Looking downstream from Reach 3 at the manmade bridge on the snowmobile trail.

2.2.2 WATER QUALITY

The water quality of WC2 was sampled in the field with a YSI meter. The results can be seen in Table 2-5. The pH of WC2 is below the CCME guideline.

Table 2-5 Field Water Quality Measurements (YSI Meter)

Parameter	CCME Guideline	WC2
		2-Sep-16
Temperature (°C)		16.86
Conductivity (µs/cm)		36
TDS (mg/L)		0.023
Salinity (ppm)		0.02
Dissolved Oxygen (%)		77.4
Dissolved Oxygen (mg/L)	5	7.57
pH	6.5-9.0	**5.83**

WSP sampled WC2 and sent the samples to AGAT Labs for analysis. The results can be seen in Appendix B. The water samples were compared to the CCME guidelines for the Protection of Aquatic Life (freshwater) and the exceedances are as follows:

- Dissolved Iron;
- pH; and
- Total Iron.

This is not known to inhibit fish, however, the extended exposure to metals such as iron is not known.

2.2.3 FISH PRESENCE

WSP deployed 5 minnow traps throughout the reaches and were allowed to fish for at least 48 hours. The fish presence captured in WC2 is summarized in Table 2-6. WSP did not observe live fish during the habitat assessment.

No fish were harmed during the surveys and all were released. WSP completed the fish identification using the UNB Inland Fish Species of New Brunswick[3].

[3] Inland Fish Species of New Brunswick; University of New Brunswick

Table 2-6 Fish Presence in WC2

Fish Survey									
WC 2		**WC 2**		**WC 2**		**WC 2**		**WC 2**	
Tag No.	1592	**Tag No.**	1598	**Tag No.**	1597	**Tag No.**	1596	**Tag No.**	1593
Fish Species	**Total**	**Fish Species**	**Total**	**Fish Species**	**Total**	**Fish Species**	**Total**	**Fish Species**	**Total**
Dates Fished	Sept.2/16	**Dates Fished**	Sept.2/16	**Dates Fished**	Sept.2/16	**Dates Fished**	Sept.2/16	**Dates Fished**	Sept. 2/16
Ninespine Stickleback	0	Ninespine Stickleback	0	Ninespine Stickleback	0	Ninespine Stickleback	1	Ninespine Stickleback	0
Common Shiner	0	Common Shiner	2	Common Shiner	0	Common Shiner	0	Common Shiner	0
White Sucker	0	White Sucker	2	White Sucker	4	White Sucker	0	White Sucker	0
Pearl Dace	0	Pearl Dace	0	Pearl Dace	0	Pearl Dace	0	Peal Dace	0
Blacknose Shiner	0	Blacknose Shiner	0	Blacknose Shiner	0	Blacknose Shiner	0	Blacknose Shiner	0
TOTAL	**0**	**TOTAL**	**4**	**TOTAL**	**4**	**TOTAL**	**1**	**TOTAL**	**0**

2.3 TRIBUTARY TO RIVIERE A L'ANGUILLE (WC 3)

Watercourse 3 (WC3) is a tributary to Riviere a L'Anguille and flows west. WSP field personnel completed the stream assessment on August 11, 2016. The reaches and water quality sampling locations are shown in Figure 3, Appendix A.

2.3.1 FISH HABITAT

WSP completed a survey on three reaches of the main channel of a beaver impacted watercourse. WC3 has extensive wetland on the right and left banks, however, all reaches are deemed similar. The average wetted width for Reaches 1-3 is 3 m and the bankful channel average width is 5.5 m. The average depth of the wetted width for all three reaches was greater than 70 cm. The substrate consisted of fines and organics with little to no flow.

Reaches 1-3 are dominated by grasses with spots of bare ground and shrubs. There were no defined banks for either reach. The canopy cover above Reaches 1-3 was 0%; the left bank had approximately 5% overhanging vegetation and the right bank had approximately 3% overhanging vegetation. There was 2 m of woody debris in Reach 1 and Reach 3 and 1 m of woody debris in Reach 2. Table 2-7 below summarizes the characteristics of WC3.

Table 2-7 WC3 Characteristics

Watercourse Characteristics											
Reach No.	Stream Type*	Channel Type**	Length (m)	AVG. Width (m)		Substrate (%)	Avg. Depth Wet Width (cm)	0-50% Overhanging Vegetation		Large Woody Debris in Stream (m)	Flow (cm/s)
				Wet	Bank Channel	Fines/Organics		L	R		
WC3											
1	13	1	30	3	5-6	100	> 70	5	3	2	-
2	13	1	30	3	5-6	100	75	5	3	1	-
3	13	1	30	3	5-6	100	>70	5	3	2	-

***Stream Type** --> 13 = Beaver; 24 = Natural Deadwater

**** Channel Type** --> 1 = Main

Reach No.	Shade (%)	Stream Banks				Depth					
		Vegetation				1/4 (cm)		1/2 (cm)		3/4 (cm)	
		Bare Ground	Grasses	Shrubs	Trees	Wet	Channel	Wet	Channel	Wet	Channel
WC3											
1	0	5	90	5	0	Avg. 70 cm across					
2	0	5	90	5	0	Avg. 70 cm across					
3	0	5	90	5	0	Avg. 70 cm across					

Photo 1 – Looking downstream at Reach 1 and the extensive wetland.

Photo 2 – Looking upstream at Reach 1.

Photo 3 – Looking at a white sucker caught in one of the minnow traps.

Photo 4 – Looking at the common shiner caught in one of the minnow traps.

2.3.2 WATER QUALITY

The water quality of WC3 was sampled in the field with a YSI meter. The results can be seen in Table 2-8. The pH of WC3 is below the CCME guideline and the temperature is does not support the habitat for cold water fish.

Table 2-8 Field Water Quality Measurements (YSI Meter)

Parameter	CCME Guideline	WC3
		11-Aug-16
Temperature (°C)		21.25
Conductivity (µs/cm)		49
TDS (mg/L)		0.033
Salinity (ppm)		0.02
Dissolved Oxygen (%)		71.2
Dissolved Oxygen (mg/L)	5	6.05
pH	6.5-9.0	6.77

WSP sampled WC3 and sent the samples to AGAT Labs for analysis. The results can be seen in Appendix B. The water samples were compared to the CCME guidelines for the Protection of Aquatic Life (freshwater) and the exceedances are as follows:

- Dissolved Iron;
- pH;
- Total Cadmium; and
- Total Iron.

The effects of cadmium on the freshwater environment can be influenced by hardness, alkalinity, pH, dissolved organic matter and temperature (CCME, 2014). This is not known to inhibit fish, however, the extended exposure to metals such as iron and cadmium are not known.

2.3.3 FISH PRESENCE

WSP deployed 3 minnow traps throughout the reaches and were allowed to fish for at least 48 hours. The fish presence captured in WC3 is summarized in Table 2-9. WSP did not observe live fish during the habitat assessment.

No fish were harmed during the surveys and all were released. WSP completed the fish identification using the UNB Inland Fish Species of New Brunswick[4].

[4] Inland Fish Species of New Brunswick; University of New Brunswick

Table 2-9 Fish Presence in WC3

Fish Survey					
WC 3		**WC 3**		**WC 3**	
Tag No.	1591	**Tag No.**	1593	**Tag No.**	1592
Fish Species	**Total**	**Fish Species**	**Total**	**Fish Species**	**Total**
Dates Fished	Aug 12-15/16	**Dates Fished**	Aug 12-15/16	**Dates Fished**	Aug 12-15/16
Ninespine Stickleback	0	Ninespine Stickleback	0	Ninespine Stickleback	0
Common Shiner	12	Common Shiner	10	Common Shiner	9
White Sucker	9	White Sucker	4	White Sucker	6
Peal Dace	17	Pearl Dace	7	Pearl Dace	8
Blacknose Shiner	1	Blacknose Shiner	0	Blacknose Shiner	0
TOTAL	**39**	**TOTAL**	**21**	**TOTAL**	**23**

Ninespine Stickleback – *Pungitius pungitius*

The body of the ninespine stickleback is much more slender compared to other members of this family. Its colour is light olive to brown and sometimes grayish back. Their sides are darkly mottled and the belly is lighter, silvery to white. Their body is not scaled and they do not have bony plates. They have nine (7-12) short and inclined alternately to left and right. The ninespine stickleback has a long and narrow caudal peduncle and the caudal fin is rounded. The average size of the ninespine stickleback is 2.5 inches.

The ninespine stickleback is found in both brackish waters and freshwater lakes and rivers. In rivers and streams it is generally found in slower areas where there is vegetation. The diet of the ninespine stickleback consists mostly on aquatic insects and crustaceans, but will eat the eggs and young other species of fish. Spawning takes place over the summer in fresh water. Like other sticklebacks, the ninespine stickleback male builds a nest using pieces of vegetation and other debris, courts a female, and guards the eggs and young. Likely predators of the ninespine stickleback are any larger fishes and fish eating birds (Univsersity of New Brunswick).

Common Shiner - *Notropis cornutus*

The common shiner has an olive back with a dark dorsal stripe. Its sides are silvery and sometimes have a bronze tinge. The body is strongly laterally compressed fish and its head and mouth are large. The origin of the dorsal fin is directly over the origin of the pelvic fins. Anal fin rays 9-12 (25% of population may have only 8 rays). The lateral line is slightly curved downwards with 40 - 44 scales along its length. The scales are noticeably taller than wide (twice as high as wide). The average size of the common shiner is 2 - 4 inches, but can grow up to 8 inches.

The common shiner prefers faster pools in rivers and streams, but is also found in lakes. Food items of the common shiner include terrestrial and aquatic insects, vegetation, and other fishes. Spawning occurs from spring to early summer. The male fish develops red to orange colour on the tips of its fins and tubercles on its head. The male will dig a nest in gravel or may use the nest of another fish. After eggs are deposited the male will guard the nest. Like the golden shiner, the common shiner is popular bait among anglers. Natural predators include larger fish like smallmouth bass and chain pickerel, and birds, such as mergansers and kingfishers. (Univsersity of New Brunswick).

White Sucker; *Catostomus commersoni*

Scales larger, usually fewer than 90 in lateral line; lower lip much wider than its height; oblique rows of scales from lateral line to dorsal origin 8-10; dorsal fin rays 10-12; least caudal peduncle depth more than one-half length of dorsal fin base; no membranous connection between pelvic fins and body (University of New Brunswick).

Peal Dace – *Semotilus margarita*

Similar in appearance to the lake chub, pearl dace have a cigar shaped body with a more blunt head and slightly sub-terminal mouth. Its back is dark olive to black with lighter silvery sides and white belly. The sides will often have brown and black spots. The dorsal fin (lacks a dark spot) begins behind the pelvic fins and the caudal is slightly forked. The lateral line is complete with 62 - 78 scales. The pearl dace has a small barbel located on the premaxillaries, however, it can be absent on one or both sides. The average size of the pearl dace is 3.5 inches but can grow to 6 inches.

The pearl dace habitats are cool bogs, streams, and lakes. Pearl dace eat a variety of aquatic organisms including plankton, chironomids, and copepods. The pearl dace is likely to be a forage fish for many larger fish and fish eating birds. Spawning occurs in the spring to early summer (May - June). At this time the males take on orange/red colouration on its sides below the lateral line. Spawning sites are in shallow water with sand or gravel substrate (University of New Brunswick).

Blacknose Shiner, *Notropis heterolepis*

Anal fin rays typically 8, sometimes 7; dorsal fin located over or behind a vertical through pelvic insertion; lateral line complete (University of New Brunswick).

2.4 TRIBUTARY TO RIVIERE A L'ANGUILLE (WC 4)

Watercourse 4 (WC4) is a tributary to Riviere a L'Anguille and flows west. This tributary is located south of WC3. WSP field personnel completed the stream assessment on August 11, 2016. The reaches and water quality sampling locations are shown in Figure 3, Appendix A.

2.4.1 FISH HABITAT

Three reaches were assessed and all three reaches had the same characteristics; there were no differentiable reaches. The stream is the main channel of a deadwater watercourse. Each reach consisted of 25 m and the average wetted width was 1.25 m and the bankful channel average width is 1.75 m. The average depth of the wetted width was 25 cm. The substrate consisted of fines and organics with little to no flow.

Reaches 1-3 is dominated by grasses and shrubs. There were no defined banks and the canopy cover was 55%. The left bank had approximately 35% overhanging vegetation and the right bank had approximately 30% overhanging vegetation. There was no woody debris in either reach. Table 2-10 below summarizes the characteristics of WC4.

It is unlikely that WC4 supports the fish habitat of many fish from lack of water due to the vegetation choked channel and the poor water quality.

Table 2-10 WC4 Characteristics

Watercourse Characteristics											
Reach No.	Stream Type*	Channel Type**	Length (m)	AVG. Width (m)		Substrate (%)	Avg. Depth Wet Width (cm)	0-50% Overhanging Vegetation		Large Woody Debris in Stream (m)	Flow (cm/s)
				Wet	Bank Channel	Fines/Organics		L	R		
WC4											
1	24	1	25	1.25	1.75	100	25	35	30	-	-
2	24	1	25	1.25	1.75	100	25	35	30	-	-
3	24	1	25	1.25	1.75	100	25	35	30	-	-

***Stream Type** --> 13 = Beaver; 24 = Natural Deadwater

****Channel Type** --> 1 = Main

Reach No.	Shade (%)	Stream Banks				Depth					
		Vegetation				1/4 (cm)		1/2 (cm)		3/4 (cm)	
		Bare Ground	Grasses	Shrubs	Trees	Wet	Channel	Wet	Channel	Wet	Channel
WC4											
1	55	0	84	15	<1	0.03	0.07	0.2	0.2	0.02	0.02
2	50	0	84	15	<1	0.03	0.07	0.2	0.2	0.02	0.02
3	6	0	84	15	<1	0.03	0.07	0.2	0.2	0.02	0.02

Photo 1 – Looking upstream at Reach 1 of WC4.

Photo 2 – Looking downstream at Reach 1.

Photo 3 – Looking upstream at the vegetation around WC4.

Photo 4 – Looking at the water level in WC4.

2.4.2 WATER QUALITY

The water quality of WC1 was sampled in the field with a YSI meter. The results can be seen in Table 2-11. The pH and dissolved oxygen of WC4 is below the CCME guideline and the temperature is does not support the habitat for cold water fish.

Table 2-11 Field Water Quality Measurements (YSI Meter)

Parameter	CCME Guideline	WC4
		11-Aug-16
Temperature (°C)		19.98
Conductivity (µs/cm)		117
TDS (mg/L)		0.75
Salinity (ppm)		0.05
Dissolved Oxygen (%)		24.4
Dissolved Oxygen (mg/L)	5	**2.18**
pH	6.5-9.0	**6.45**

WSP sampled WC4 and sent the samples to AGAT Labs for analysis. The results can be seen in Appendix B. The water samples were compared to the CCME guidelines for the Protection of Aquatic Life (freshwater) and the exceedances are as follows:

- Dissolved Iron;
- pH;
- Total Arsenic; and
- Total Iron.

Arsenic is absorbed by colloidal humic material under conditions of high organic content, low pH, low phosphorous, and low mineral content (CCME, 2001). This is not known to inhibit fish, however, the extended exposure to metals such as iron and arsenic is not known.

2.4.3 FISH PRESENCE

Fish surveys were not conducted on WC4 due to the nature of the watercourse, lack of water and no potential habitat for fish species.

2.5 POND

The pond that was sampled is located on the Theriault & Hachey Peat Moss Plant in Baie-Ste-Anne. It is situated immediately east of a harvesting field (see Figure 2, Appendix A). WSP field personnel completed the field survey on August 12, 2016. The sampling location can be seen in Figure 2, Appendix A.

2.5.1 FISH HABITAT

WSP did not complete a fish habitat assessment on the Pond. It is unlikely that the Pond supports cold water fish. The potential for warm water species does exist, though the pH is low and the Pond is likely to warm significantly in summer. The outlet (WC1 – tributary to E Branch Eel River) is blocked by vegetation wherever the channel disappears and the potential for fish passage through to the Pond is diminished.

Photo 1 – Looking northeast at the Pond

Photo 2 – Looking southwest at the Pond.

Photo 3 – Looking west towards the harvesting field from the edge of the Pond.

2.5.2 WATER QUALITY

The water quality of the Pond was sampled in the field with a YSI meter. The results can be seen in Table 2-12. The pH of the Pond is below the CCME guideline and the temperature does not support the habitat for cold water fish.

Table 2-12 Field Water Quality Measurements (YSI Meter)

Parameter	CCME Guideline	POND
		12-Aug-16
Temperature (°C)		21.95
Conductivity (µs/cm)		31
TDS (mg/L)		0.02
Salinity (ppm)		0.01
Dissolved Oxygen (%)		83.4
Dissolved Oxygen (mg/L)	5	7.12
pH	6.5-9.0	7.57

WSP sampled the Pond and sent the samples to AGAT Labs for analysis. The results can be seen in Appendix B. The water samples were compared to the CCME guidelines for the Protection of Aquatic Life (freshwater) and the exceedances are as follows:

- Dissolved Iron; and
- Total Iron.

This is not known to inhibit fish, however, the extended exposure to metals such as iron is not known.

2.5.3 FISH PRESENCE

WSP did not complete any fish surveys for the Pond. No fish were observed during water sampling at the Pond.

3 SUMMARY

WSP conducted fish and fish habitat surveys on August 11, and 12, and September 2, 2016 for the proposed peat harvesting development of Bog #324W. Four watercourses and one pond within the study area were assessed in the field for water quality and all watercourses were assessed for fish presence and fish habitat. The work was performed during the low flow season of summer 2016. All applicable and appropriate permits and licenses were obtained from the Department of Fisheries and Oceans (DFO) and the Kouchibouguac National Park (KNP).

Each sampling location was assessed for fish habitat characteristics including bank and channel vegetation structure, substrate, and standard widths and depths of the watercourse. A modified NBDNR/DFO Stream Assessment form was used to compile the habitat information. The water quality was tested in-situ using a YSI Multi-Parameter Water Quality Monitoring meter and water samples were collected and submitted to AGAT Laboratories for analysis of General Chemistry, Nutrients, Hardness, and Metals (Total and Dissolved).

Fish presence surveys were originally planned to be conducted with the use of an LR-24 Electrofisher, however the water temperature, and depth of channel for each watercourse was greater than the capacity to use the electrofisher. Minnow traps were set in all watercourses (with the exception of WC4) to catch fish. All fish caught were identified, measured, and released.

The field and laboratory observations indicate that the watercourses flowing away from Bog #324W are poor fish quality, with warm temperatures, low dissolved oxygen, and low pH. Although warm-water fish were observed in WC1-WC3, no sport fish (salmonids such as brook trout or Atlantic salmon) were present at the sampling locations. The habitat characteristics are also poor for salmonids with no spawning habitat noted. The watercourses appear to be beaver impacted drainage channels for the bog.

4 CLOSURE

This report has been authored by Virgil Grecian, M.Sc., Environmental Site Assessor.

5 BIBLIOGRAPHY

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University of New Brunswick. (n.d.). *Canadian Rivers Institute.* Retrieved 10 5, 2016, from Blacknose Shiner: http://www.unb.ca/research/institutes/cri/links/inlandfishesnb/Species/blacknoseshiner.html

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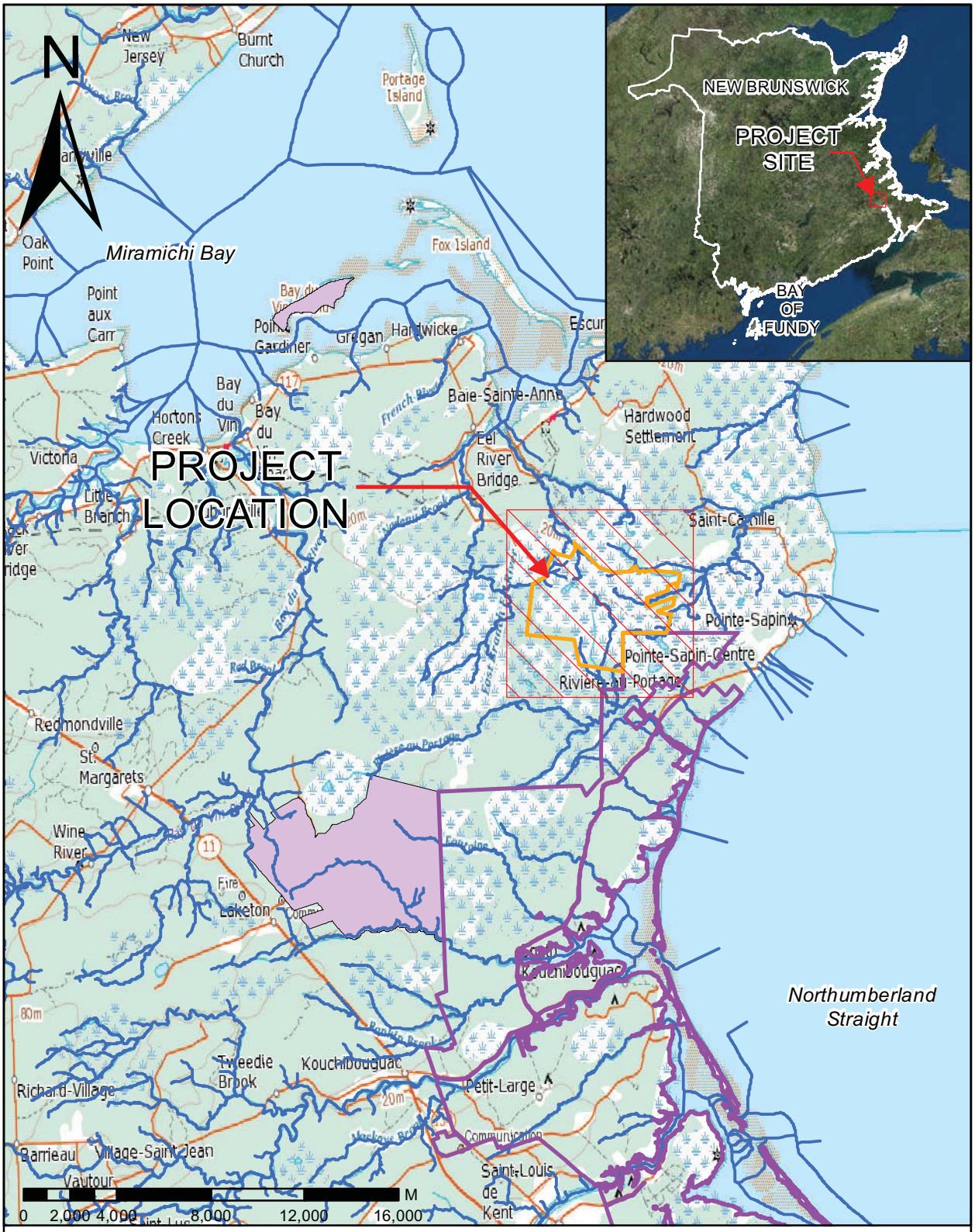
Univsersity of New Brunswick. (n.d.). *Canadian Rivers Institute.* Retrieved 10 05, 2016, from Ninespine Stickleback: http://www.unb.ca/research/institutes/cri/links/inlandfishesnb/Species/ninespinestickleback.html

Appendix A
Figures



Date: September 21, 2016
Scale: 1:250,000
Project No.: 161-02978
Drawn: VDG
DATUM: UTM NAD 83 Z 20

NOTES:

Property data SNB, Aerial Imagery from http://services.arcgisonline.com and Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

FIGURE 1
Project Location
Peat Development Lease Extension
Kouchibouguac, NB

WSP

Legend

- SAMPLING STATIONS
- BERGER_PARK
- PROPOSED LEASE EXTENSION
- **WATERCOURSE (NBHN)**
- REGULATED WETLAND

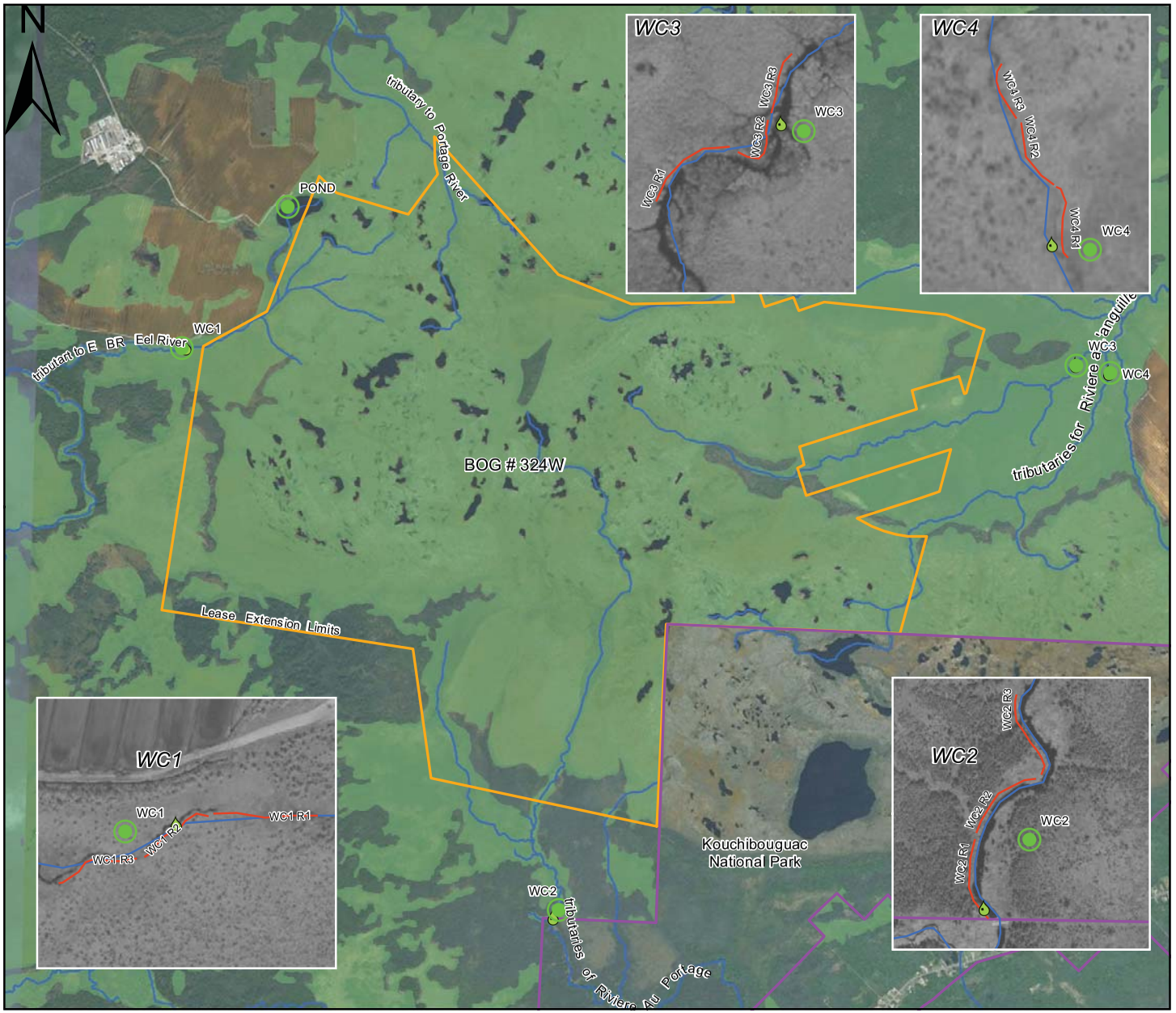
NOTES:
Property data SNB,
Aerial Imagery from http://services.arcgisonline.com and Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

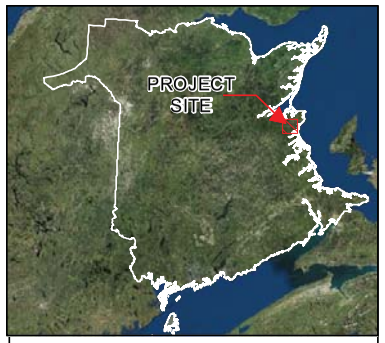
0 250 500 1,000 1,500 2,000 M

FIGURE 2 SITE LAYOUT FISH AND FISH HABITAT SAMPLING LOCATIONS BOG #324W

WSP Project No. 161-02978

WSP





Legend

- WATER QUALITY
- SAMPLING STATIONS
- NATIONAL PARK BOUNDARY
- PROPOSED LEASE EXTENSION
- WATERCOURSE (NBHN)
- REGULATED WETLAND

NOTES:
Property data SNB,
Aerial Imagery from http://services.arcgisonline.com and Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

0 250 500 1,000 1,500 2,000 M

FIGURE 3 WC REACH LOCATIONS FISH AND FISH HABITAT SAMPLING LOCATIONS BOG #324W

WSP Project No. 161-02798

WSP

Appendix B
Water Quality

WSP Canada Inc.
161-02978

Appendix B

Standard Water Analysis & Total Metals Scan
Berger Peat Development, Pointe-Sapin, NB
Project No.: 161-02978

Parameter	Units	RDL	CCME[1]		Freshwater Samples				
					WC1 7773828 12-Aug-16	WC2 7824652 2-Sep-16	WC3 7771679 11-Aug-16	WC4 7771681 11-Aug-16	POND 7773818 12-Aug-16
			Short Term (mg/L)	Long Term (mg/L)					
pH		-	6.5-9.0		5	5.55	6.14	5.54	6.78
Reactive Silica as SiO2	mg/L	0.5	-	-	0.5	6.6	3.5	3.5	0.7
Chloride	mg/L	1	640	120	3	4	3	3	5
Fluoride	mg/L	0.1	-	0.12	<0.12	< 0.12	<0.12	<0.12	<0.12
Sulphate	mg/L	2	-	-	<2	< 2	<2	<2	<2
Alkalinity	mg/L	5	-	-	<5	< 5	8	5	<5
True Color	TCU	5	-	-	189	314	349	502	242
Turbidity	NTU	0.1	-	-	1.5	2.6	6.9	121	5.8
Electrical Conductivity	umho/cm	1	-	-	34	31	35	40	29
Nitrate + Nitrite as N	mg/L	0.05	-	-	<0.05	< 0.05	<0.05	<0.05	<0.05
Nitrate as N	mg/L	0.05	550	13	<0.05	< 0.05	<0.05	<0.05	<0.05
Nitrite as N	mg/L	0.05	-	0.06	<0.05	< 0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L	0.03	19		<0.03	< 0.03	<0.03	0.16	<0.03
Total Organic Carbon	mg/L	0.5	-	-	24.5	26.6	31.2	61.7	17.6
Ortho-Phosphate as P	mg/L	0.01	-	-	<0.01	<0.01	<0.01	<0.01	0.05
Total Sodium	mg/L	0.1	-	-	2.4	3	4.5	4.4	2.3
Total Potassium	mg/L	0.1	-	-	0.2	0.5	0.6	0.7	0.3
Total Calcium	mg/L	0.1	-	-	0.8	2.2	5.6	8.9	1.7
Total Magnesium	mg/L	0.1	-	-	0.4	0.5	1	1.2	0.4
Total Phosphorous	mg/L	0.02	-	-	<0.02	0.09	0.15	0.78	0.08
Bicarb. Alkalinity (as CaCO3)	mg/L	5	-	-	<5	<5	8	5	<5
Carb. Alkalinity (as CaCO3)	mg/L	10	-	-	<10	<10	<10	<10	<10
Hydroxide	mg/L	5	-	-	<5	<5	<5	<5	<5
Calculated TDS	mg/L	1	-	-	7	14	23	44	11
Hardness	mg/L	-	-	-	3.6	7.6	18.1	27.2	5.9
Langelier Index (@20C)	NA	-	-	-	-5.89	-4.92	-3.73	-4.36	-3.8
Langelier Index (@ 4C)	NA	-	-	-	-6.21	-5.24	-4.05	-4.68	-4.12
Saturation pH (@ 20C)	NA	-	-	-	10.9	10.5	9.87	9.9	10.6
Saturation pH (@ 4C)	NA	-	-	-	11.2	10.8	10.2	10.2	10.9
Anion Sum	me/L	-	-	-	0.08	0.11	0.24	0.18	0.14
Cation sum	me/L	-	-	-	0.21	0.44	0.73	1.62	0.29
% Difference/ Ion Balance (NS)	%	-	-	-	41.9	59.2	49.9	79.5	34
			Short Term (ug/L)	Long Term (ug/L)					
Total Aluminum	ug/L	5	-	-	27	109	301	695	77
Total Antimony	ug/L	2	-	-	<2	<2	<2	<2	<2
Total Arsenic	ug/L	2	5		<2	2	2	8	3
Total Barium	ug/L	5	-	-	17	53	161	573	61
Total Beryllium	ug/L	2	-	-	<2	<2	<2	<2	<2
Total Bismuth	ug/L	2	-	-	<2	<2	<2	<2	<2
Total Boron	ug/L	5	29000	1500	<5	<5	5	6	<5
Total Cadmium	ug/L	0.17	1	0.09	<0.017	0.074	0.100	0.076	0.026
Total Chromium	ug/L	1	-	-	<1	<1	1	1	<1
Total Cobalt	ug/L	1	-	-	<1	<1	<1	<1	<1
Total Copper	ug/L	1	-	-	<1	1	<1	<1	<1
Total Iron	ug/L	50	300		310	3340	3350	21300	1410
Total Lead	ug/L	0.5	-	-	0.7	0.7	0.7	7.9	1.3
Total Manganese	ug/L	2	-	-	14	31	130	256	37
Total Molybdenum	ug/L	2	73		<2	<2	<2	<2	<2
Total Nickel	ug/L	2	-	-	<2	<2	<2	<2	<2
Total Selenium	ug/L	1	1		<1	<1	<1	<1	<1
Total Silver	ug/L	0.1	-	0.25	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L	5	-	-	6	11	20	41	7
Total Thallium	ug/L	0.1	0.8		<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L	2	-	-	<2	<2	<2	<2	<2
Total Titanium	ug/L	2	-	-	<2	<2	4	16	<2
Total Uranium	ug/L	0.1	33	15	<0.1	<0.1	<0.1	0.2	0.1
Total Vanadium	ug/L	2	-	-	<2	<2	<2	3	<2
Total Zinc	ug/L	5	30		<5	6	6	19	<5
Total Suspended Solids	mg/L	5	Narrative	-	<5	12	21	90	8

Notes:

[1] CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)

shading denotes a guideline exceedance

RDL denotes laboratory reported detection limit

\- denotes no value/not analysed

WC1	WSP Sample ID
7773828	Laboratory Sample ID
12-Aug-16	Sampling date

Appendix B

Dissolved Metals
Berger Peat Development, Pointe-Sapin, NB
Project No.: 161-02978

Parameter	Units	RDL	Guideline[1]		Freshwater Samples				
			Short Term (ug/L)	Long Term (ug/L)	WC1 7773828 12-Aug-16	WC2 7824652 02-Sep-16	WC3 7771679 11-Aug-16	WC4 7771681 11-Aug-16	POND 7773818 12-Aug-16
Dissolved Aluminum	ug/L	5	-	-	11	82	91	100	32
Dissolved Antimony	ug/L	2	-	-	<2	<2	<2	<2	<2
Dissolved Arsenic	ug/L	2	5		<2	<2	<2	<2	4
Dissolved Barium	ug/L	5	-	-	12	43	83	136	33
Dissolved Beryllium	ug/L	2	-	-	<2	<2	<2	<2	<2
Dissolved Bismuth	ug/L	2	-	-	<2	<2	<2	<2	<2
Dissolved Boron	ug/L	5	29000	1500	<5	<5	<5	<5	<5
Dissolved Cadmium	ug/L	0.017	1	0.09	**0.15**	<0.017	0.031	<0.017	<0.017
Dissolved Chromium	ug/L	1	-	-	<1	1	<1	<1	<1
Dissolved Cobalt	ug/L	1	-	-	<1	<1	<1	<1	<1
Dissolved Copper	ug/L	1	-	-	<2	<2	<2	<2	<2
Dissolved Iron	ug/L	50	300		266	**1510**	**2040**	**3330**	**1120**
Dissolved Lead	ug/L	0.5	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved Manganese	ug/L	2	-	-	23	293	46	151	23
Dissolved Molybdenum	ug/L	2	73		<2	<2	<2	<2	<2
Dissolved Nickel	ug/L	2	-	-	<2	<2	<2	<2	<2
Dissolved Selenium	ug/L	1	1		<1	<1	<1	<1	<1
Dissolved Silver	ug/L	0.1	-	0.25	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Strontium	ug/L	5	-	-	6	9	14	19	6
Dissolved Thallium	ug/L	0.1	0.8		<0.1	<0.1	<0.1	<1.0	<0.1
Dissolved Tin	ug/L	2	-	-	<2	<2	<2	<2	<2
Dissolved Titanium	ug/L	2	-	-	<2	<2	2	<2	<2
Dissolved Uranium	ug/L	0.1	33	15	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Vanadium	ug/L	2	-	-	<2	<2	<2	<2	<2
Dissolved Zinc	ug/L	5	30		<5	<5	<5	<5	<5

Notes:

[1] CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)

	shading denotes a guideline exceedance
RDL	denotes laboratory reported detection limit
-	denotes no value/not analysed

Sample Details

WC1	WSP Sample ID
7773828	Laboratory Sample ID
12-Aug-16	Sampling date

Appendix C
Laboratory Certificates

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: WSP CANADA INC.
55 DRISCOLL CRESCENT
MONCTON, NB E1E4C8
(506) 857-1675

ATTENTION TO: VIRGIL GRECIAN

PROJECT: 161-02978

AGAT WORK ORDER: 16X126285

WATER ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganics Supervisor

DATE REPORTED: Aug 23, 2016

PAGES (INCLUDING COVER): 14

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Dartmouth, Nova Scotia
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TEL (902)468-8718
FAX (902)468-8924
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Certificate of Analysis

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

Dissolved Metals (FWAL)

DATE RECEIVED: 2016-08-15

DATE REPORTED: 2016-08-16

		SAMPLE DESCRIPTION:		WC3	WC4
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		8/11/2016	8/11/2016
Parameter	Unit	G / S	RDL	7771679	7771681
Dissolved Aluminum	ug/L		5	91	100
Dissolved Antimony	ug/L		2	<2	<2
Dissolved Arsenic	ug/L	12.5	2	<2	<2
Dissolved Barium	ug/L		5	83	136
Dissolved Beryllium	ug/L		2	<2	<2
Dissolved Bismuth	ug/L		2	<2	<2
Dissolved Boron	ug/L	NRG, NRG	5	<5	<5
Dissolved Cadmium	ug/L	0.12	0.017	0.031	<0.017
Dissolved Chromium	ug/L		1	<1	<1
Dissolved Cobalt	ug/L		1	<1	<1
Dissolved Copper	ug/L		2	<2	<2
Dissolved Iron	ug/L		50	2040	3330
Dissolved Lead	ug/L		0.5	<0.5	<0.5
Dissolved Manganese	ug/L		2	46	151
Dissolved Molybdenum	ug/L		2	<2	<2
Dissolved Nickel	ug/L		2	<2	<2
Dissolved Selenium	ug/L		1	<1	<1
Dissolved Silver	ug/L		0.1	<0.1	<0.1
Dissolved Strontium	ug/L		5	14	19
Dissolved Thallium	ug/L		0.1	<0.1	<0.1
Dissolved Tin	ug/L		2	<2	<2
Dissolved Titanium	ug/L		2	2	<2
Dissolved Uranium	ug/L	NRG, NRG	0.1	<0.1	<0.1
Dissolved Vanadium	ug/L		2	<2	<2
Dissolved Zinc	ug/L		5	<5	<5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

7771679-7771681 Analysis completed on a filtered sample.

Certified By:

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

DATE RECEIVED: 2016-08-15

DATE REPORTED: 2016-08-18

Parameter	Unit	SAMPLE DESCRIPTION: / SAMPLE TYPE: / DATE SAMPLED: G / S	RDL	WC3 Water 8/11/2016 7771679	WC4 Water 8/11/2016 7771681
pH		6.5-9.0		6.14	5.54
Reactive Silica as SiO2	mg/L		0.5	3.5	3.5
Chloride	mg/L	NRG	1	3	3
Fluoride	mg/L	NRG	0.12	<0.12	<0.12
Sulphate	mg/L		2	<2	<2
Alkalinity	mg/L		5	8	5
True Color	TCU	Narrative	5	349	502
Turbidity	NTU	Narrative	0.1	6.9	121
Electrical Conductivity	umho/cm		1	35	40
Nitrate + Nitrite as N	mg/L		0.05	<0.05	<0.05
Nitrate as N	mg/L	1500, 200	0.05	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	0.16
Total Organic Carbon	mg/L		0.5	31.2	61.7
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01
Total Sodium	mg/L		0.1	4.5	4.4
Total Potassium	mg/L		0.1	0.6	0.7
Total Calcium	mg/L		0.1	5.6	8.9
Total Magnesium	mg/L		0.1	1.0	1.2
Total Phosphorous	mg/L	Fact Sheet	0.02	0.15	0.78
Bicarb. Alkalinity (as CaCO3)	mg/L		5	8	5
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10
Hydroxide	mg/L		5	<5	<5
Calculated TDS	mg/L		1	23	44
Hardness	mg/L			18.1	27.2
Langelier Index (@20C)	NA			-3.73	-4.36
Langelier Index (@ 4C)	NA			-4.05	-4.68
Saturation pH (@ 20C)	NA			9.87	9.90
Saturation pH (@ 4C)	NA			10.2	10.2
Anion Sum	me/L			0.24	0.18

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

DATE RECEIVED: 2016-08-15

DATE REPORTED: 2016-08-18

		SAMPLE DESCRIPTION:		WC3	WC4
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		8/11/2016	8/11/2016
Parameter	Unit	G / S	RDL	7771679	7771681
Cation sum	me/L			0.73	1.62
% Difference/ Ion Balance (NS)	%			49.9	79.5
Total Aluminum	ug/L		5	301	695
Total Antimony	ug/L		2	<2	<2
Total Arsenic	ug/L	12.5	2	2	8
Total Barium	ug/L		5	161	573
Total Beryllium	ug/L		2	<2	<2
Total Bismuth	ug/L		2	<2	<2
Total Boron	ug/L	NRG, NRG	5	5	6
Total Cadmium	ug/L	0.12	0.017	0.100	0.076
Total Chromium	ug/L		1	1	1
Total Cobalt	ug/L		1	<1	<1
Total Copper	ug/L		1	<1	<1
Total Iron	ug/L		50	3350	21300
Total Lead	ug/L		0.5	0.7	7.9
Total Manganese	ug/L		2	130	256
Total Molybdenum	ug/L		2	<2	<2
Total Nickel	ug/L		2	<2	<2
Total Selenium	ug/L		1	<1	<1
Total Silver	ug/L	7.5, NRG	0.1	<0.1	<0.1
Total Strontium	ug/L		5	20	41
Total Thallium	ug/L		0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2
Total Titanium	ug/L		2	4	16
Total Uranium	ug/L	NRG, NRG	0.1	<0.1	0.2
Total Vanadium	ug/L		2	<2	3
Total Zinc	ug/L		5	6	19

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

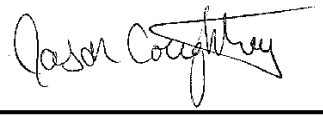
DATE RECEIVED: 2016-08-15

DATE REPORTED: 2016-08-18

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

7771679-7771681 TOC was analysed at AGAT Montreal.
Ion Balance is biased high, contributing parameters have been confirmed.

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

TSS

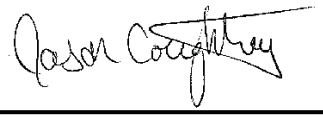
DATE RECEIVED: 2016-08-15

DATE REPORTED: 2016-08-16

		SAMPLE DESCRIPTION:		WC3	WC4
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		8/11/2016	8/11/2016
Parameter	Unit	G / S	RDL	7771679	7771681
Total Suspended Solids	mg/L	Narrative	5	21	90

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

Certified By:



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Guideline Violation

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7771679	WC3	NS-CCME MAL	MTL - Standard Water Analysis + Total Metals	pH	6.5-9.0	6.14
7771681	WC4	NS-CCME MAL	MTL - Standard Water Analysis + Total Metals	pH	6.5-9.0	5.54

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Quality Assurance

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date:			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
MTL - Standard Water Analysis + Total Metals															
pH	7771679	7771679	6.14	6.03	1.8%	<	100%	80%	120%	NA	80%	120%	NA	80%	120%
Reactive Silica as SiO2	1	7770175	4.1	4.1	0.0%	< 0.5	114%	80%	120%		80%	120%	96%	80%	120%
Chloride	7767958		48	49	2.1%	< 1	104%	80%	120%	NA	80%	120%	NA	80%	120%
Fluoride	7767958		<0.12	<0.12	NA	< 0.12	115%	80%	120%	NA	80%	120%	89%	80%	120%
Sulphate	7767958		<2	<2	NA	< 2	113%	80%	120%	NA	80%	120%	114%	80%	120%
Alkalinity	7771679	7771679	8	7	NA	< 5	95%	80%	120%	NA	80%	120%	NA	80%	120%
True Color	1	7773828	189	171	10.0%	< 5	110%	80%	120%		80%	120%		80%	120%
Turbidity	1	7773828	1.5	1.3	14.3%	< 0.1	103%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	7771679	7771679	35	36	2.8%	< 1	80%	80%	120%	NA	80%	120%	NA	80%	120%
Nitrate as N	7767958		0.22	0.22	NA	< 0.05	97%	80%	120%	NA	80%	120%	85%	80%	120%
Nitrite as N	7767958		0.06	<0.05	NA	< 0.05	103%	80%	120%	NA	80%	120%	88%	80%	120%
Ammonia as N	1	7770175	0.04	0.05	NA	< 0.03	103%	80%	120%		80%	120%	106%	80%	120%
Total Organic Carbon	4		NA	NA	0.0%	< 0.5	98%	80%	120%	105%	80%	120%	NA	80%	120%
Ortho-Phosphate as P	1		< 0.01	< 0.01	NA	< 0.01	103%	80%	120%	95%	80%	120%	104%	80%	120%
Total Sodium	8162016		358	378	5.4%	< 0.1	120%	80%	120%	120%	80%	120%	96%	70%	130%
Total Potassium	8162016		0.2	0.2	NA	< 0.1	120%	80%	120%	120%	80%	120%	130%	70%	130%
Total Calcium	8162016		2.0	2.4	18.2%	< 0.1	120%	80%	120%	96%	80%	120%	100%	70%	130%
Total Magnesium	8162016		0.3	0.3	NA	< 0.1	120%	80%	120%	120%	80%	120%	120%	80%	120%
Total Phosphorous	8162016		0.03	< 0.02	NA	< 0.02	NA	80%	120%	85%	80%	120%	NA	70%	130%
Bicarb. Alkalinity (as CaCO3)	7771679	7771679	8	7	NA	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Carb. Alkalinity (as CaCO3)	7771679	7771679	<10	<10	NA	< 10	NA	80%	120%	NA	80%	120%	NA	80%	120%
Hydroxide	7771679	7771679	<5	<5	NA	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	8162016		24	23	NA	< 5	NA	80%	120%	NA	80%	120%	130%	70%	130%
Total Antimony	8162016		< 2	< 2	NA	< 2	80%	80%	120%	113%	80%	120%	103%	70%	130%
Total Arsenic	8162016		< 2	< 2	NA	< 2	102%	80%	120%	101%	80%	120%	85%	70%	130%
Total Barium	8162016		< 5	< 5	NA	< 5	101%	80%	120%	105%	80%	120%	104%	70%	130%
Total Beryllium	8162016		< 2	< 2	NA	< 2	104%	80%	120%	110%	80%	120%	108%	70%	130%
Total Bismuth	8162016		< 2	< 2	NA	< 2	93%	80%	120%	103%	80%	120%	99%	70%	130%
Total Boron	8162016		145	147	1.4%	< 5	106%	80%	120%	110%	80%	120%	104%	70%	130%
Total Cadmium	8162016		< 0.017	< 0.017	NA	< 0.017	101%	80%	120%	101%	80%	120%	101%	70%	130%
Total Chromium	8162016		< 1	< 1	NA	< 1	98%	80%	120%	94%	80%	120%	111%	70%	130%
Total Cobalt	8162016		< 1	< 1	NA	< 1	97%	80%	120%	101%	80%	120%	107%	70%	130%
Total Copper	8162016		< 1	< 1	NA	< 1	103%	80%	120%	80%	80%	120%	103%	70%	130%
Total Iron	8162016		85	94	NA	< 50	103%	80%	120%	100%	80%	120%	122%	70%	130%
Total Lead	8162016		1.2	< 0.5	NA	< 0.5	101%	80%	120%	105%	80%	120%	86%	70%	130%
Total Manganese	8162016		24	23	4.3%	< 2	105%	80%	120%	108%	80%	120%	92%	70%	130%
Total Molybdenum	8162016		< 2	< 2	NA	< 2	98%	80%	120%	103%	80%	120%	112%	70%	130%
Total Nickel	8162016		< 2	< 2	NA	< 2	101%	80%	120%	106%	80%	120%	114%	70%	130%
Total Selenium	8162016		< 1	< 1	NA	< 1	98%	80%	120%	105%	80%	120%	84%	70%	130%

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Quality Assurance

CLIENT NAME: WSP CANADA INC.
AGAT WORK ORDER: 16X126285
PROJECT: 161-02978
ATTENTION TO: VIRGIL GRECIAN
SAMPLING SITE:
SAMPLED BY:

Water Analysis (Continued)

RPT Date:			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Silver	8162016		< 0.1	< 0.1	NA	< 0.1	104%	80%	120%	103%	80%	120%	98%	70%	130%
Total Strontium	8162016		7	6	NA	< 5	92%	80%	120%	94%	80%	120%	92%	70%	130%
Total Thallium	8162016		< 0.1	< 0.1	NA	< 0.1	104%	80%	120%	107%	80%	120%	101%	70%	130%
Total Tin	8162016		< 2	< 2	NA	< 2	97%	80%	120%	105%	80%	120%	109%	70%	130%
Total Titanium	8162016		< 2	< 2	NA	< 2	116%	80%	120%	120%	80%	120%	125%	70%	130%
Total Uranium	8162016		< 0.1	< 0.1	NA	< 0.1	99%	80%	120%	105%	80%	120%	107%	70%	130%
Total Vanadium	8162016		< 2	< 2	NA	< 2	96%	80%	120%	100%	80%	120%	111%	70%	130%
Total Zinc	8162016		< 5	< 5	NA	< 5	95%	80%	120%	89%	80%	120%	91%	70%	130%
Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.															
Dissolved Metals (FWAL)															
Dissolved Aluminum	8162016		73	79	7.9%	< 5	117%	80%	120%	106%	80%	120%	115%	70%	130%
Dissolved Antimony	8162016		< 2	< 2	0.0%	< 2	80%	80%	120%	113%	80%	120%	106%	70%	130%
Dissolved Arsenic	8162016		< 2	< 2	0.0%	< 2	94%	80%	120%	92%	80%	120%	95%	70%	130%
Dissolved Barium	8162016		181	176	2.8%	< 5	100%	80%	120%	102%	80%	120%	96%	70%	130%
Dissolved Beryllium	8162016		< 2	< 2	0.0%	< 2	106%	80%	120%	111%	80%	120%	114%	70%	130%
Dissolved Bismuth	8162016		< 2	< 2	0.0%	< 2	90%	80%	120%	100%	80%	120%	70%	70%	130%
Dissolved Boron	8162016		54	53	1.9%	< 5	120%	80%	120%	107%	80%	120%	99%	70%	130%
Dissolved Cadmium	8162016		< 0.017	< 0.017	0.0%	< 0.017	100%	80%	120%	104%	80%	120%	109%	70%	130%
Dissolved Chromium	8162016		3	3	0.0%	< 1	102%	80%	120%	106%	80%	120%	107%	70%	130%
Dissolved Cobalt	8162016		2	2	0.0%	< 1	98%	80%	120%	101%	80%	120%	116%	70%	130%
Dissolved Copper	8162016		48	17	0.0%	< 2	109%	80%	120%	80%	80%	120%	70%	70%	130%
Dissolved Iron	8162016		23400	23700	1.3%	< 50	107%	80%	120%	104%	80%	120%	99%	70%	130%
Dissolved Lead	8162016		1.3	1.3	0.0%	< 0.5	96%	80%	120%	97%	80%	120%	79%	70%	130%
Dissolved Manganese	8162016		1.15	1.16	NA	< 2	102%	80%	120%	101%	80%	120%	95%	70%	130%
Dissolved Molybdenum	8162016		< 2	< 2	0.0%	< 2	97%	80%	120%	101%	80%	120%	99%	70%	130%
Dissolved Nickel	8162016		4	3	28.6%	< 2	106%	80%	120%	111%	80%	120%	116%	70%	130%
Dissolved Selenium	8162016		< 1	< 1	0.0%	< 1	98%	80%	120%	95%	80%	120%	92%	70%	130%
Dissolved Silver	8162016		< 0.1	< 0.1	0.0%	< 0.1	102%	80%	120%	100%	80%	120%	NA	70%	130%
Dissolved Strontium	8162016		142	143	0.7%	< 5	88%	80%	120%	89%	80%	120%	96%	70%	130%
Dissolved Thallium	8162016		< 0.1	< 0.1	0.0%	< 0.1	100%	80%	120%	104%	80%	120%	94%	70%	130%
Dissolved Tin	8162016		< 2	< 2	0.0%	< 2	97%	80%	120%	103%	80%	120%	104%	70%	130%
Dissolved Titanium	8162016		< 2	< 2	0.0%	< 2	104%	80%	120%	89%	80%	120%	86%	70%	130%
Dissolved Uranium	8162016		< 0.1	< 0.1	0.0%	< 0.1	97%	80%	120%	101%	80%	120%	91%	70%	130%
Dissolved Vanadium	8162016		6	7	15.4%	< 2	91%	80%	120%	99%	80%	120%	110%	70%	130%
Dissolved Zinc	8162016		23	17	0.0%	< 5	82%	80%	120%	85%	80%	120%	107%	70%	130%
Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.															
TSS															
Total Suspended Solids	1	1687	16	14	NA	< 5	101%	80%	120%		120%	120%	106%	80%	120%

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Quality Assurance

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date:			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Dissolved Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC
Sulphate	INORG-121-6005	SM 4110 B	IC

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorous	MET-121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126285

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC

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Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Laboratory Use Only
Arrival Condition: ☑ Good ☐ Poor (see notes)
Arrival Temperature: 6.8
Hold Time:
AGAT Job Number: AL 602045
Notes: 16X126285

Report Information
Company: WSP Canada Inc.
Contact: Virgil Grecian
Address: 55 Driscoll Cres. Moncton, NB E1E 4C8
Phone: 506-857-1675 Fax:
Client Project #: 161-02978
AGAT Quotation:
Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):
1. Name: Virgil Grecian
Email: virgil.grecian@wspgroup.com
2. Name:
Email:

Report Format
☐ Single Sample per page
☐ Multiple Samples per page
☒ Excel Format Included

Turnaround Time Required (TAT)
Regular TAT ☒ 5 to 7 working days
Rush TAT ☐ Same day ☐ 1 day ☐ 2 days ☐ 3 days
Date Required:

Regulatory Requirements (Check):
☐ List Guidelines on Report ☐ Do not list Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Fuel ☐ Lube
☐ CCME ☐ CDWQ
☐ Industrial ☐ NSESQ-Cont. Sites
☐ Commercial ☐ HRM 101
☐ Res/Park ☐ Storm Water
☐ Agricultural ☐ Waste Water
☐ FWAL
☐ Sediment ☑ Other aquatic life.

Drinking Water Sample: ☐ Yes ☒ No
Reg. No.:

Invoice To Same Yes ☒ / No ☐
Company:
Contact:
Address:
Phone: Fax:
PO/Credit Card#:

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments – Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: ☑Total ☑Diss ☐ Available	Mercury	☐ BOD ☐ CBOD	pH	☒TSS ☐ TDS ☐ VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (PIRI) ☐ low level	Tier 2: TPH/BTEX Fractionation	CCME-CWS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC + EC ☐ P/A ☐ MPN ☐ MF	☐ HPC ☐ Pseudomonas	Fecal Coliform ☐ MPN ☐ MF	Other:	Other:	Hazardous (Y/N)
WC3	Aug. 11/16 3pm	H_2O		*call Jessica		X																						
WC3	" "	H_2O		McIntyre @	X		X																					
WC3	↓	H_2O		506-424-0925			X																					
WC3	↓	H_2O		to confirm							X																	
WC3	↓	H_2O		sample	X	X																						
WC4	4pm	H_2O		analysis.		X																						
WC4	↓	H_2O			X		X																					
WC4	↓	H_2O									X																	
WC4	↓	H_2O					X																					
WC4	↓	H_2O			X	X																						

Samples Relinquished By (Print Name): Date/Time:
Samples Relinquished By (Sign): Date/Time:
Samples Received By (Print Name): R [signature] Date/Time: 8/12/16 925
Samples Received By (Sign): [signature] Date/Time: 8/12/16 925

Pink Copy - Client
Yellow Copy - AGAT
White Copy- AGAT

Page ☐ of ☐

Nº: 054235

T MacDonald [signature] 15-Aug-16 8:44

AGAT Laboratories

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CLIENT NAME: WSP CANADA INC.
55 DRISCOLL CRESCENT
MONCTON, NB E1E4C8
(506) 857-1675

ATTENTION TO: VIRGIL GRECIAN

PROJECT: 161-02978

AGAT WORK ORDER: 16X126659

WATER ANALYSIS REVIEWED BY: Laura Baker, Inorganics Data Reporter

DATE REPORTED: Aug 24, 2016

PAGES (INCLUDING COVER): 14

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

TSS

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-08-24

		SAMPLE DESCRIPTION:		POND	WC1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		8/12/2016	8/12/2016
Parameter	Unit	G / S	RDL	7773818	7773828
Total Suspended Solids	mg/L	Narrative	5	8	<5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

Dissolved Metals (FWAL)

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-08-24

		SAMPLE DESCRIPTION:		POND	WC1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		8/12/2016	8/12/2016
Parameter	Unit	G / S	RDL	7773818	7773828
Dissolved Aluminum	ug/L		5	32	11
Dissolved Antimony	ug/L		2	<2	<2
Dissolved Arsenic	ug/L	12.5	2	4	<2
Dissolved Barium	ug/L		5	33	12
Dissolved Beryllium	ug/L		2	<2	<2
Dissolved Bismuth	ug/L		2	<2	<2
Dissolved Boron	ug/L	NRG, NRG	5	<5	<5
Dissolved Cadmium	ug/L	0.12	0.017	<0.017	0.150
Dissolved Chromium	ug/L		1	<1	<1
Dissolved Cobalt	ug/L		1	<1	<1
Dissolved Copper	ug/L		2	<2	<2
Dissolved Iron	ug/L		50	1120	266
Dissolved Lead	ug/L		0.5	<0.5	<0.5
Dissolved Manganese	ug/L		2	23	13
Dissolved Molybdenum	ug/L		2	<2	<2
Dissolved Nickel	ug/L		2	<2	<2
Dissolved Selenium	ug/L		1	<1	<1
Dissolved Silver	ug/L		0.1	<0.1	<0.1
Dissolved Strontium	ug/L		5	6	6
Dissolved Thallium	ug/L		0.1	<0.1	<0.1
Dissolved Tin	ug/L		2	<2	<2
Dissolved Titanium	ug/L		2	<2	<2
Dissolved Uranium	ug/L	NRG, NRG	0.1	<0.1	<0.1
Dissolved Vanadium	ug/L		2	<2	<2
Dissolved Zinc	ug/L		5	<5	<5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

7773818-7773828 Analysis completed on a filtered sample.

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-08-24

Parameter	Unit	SAMPLE DESCRIPTION: / SAMPLE TYPE: / DATE SAMPLED: G / S	RDL	POND Water 8/12/2016 7773818	WC1 Water 8/12/2016 7773828
pH		6.5-9.0		6.78	5.00
Reactive Silica as SiO2	mg/L		0.5	0.7	0.5
Chloride	mg/L	NRG	1	5	3
Fluoride	mg/L	NRG	0.12	<0.12	<0.12
Sulphate	mg/L		2	<2	<2
Alkalinity	mg/L		5	<5	<5
True Color	TCU	Narrative	5	242	189
Turbidity	NTU	Narrative	0.1	5.8	1.5
Electrical Conductivity	umho/cm		1	29	34
Nitrate + Nitrite as N	mg/L		0.05	<0.05	<0.05
Nitrate as N	mg/L	1500, 200	0.05	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	<0.03
Total Organic Carbon	mg/L		0.5	17.6	24.5
Ortho-Phosphate as P	mg/L		0.01	0.05	<0.01
Total Sodium	mg/L		0.1	2.3	2.4
Total Potassium	mg/L		0.1	0.3	0.2
Total Calcium	mg/L		0.1	1.7	0.8
Total Magnesium	mg/L		0.1	0.4	0.4
Total Phosphorous	mg/L	Fact Sheet	0.02	0.08	<0.02
Bicarb. Alkalinity (as CaCO3)	mg/L		5	<5	<5
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10
Hydroxide	mg/L		5	<5	<5
Calculated TDS	mg/L		1	11	7
Hardness	mg/L			5.9	3.6
Langelier Index (@20C)	NA			-3.80	-5.89
Langelier Index (@ 4C)	NA			-4.12	-6.21
Saturation pH (@ 20C)	NA			10.6	10.9
Saturation pH (@ 4C)	NA			10.9	11.2
Anion Sum	me/L			0.14	0.08

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Certificate of Analysis

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-08-24

		SAMPLE DESCRIPTION:		POND	WC1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		8/12/2016	8/12/2016
Parameter	Unit	G / S	RDL	7773818	7773828
Cation sum	me/L			0.29	0.21
% Difference/ Ion Balance (NS)	%			34.0	41.9
Total Aluminum	ug/L		5	77	27
Total Antimony	ug/L		2	<2	<2
Total Arsenic	ug/L	12.5	2	3	<2
Total Barium	ug/L		5	61	17
Total Beryllium	ug/L		2	<2	<2
Total Bismuth	ug/L		2	<2	<2
Total Boron	ug/L	NRG, NRG	5	<5	<5
Total Cadmium	ug/L	0.12	0.017	0.026	<0.017
Total Chromium	ug/L		1	<1	<1
Total Cobalt	ug/L		1	<1	<1
Total Copper	ug/L		1	<1	<1
Total Iron	ug/L		50	1410	310
Total Lead	ug/L		0.5	1.3	0.7
Total Manganese	ug/L		2	37	14
Total Molybdenum	ug/L		2	<2	<2
Total Nickel	ug/L		2	<2	<2
Total Selenium	ug/L		1	<1	<1
Total Silver	ug/L	7.5, NRG	0.1	<0.1	<0.1
Total Strontium	ug/L		5	7	6
Total Thallium	ug/L		0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2
Total Titanium	ug/L		2	<2	<2
Total Uranium	ug/L	NRG, NRG	0.1	0.1	<0.1
Total Vanadium	ug/L		2	<2	<2
Total Zinc	ug/L		5	<5	<5

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Certificate of Analysis

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-08-24

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

7773818-7773828 TOC was analysed at AGAT Montreal.
When the cation and anion sums are below 1 me/L, the acceptable criteria is less than 0.3me/L.

Certified By:

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Guideline Violation

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

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CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7773828	WC1	NS-CCME MAL	Dissolved Metals (FWAL)	Dissolved Cadmium	0.12	0.150
7773828	WC1	NS-CCME MAL	MTL - Standard Water Analysis + Total Metals	pH	6.5-9.0	5.00

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Quality Assurance

CLIENT NAME: WSP CANADA INC.
AGAT WORK ORDER: 16X126659
PROJECT: 161-02978
ATTENTION TO: VIRGIL GRECIAN
SAMPLING SITE:
SAMPLED BY:

Water Analysis

RPT Date: Aug 24, 2016			DUPLICATE				REFERENCE MATERIAL				METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
MTL - Standard Water Analysis + Total Metals															
pH	7773828	7773828	5.00	4.28	15.5%	<	101%	80%	120%	NA	80%	120%	NA	80%	120%
Reactive Silica as SiO2	1	7770175	4.1	4.1	0.0%	< 0.5	114%	80%	120%		80%	120%	96%	80%	120%
Chloride	7767958		48	49	3.1%	< 1	104%	80%	120%	NA	80%	120%	NA	80%	120%
Fluoride	7767958		<0.12	<0.12	NA	< 0.12	115%	80%	120%	NA	80%	120%	89%	80%	120%
Sulphate	7767958		<2	<2	NA	< 2	113%	80%	120%	NA	80%	120%	114%	80%	120%
Alkalinity	7773828	7773828	<5	<5	NA	< 5	95%	80%	120%	NA	80%	120%	NA	80%	120%
True Color	1	7773828	171	189	10.0%	< 5	110%	80%	120%		80%	120%		80%	120%
Turbidity	1	7773828	1.5	1.3	14.3%	< 0.1	103%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	7773828	7773828	34	34	1.4%	< 1	92%	80%	120%	NA	80%	120%	NA	80%	120%
Nitrate as N	7767958		0.22	0.22	NA	< 0.05	97%	80%	120%	NA	80%	120%	85%	80%	120%
Nitrite as N	7767958		0.06	<0.05	NA	< 0.05	103%	80%	120%	NA	80%	120%	88%	80%	120%
Ammonia as N	1	7775380	<0.03	<0.03	NA	< 0.03	102%	80%	120%		80%	120%	100%	80%	120%
Total Organic Carbon	7777382		4.7	4.5	4.6%	< 0.5	102%	80%	120%	106%	80%	120%	114%	80%	120%
Ortho-Phosphate as P	1		< 0.01	< 0.01	NA	< 0.01	103%	80%	120%	95%	80%	120%	104%	80%	120%
Total Sodium	8172016		32.0	30.8	3.8%	< 0.1	113%	80%	120%	114%	80%	120%	98%	70%	130%
Total Potassium	8172016		1.76	1.72	2.3%	< 0.1	111%	80%	120%	115%	80%	120%	105%	70%	130%
Total Calcium	8172016		12.2	12.2	0.0%	< 0.1	109%	80%	120%	108%	80%	120%	98%	70%	130%
Total Magnesium	8172016		4.1	4.0	2.5%	< 0.1	112%	80%	120%	119%	80%	120%	107%	80%	120%
Total Phosphorous	8172016		1.17	0.934	22.4%	< 0.02	80%	80%	120%	92%	80%	120%	88%	70%	130%
Bicarb. Alkalinity (as CaCO3)	7773828	7773828	<5	<5	NA	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Carb. Alkalinity (as CaCO3)	7773828	7773828	<10	<10	NA	< 10	NA	80%	120%	NA	80%	120%	NA	80%	120%
Hydroxide	7773828	7773828	<5	<5	NA	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	8172016		7	5	0.0%	< 5	119%	80%	120%	120%	80%	120%	126%	70%	130%
Total Antimony	8172016		< 2	< 2	0.0%	< 2	80%	80%	120%	109%	80%	120%	93%	70%	130%
Total Arsenic	8172016		57	58	1.7%	< 2	94%	80%	120%	116%	80%	120%	125%	70%	130%
Total Barium	8172016		6	6	0.0%	< 5	100%	80%	120%	103%	80%	120%	99%	70%	130%
Total Beryllium	8172016		< 2	< 2	0.0%	< 2	97%	80%	120%	96%	80%	120%	92%	70%	130%
Total Bismuth	8172016		< 2	< 2	0.0%	< 2	103%	80%	120%	112%	80%	120%	116%	70%	130%
Total Boron	8172016		65	62	4.7%	< 5	100%	80%	120%	100%	80%	120%	89%	70%	130%
Total Cadmium	8172016		< 0.017	< 0.017	0.0%	< 0.017	103%	80%	120%	103%	80%	120%	96%	70%	130%
Total Chromium	8172016		< 1	< 1	0.0%	< 1	106%	80%	120%	107%	80%	120%	92%	70%	130%
Total Cobalt	8172016		< 1	< 1	0.0%	< 1	97%	80%	120%	100%	80%	120%	101%	70%	130%
Total Copper	8172016		< 1	< 1	0.0%	< 1	83%	80%	120%	80%	80%	120%	NA	70%	130%
Total Iron	8172016		1000	1000	0.0%	< 50	99%	80%	120%	105%	80%	120%	73%	70%	130%
Total Lead	8172016		< 0.5	< 0.5	0.0%	< 0.5	118%	80%	120%	113%	80%	120%	114%	70%	130%
Total Manganese	8172016		173	169	2.3%	< 2	103%	80%	120%	102%	80%	120%	98%	70%	130%
Total Molybdenum	8172016		6	6	0.0%	< 2	105%	80%	120%	109%	80%	120%	110%	70%	130%
Total Nickel	8172016		< 2	< 2	0.0%	< 2	98%	80%	120%	105%	80%	120%	97%	70%	130%
Total Selenium	8172016		< 1	< 1	0.0%	< 1	104%	80%	120%	100%	80%	120%	97%	70%	130%

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Quality Assurance

CLIENT NAME: WSP CANADA INC.
AGAT WORK ORDER: 16X126659
PROJECT: 161-02978
ATTENTION TO: VIRGIL GRECIAN
SAMPLING SITE:
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Aug 24, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Silver	8172016		< 0.1	< 0.1	0.0%	< 0.1	107%	80%	120%	102%	80%	120%	100%	70%	130%
Total Strontium	8172016		38	37	2.7%	< 5	92%	80%	120%	95%	80%	120%	92%	70%	130%
Total Thallium	8172016		< 0.1	< 0.1	0.0%	< 0.1	114%	80%	120%	114%	80%	120%	114%	70%	130%
Total Tin	8172016		< 2	< 2	0.0%	< 2	98%	80%	120%	106%	80%	120%	104%	70%	130%
Total Titanium	8172016		< 2	< 2	0.0%	< 2	88%	80%	120%	82%	80%	120%	98%	70%	130%
Total Uranium	8172016		13.9	13.4	3.7%	< 0.1	109%	80%	120%	109%	80%	120%	89%	70%	130%
Total Vanadium	8172016		< 2	< 2	0.0%	< 2	95%	80%	120%	92%	80%	120%	87%	70%	130%
Total Zinc	8172016		< 5	< 5	0.0%	< 5	98%	80%	120%	93%	80%	120%	70%	70%	130%
Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.															
Dissolved Metals (FWAL)															
Dissolved Aluminum	8182016		< 5	6	0.0%	< 5	95%	80%	120%	98%	80%	120%	101%	70%	130%
Dissolved Antimony	8182016		< 2	< 2	0.0%	< 2	80%	80%	120%	111%	80%	120%	99%	70%	130%
Dissolved Arsenic	8182016		< 2	< 2	0.0%	< 2	111%	80%	120%	109%	80%	120%	99%	70%	130%
Dissolved Barium	8182016		15	15	0.0%	< 5	101%	80%	120%	102%	80%	120%	106%	70%	130%
Dissolved Beryllium	8182016		< 2	< 2	0.0%	< 2	111%	80%	120%	117%	80%	120%	101%	70%	130%
Dissolved Bismuth	8182016		< 2	< 2	0.0%	< 2	96%	80%	120%	103%	80%	120%	NA	70%	130%
Dissolved Boron	8182016		87	83	4.7%	< 5	103%	80%	120%	104%	80%	120%	116%	70%	130%
Dissolved Cadmium	8182016		0.126	0.133	5.4%	< 0.017	103%	80%	120%	103%	80%	120%	101%	70%	130%
Dissolved Chromium	8182016		< 1	< 1	0.0%	< 1	83%	80%	120%	87%	80%	120%	83%	70%	130%
Dissolved Cobalt	8182016		1	2	0.0%	< 1	100%	80%	120%	109%	80%	120%	88%	70%	130%
Dissolved Copper	8182016		< 2	< 2	0.0%	< 2	NA	80%	120%	NA	80%	120%	129%	70%	130%
Dissolved Iron	8182016		< 50	< 50	0.0%	< 50	100%	80%	120%	96%	80%	120%	89%	70%	130%
Dissolved Lead	8182016		< 0.5	< 0.5	0.0%	< 0.5	105%	80%	120%	104%	80%	120%	109%	70%	130%
Dissolved Manganese	8182016		1040	1080	3.8%	< 2	101%	80%	120%	101%	80%	120%	97%	70%	130%
Dissolved Molybdenum	8182016		89	93	4.4%	< 2	95%	80%	120%	100%	80%	120%	105%	70%	130%
Dissolved Nickel	8182016		4	4	0.0%	< 2	100%	80%	120%	95%	80%	120%	83%	70%	130%
Dissolved Selenium	8182016		2	2	0.0%	< 1	100%	80%	120%	99%	80%	120%	106%	70%	130%
Dissolved Silver	1		< 0.1	< 0.1	0.0%	< 0.1	103%	80%	120%	97%	80%	120%	70%	70%	130%
Dissolved Strontium	8182016		2970	2940	1.0%	< 5	99%	80%	120%	98%	80%	120%	97%	70%	130%
Dissolved Thallium	8182016		< 0.1	< 0.1	0.0%	< 0.1	104%	80%	120%	103%	80%	120%	93%	70%	130%
Dissolved Tin	8182016		< 2	< 2	0.0%	< 2	98%	80%	120%	105%	80%	120%	109%	70%	130%
Dissolved Titanium	8182016		< 2	< 2	0.0%	< 2	87%	80%	120%	80%	80%	120%	130%	70%	130%
Dissolved Uranium	8182016		35.8	35.8	0.0%	< 0.1	102%	80%	120%	103%	80%	120%	98%	70%	130%
Dissolved Vanadium	8182016		< 2	< 2	0.0%	< 2	109%	80%	120%	104%	80%	120%	82%	70%	130%
Dissolved Zinc	8182016		5	< 5	0.0%	< 5	84%	80%	120%	86%	80%	120%	83%	70%	130%
Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.															
TSS															
Total Suspended Solids	1	0175	< 5	< 5	0.0%	< 5	96%	80%	120%		120%	120%	113%	80%	120%

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Quality Assurance

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Aug 24, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Dissolved Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Sulphate	INORG-121-6005	SM 4110 B	IC
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorous	MET-121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X126659

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Chain of Custody Record

Laboratory Use Only
Arrival Condition: ☐ Good ☐ Poor (see notes)
Arrival Temperature: 6°
Hold Time:
AGAT Job Number: 16X126659
Notes: See bottom 2 samples only. CWH 16-8-16

Report Information
Company: WSP Canada Inc.
Contact: Virgil Grecian
Address: 65 Driscoll Cres. Moncton, NB E1E 4C8
Phone: 506-857-1675 Fax:
Client Project #: 161-02978
AGAT Quotation:
Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):
1. Name: Virgil Grecian
Email: virgil.grecian@wspgroup.com
2. Name:
Email:

Report Format
☐ Single Sample per page
☐ Multiple Samples per page
☒ Excel Format Included

Turnaround Time Required (TAT)
Regular TAT ☒ 5 to 7 working days
Rush TAT ☐ Same day ☐ 1 day ☐ 2 days ☐ 3 days
Date Required:

Regulatory Requirements (Check):
☐ List Guidelines on Report ☐ Do not list Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Fuel ☐ Lube
☒ CCME ☐ CDWQ
☐ Industrial ☐ NSESQ-Cont. Sites
☐ Commercial ☐ HRM 101
☐ Res/Park ☐ Storm Water
☐ Agricultural ☐ Waste Water
☐ FWAL
☐ Sediment
☒ Other: aquatic life

Drinking Water Sample: ☐ Yes ☒ No
Reg. No.:

Invoice To Same Yes ☒ / No ☐
Company:
Contact:
Address:
Phone: Fax:
PO/Credit Card#:

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments – Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: ☒ Total ☐ Diss ☐ Available	Mercury	☐ BOD ☐ CBOD	pH	☒ TSS ☐ TDS ☐ VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (PIRI) ☐ low level	Tier 2: TPH/BTEX Fractionation	CCME-CWS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC + EC ☐ P/A ☐ MPN ☐ MF	☐ HPC ☐ Pseudomonas	Fecal Coliform ☐ MPN ☐ MF	Other:	Other:	Hazardous (Y/N)
POND	Aug. 12/16 - 2 pm	H_2O		*call Jessica							X																	
POND				McIntyre to	X		X																					
POND				confirm	X		X																					
POND				analysis *		X																						
WC1					X	X																						
WC1	Aug. 12/16 - 3 pm	H_2O		506-424-0925							X																	
WC1					X		X																					
WC1				Each sample requires	X		X																					
WC1				SWA + TMS & DMS		X																						
WC1				as well TSS.	X	X	X				X	}			LOG AS SUCH													
POND				CWH 16-8-16	X	X	X																					
WC1					X	X	X				X																	

Samples Relinquished By (Print Name):	Date/Time	Samples Received By (Print Name):	Date/Time
		Tina Donald	16-Dec-16
Samples Relinquished By (Sign):	Date/Time	Samples Received By (Sign):	Date/Time
Valerie Gibbs		O'Donald	09 00

Pink Copy - Client
Yellow Copy - AGAT
White Copy- AGAT

Page ___ of ___
Nº: 052646

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CLIENT NAME: WSP CANADA INC.
55 DRISCOLL CRESCENT
MONCTON, NB E1E4C8
(506) 857-1675

ATTENTION TO: VIRGIL GRECIAN

PROJECT: 161-02978

AGAT WORK ORDER: 16X134279

WATER ANALYSIS REVIEWED BY: Laura Baker, Inorganics Data Reporter

DATE REPORTED: Sep 14, 2016

PAGES (INCLUDING COVER): 14

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

Dissolved Metals (FWAL)

DATE RECEIVED: 2016-09-06

DATE REPORTED: 2016-09-14

		SAMPLE DESCRIPTION:		WC2 - 01	Dup2 - 02
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		9/2/2016	9/2/2016
Parameter	Unit	G / S	RDL	7824652	7824653
Dissolved Aluminum	ug/L		5	82	88
Dissolved Antimony	ug/L		2	<2	<2
Dissolved Arsenic	ug/L	12.5	2	<2	<2
Dissolved Barium	ug/L		5	43	43
Dissolved Beryllium	ug/L		2	<2	<2
Dissolved Bismuth	ug/L		2	<2	<2
Dissolved Boron	ug/L	NRG, NRG	5	<5	<5
Dissolved Cadmium	ug/L	0.12	0.017	<0.017	<0.017
Dissolved Chromium	ug/L		1	1	1
Dissolved Cobalt	ug/L		1	<1	<1
Dissolved Copper	ug/L		2	<2	<2
Dissolved Iron	ug/L		50	1510	1610
Dissolved Lead	ug/L		0.5	<0.5	<0.5
Dissolved Manganese	ug/L		2	293	299
Dissolved Molybdenum	ug/L		2	<2	<2
Dissolved Nickel	ug/L		2	<2	<2
Dissolved Selenium	ug/L		1	<1	<1
Dissolved Silver	ug/L		0.1	<0.1	<0.1
Dissolved Strontium	ug/L		5	9	9
Dissolved Thallium	ug/L		0.1	<0.1	<0.1
Dissolved Tin	ug/L		2	<2	<2
Dissolved Titanium	ug/L		2	<2	<2
Dissolved Uranium	ug/L	NRG, NRG	0.1	<0.1	<0.1
Dissolved Vanadium	ug/L		2	<2	<2
Dissolved Zinc	ug/L		5	<5	<5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

7824652-7824653 Analysis completed on a filtered sample.

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

DATE RECEIVED: 2016-09-06

DATE REPORTED: 2016-09-14

		SAMPLE DESCRIPTION:		WC2 - 01	Dup2 - 02
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		9/2/2016	9/2/2016
Parameter	Unit	G / S	RDL	7824652	7824653
pH		6.5-9.0		5.55	5.26
Reactive Silica as SiO2	mg/L		0.5	6.6	4.4
Chloride	mg/L	NRG	1	4	3
Fluoride	mg/L	NRG	0.12	<0.12	<0.12
Sulphate	mg/L		2	<2	<2
Alkalinity	mg/L		5	<5	<5
True Color	TCU	Narrative	5	314	316
Turbidity	NTU	Narrative	0.1	2.6	2.9
Electrical Conductivity	umho/cm		1	31	31
Nitrate + Nitrite as N	mg/L		0.05	<0.05	<0.05
Nitrate as N	mg/L	1500, 200	0.05	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	<0.03
Total Organic Carbon	mg/L		0.5	26.6	25.8
Ortho-Phosphate as P	mg/L		0.01	<0.01	0.03
Total Sodium	mg/L		0.1	3.0	3.1
Total Potassium	mg/L		0.1	0.5	0.6
Total Calcium	mg/L		0.1	2.2	2.1
Total Magnesium	mg/L		0.1	0.5	0.5
Total Phosphorous	mg/L	Fact Sheet	0.02	0.09	0.08
Bicarb. Alkalinity (as CaCO3)	mg/L		5	<5	<5
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10
Hydroxide	mg/L		5	<5	<5
Calculated TDS	mg/L		1	14	13
Hardness	mg/L			7.6	7.3
Langelier Index (@20C)	NA			-4.92	-5.23
Langelier Index (@ 4C)	NA			-5.24	-5.55
Saturation pH (@ 20C)	NA			10.5	10.5
Saturation pH (@ 4C)	NA			10.8	10.8
Anion Sum	me/L			0.11	0.08

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

DATE RECEIVED: 2016-09-06

DATE REPORTED: 2016-09-14

		SAMPLE DESCRIPTION:		WC2 - 01	Dup2 - 02
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		9/2/2016	9/2/2016
Parameter	Unit	G / S	RDL	7824652	7824653
Cation sum	me/L			0.44	0.45
% Difference/ Ion Balance (NS)	%			59.2	68.1
Total Aluminum	ug/L		5	109	113
Total Antimony	ug/L		2	<2	<2
Total Arsenic	ug/L	12.5	2	2	3
Total Barium	ug/L		5	53	53
Total Beryllium	ug/L		2	<2	<2
Total Bismuth	ug/L		2	<2	<2
Total Boron	ug/L	NRG, NRG	5	<5	<5
Total Cadmium	ug/L	0.12	0.017	0.074	0.086
Total Chromium	ug/L		1	<1	<1
Total Cobalt	ug/L		1	<1	<1
Total Copper	ug/L		1	1	1
Total Iron	ug/L		50	3340	3360
Total Lead	ug/L		0.5	0.7	0.8
Total Manganese	ug/L		2	310	314
Total Molybdenum	ug/L		2	<2	<2
Total Nickel	ug/L		2	<2	<2
Total Selenium	ug/L		1	<1	<1
Total Silver	ug/L	7.5, NRG	0.1	<0.1	<0.1
Total Strontium	ug/L		5	11	11
Total Thallium	ug/L		0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2
Total Titanium	ug/L		2	<2	<2
Total Uranium	ug/L	NRG, NRG	0.1	<0.1	<0.1
Total Vanadium	ug/L		2	<2	<2
Total Zinc	ug/L		5	6	<5

Certified By:

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AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

MTL - Standard Water Analysis + Total Metals

DATE RECEIVED: 2016-09-06

DATE REPORTED: 2016-09-14

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

7824652-7824653 TOC was analysed at AGAT Montreal.
Ion Balance is biased high, contributing parameters have been confirmed.

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Certificate of Analysis

AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

TSS

DATE RECEIVED: 2016-09-06

DATE REPORTED: 2016-09-14

		SAMPLE DESCRIPTION:		WC2 - 01	Dup2 - 02
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		9/2/2016	9/2/2016
Parameter	Unit	G / S	RDL	7824652	7824653
Total Suspended Solids	mg/L	Narrative	5	12	8

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME MAL - updated 2015

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Guideline Violation

AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

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CLIENT NAME: WSP CANADA INC.

ATTENTION TO: VIRGIL GRECIAN

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7824652	WC2 - 01	NS-CCME MAL	MTL - Standard Water Analysis + Total Metals	pH	6.5-9.0	5.55
7824653	Dup2 - 02	NS-CCME MAL	MTL - Standard Water Analysis + Total Metals	pH	6.5-9.0	5.26

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Quality Assurance

CLIENT NAME: WSP CANADA INC.
AGAT WORK ORDER: 16X134279
PROJECT: 161-02978
ATTENTION TO: VIRGIL GRECIAN
SAMPLING SITE:
SAMPLED BY:

Water Analysis

RPT Date: Sep 14, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
MTL - Standard Water Analysis + Total Metals															
pH	7816781		7.39	7.38	0.1%	<	100%	80%	120%	NA	80%	120%	NA	80%	120%
Reactive Silica as SiO2	1	7824680	4.3	4.5	4.5%	< 0.5	111%	80%	120%		80%	120%	88%	80%	120%
Chloride	7821019		13	13	1.4%	< 1	94%	80%	120%	NA	80%	120%	NA	80%	120%
Fluoride	7821019		0.16	0.21	NA	< 0.12	110%	80%	120%	NA	80%	120%	108%	80%	120%
Sulphate	7821019		2	2	NA	< 2	96%	80%	120%	NA	80%	120%	95%	80%	120%
Alkalinity	7816781		57	56	1.4%	< 5	87%	80%	120%	NA	80%	120%	NA	80%	120%
True Color	1	7824653	311	316	1.6%	< 5	100%	80%	120%		80%	120%		80%	120%
Turbidity	1	7826523	1030	1060	2.9%	< 0.1	96%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	7816781		178	177	0.2%	< 1	98%	80%	120%	NA	80%	120%	NA	80%	120%
Nitrate as N	7821019		0.07	<0.05	NA	< 0.05	89%	80%	120%	NA	80%	120%	90%	80%	120%
Nitrite as N	7821019		<0.05	<0.05	NA	< 0.05	95%	80%	120%	NA	80%	120%	99%	80%	120%
Ammonia as N	1	7824680	<0.05	<0.05	NA	< 0.03	89%	80%	120%		80%	120%	104%	80%	120%
Total Organic Carbon	7829364		1.9	1.9	NA	< 0.5	NA	80%	120%	86%	80%	120%	81%	80%	120%
Ortho-Phosphate as P	1		0.04	0.02	NA	< 0.01	100%	80%	120%		80%	120%	117%	80%	120%
Total Sodium	9072016		16.3	17.3	6.0%	< 0.1	110%	80%	120%	111%	80%	120%	99%	70%	130%
Total Potassium	9072016		0.6	0.6	0.0%	< 0.1	109%	80%	120%	113%	80%	120%	118%	70%	130%
Total Calcium	9072016		19.2	20.5	6.5%	< 0.1	102%	80%	120%	106%	80%	120%	101%	70%	130%
Total Magnesium	9072016		1.2	1.2	0.0%	< 0.1	115%	80%	120%	120%	80%	120%	110%	80%	120%
Total Phosphorous	9072016		0.28	0.28	0.0%	< 0.02	113%	80%	120%	120%	80%	120%	98%	70%	130%
Bicarb. Alkalinity (as CaCO3)	7816781		57	56	1.4%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Carb. Alkalinity (as CaCO3)	7816781		<10	<10	NA	< 10	NA	80%	120%	NA	80%	120%	NA	80%	120%
Hydroxide	7816781		<5	<5	NA	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	9072016		16	13	NA	< 5	106%	80%	120%	111%	80%	120%	114%	70%	130%
Total Antimony	9072016		< 2	< 2	0.0%	< 2	88%	80%	120%	107%	80%	120%	100%	70%	130%
Total Arsenic	9072016		< 2	< 2	0.0%	< 2	102%	80%	120%	98%	80%	120%	97%	70%	130%
Total Barium	9072016		12	11	8.7%	< 5	100%	80%	120%	101%	80%	120%	94%	70%	130%
Total Beryllium	9072016		< 2	< 2	0.0%	< 2	107%	80%	120%	103%	80%	120%	113%	70%	130%
Total Bismuth	9072016		< 2	< 2	0.0%	< 2	97%	80%	120%	98%	80%	120%	104%	70%	130%
Total Boron	9072016		8	8	0.0%	< 5	110%	80%	120%	113%	80%	120%	118%	70%	130%
Total Cadmium	9072016		< 0.017	< 0.017	0.0%	< 0.017	97%	80%	120%	100%	80%	120%	101%	70%	130%
Total Chromium	9072016		< 1	< 1	0.0%	< 1	104%	80%	120%	104%	80%	120%	112%	70%	130%
Total Cobalt	9072016		< 1	< 1	0.0%	< 1	105%	80%	120%	105%	80%	120%	106%	70%	130%
Total Copper	9072016		16	17	6.1%	< 1	99%	80%	120%	106%	80%	120%	104%	70%	130%
Total Iron	9072016		57	65	13.1%	< 50	106%	80%	120%	109%	80%	120%	110%	70%	130%
Total Lead	9072016		< 0.5	< 0.5	0.0%	< 0.5	100%	80%	120%	101%	80%	120%	101%	70%	130%
Total Manganese	9072016		< 2	< 2	0.0%	< 2	107%	80%	120%	110%	80%	120%	109%	70%	130%
Total Molybdenum	9072016		< 2	< 2	0.0%	< 2	97%	80%	120%	98%	80%	120%	100%	70%	130%
Total Nickel	9072016		< 2	< 2	0.0%	< 2	101%	80%	120%	107%	80%	120%	114%	70%	130%
Total Selenium	9072016		< 1	< 1	0.0%	< 1	103%	80%	120%	96%	80%	120%	105%	70%	130%

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Quality Assurance

CLIENT NAME: WSP CANADA INC.
AGAT WORK ORDER: 16X134279
PROJECT: 161-02978
ATTENTION TO: VIRGIL GRECIAN
SAMPLING SITE:
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Sep 14, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Silver	9072016		< 0.1	< 0.1	0.0%	< 0.1	101%	80%	120%	97%	80%	120%	101%	70%	130%
Total Strontium	9072016		20	22	9.5%	< 5	100%	80%	120%	100%	80%	120%	104%	70%	130%
Total Thallium	9072016		< 0.1	< 0.1	0.0%	< 0.1	100%	80%	120%	102%	80%	120%	103%	70%	130%
Total Tin	9072016		< 2	< 2	0.0%	< 2	97%	80%	120%	100%	80%	120%	99%	70%	130%
Total Titanium	9072016		< 2	< 2	0.0%	< 2	105%	80%	120%	101%	80%	120%	108%	70%	130%
Total Uranium	9072016		< 0.1	< 0.1	0.0%	< 0.1	102%	80%	120%	103%	80%	120%	110%	70%	130%
Total Vanadium	9072016		< 2	< 2	0.0%	< 2	109%	80%	120%	110%	80%	120%	114%	70%	130%
Total Zinc	9072016		63	63	0.0%	< 5	102%	80%	120%	105%	80%	120%	98%	70%	130%
Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.															
TSS															
Total Suspended Solids	1	6972	< 5	< 5	NA	< 5	98%	80%	120%		120%	120%	103%	80%	120%
Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.															
Dissolved Metals (FWAL)															
Dissolved Aluminum	9082016		7	7	0.0%	< 5	118%	80%	120%	104%	80%	120%	89%	70%	130%
Dissolved Antimony	9082016		< 2	< 2	0.0%	< 2	93%	80%	120%	98%	80%	120%	96%	70%	130%
Dissolved Arsenic	9082016		< 2	< 2	0.0%	< 2	96%	80%	120%	90%	80%	120%	100%	70%	130%
Dissolved Barium	9082016		14	14	0.0%	< 5	101%	80%	120%	96%	80%	120%	97%	70%	130%
Dissolved Beryllium	9082016		< 2	< 2	0.0%	< 2	108%	80%	120%	109%	80%	120%	112%	70%	130%
Dissolved Bismuth	9082016		< 2	< 2	0.0%	< 2	103%	80%	120%	85%	80%	120%	NA	70%	130%
Dissolved Boron	9082016		12	13	8.0%	< 5	108%	80%	120%	102%	80%	120%	108%	70%	130%
Dissolved Cadmium	9082016		< 0.017	< 0.017	0.0%	< 0.017	100%	80%	120%	97%	80%	120%	97%	70%	130%
Dissolved Chromium	9082016		< 1	< 1	0.0%	< 1	115%	80%	120%	100%	80%	120%	92%	70%	130%
Dissolved Cobalt	9082016		< 1	< 1	0.0%	< 1	118%	80%	120%	111%	80%	120%	95%	70%	130%
Dissolved Copper	9082016		< 2	< 2	0.0%	< 2	110%	80%	120%	104%	80%	120%	92%	70%	130%
Dissolved Iron	9082016		< 50	< 50	0.0%	< 50	110%	80%	120%	101%	80%	120%	97%	70%	130%
Dissolved Lead	9082016		< 0.5	< 0.5	0.0%	< 0.5	104%	80%	120%	103%	80%	120%	99%	70%	130%
Dissolved Manganese	9082016		< 2	< 2	0.0%	< 2	111%	80%	120%	110%	80%	120%	91%	70%	130%
Dissolved Molybdenum	9082016		< 2	< 2	0.0%	< 2	103%	80%	120%	95%	80%	120%	92%	70%	130%
Dissolved Nickel	9082016		< 2	< 2	0.0%	< 2	113%	80%	120%	107%	80%	120%	96%	70%	130%
Dissolved Selenium	9082016		< 1	< 1	0.0%	< 1	106%	80%	120%	102%	80%	120%	103%	70%	130%
Dissolved Silver	9082016		< 0.1	< 0.1	0.0%	< 0.1	104%	80%	120%	99%	80%	120%	97%	70%	130%
Dissolved Strontium	9082016		56	55	1.8%	< 5	99%	80%	120%	94%	80%	120%	82%	70%	130%
Dissolved Thallium	9082016		< 0.1	< 0.1	0.0%	< 0.1	101%	80%	120%	98%	80%	120%	101%	70%	130%
Dissolved Tin	9082016		< 2	< 2	0.0%	< 2	100%	80%	120%	99%	80%	120%	100%	70%	130%
Dissolved Titanium	9082016		< 2	< 2	0.0%	< 2	105%	80%	120%	96%	80%	120%	99%	70%	130%
Dissolved Uranium	9082016		< 0.1	< 0.1	0.0%	< 0.1	104%	80%	120%	101%	80%	120%	99%	70%	130%
Dissolved Vanadium	9082016		< 2	< 2	0.0%	< 2	112%	80%	120%	105%	80%	120%	88%	70%	130%

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Quality Assurance

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Sep 14, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dissolved Zinc	9082016		8	8	0.0%	< 5	109%	80%	120%	98%	80%	120%	99%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Dissolved Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Dissolved Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC
Sulphate	INORG-121-6005	SM 4110 B	IC

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Method Summary

CLIENT NAME: WSP CANADA INC.
AGAT WORK ORDER: 16X134279
PROJECT: 161-02978
ATTENTION TO: VIRGIL GRECIAN
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorous	MET-121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 16X134279

PROJECT: 161-02978

ATTENTION TO: VIRGIL GRECIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC

AGAT Laboratories

Unit 122 • 11 Morris Drive
Dartmouth, NS
B3B 1M2
webearth.agatlabs.com • www.agatlabscom
P: 902.468.8718 • F: 902.468.8924

Chain of Custody Record

Laboratory Use Only
Arrival Condition: ☐ Good ☐ Poor (see notes)
Arrival Temperature: 7°
Hold Time:
AGAT Job Number: 16x134279
Notes:

Report Information
Company: WSP Canada Inc.
Contact: Virgil Grecian
Address: 55 Driscoll Cres. Moncton
Phone: 506 857-1675 Fax: 506 857-1679
Client Project #: 161-02978
AGAT Quotation:
Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):
1. Name: Virgil Grecian
Email: Virgil.Grecian@wspgroup.com
2. Name:
Email:

Report Format
☐ Single Sample per page
☐ Multiple Samples per page
☐ Excel Format Included

Turnaround Time Required (TAT)
Regular TAT ☒ 5 to 7 working days
Rush TAT ☐ Same day ☐ 1 day ☐ 2 days ☐ 3 days
Date Required:

Regulatory Requirements (Check):
☐ List Guidelines on Report ☐ Do not list Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Fuel ☐ Lube
☒ CCME ☐ CDWQ
☐ Industrial ☐ NSESQ-Cont. Sites
☐ Commercial ☐ HRM 101
☐ Res/Park ☐ Storm Water
☐ Agricultural ☐ Waste Water
☐ FWAL
☐ Sediment ☒ Other Aquatic Life

Drinking Water Sample: ☐ Yes ☐ No
Reg. No.:

Invoice To Same Yes ☐ / No ☐
Company:
Contact:
Address:
Phone: Fax:
PO/Credit Card#:

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments – Site/Sample Info. Sample Containment
WC2-01	Sept 2/16	H2O	5	
Dup2-02	Sept 2/16	H2O	5	

Field Filtered/Preserved	Standard Water Analysis	Metals: ☒ Total ☐ Diss ☐ Available	Mercury	☐ BOD ☐ CBOD	pH	☒ TSS ☐ TDS ☐ VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (PIRI) ☐ low level	Tier 2: TPH/BTEX Fractionation	CCME-CWS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC + EC ☐ P/A ☐ MPN ☐ MF	☐ HPC ☐ Pseudomonas	Fecal Coliform ☐ MPN ☐ MF	Other:	Other:	Hazardous (Y/N)
	X	X				X																
	X	X				X																

Samples Relinquished By (Print Name): Virgil Grecian
Samples Relinquished By (Sign):
Date/Time: Sep 6/16 905
Samples Received By (Print Name): Samantha Baker
Samples Received By (Sign):
Date/Time: Sept 6/16 9:05

Pink Copy - Client
Yellow Copy - AGAT
White Copy - AGAT

Page of
N°: 054988

Document ID: DIV 133 1501.002

Appendix D
Field Data Sheets

APPENDIX 1

FISH HABITAT SURVEY FORMS

04-98

DNR / DFO - NEW BRUNSWICK
STREAM HABITAT INVENTORY

_____ of _____

River: NC 7 Start Point: _____ End Point: _____ Drainage Code: ☐☐ ☐☐ ☐☐ ☐☐ ☐☐

No. _____

Personnel: VDG, JJM Date: Aug 12/16 GIS Map No. _____ Drainage Name: Trib to E Br Fel River

No. _____

REACH NO.	UNIT NO.	STREAM TYPE	CHANNEL TYPE	LENGTH (m)	AVG WIDTH (m)		SUBSTRATE (%)							AVG DEPTH WET WIDTH (cm)	0 - 50 % UNDERCUT BANK		0 - 50 % OVERHANGING VEGETATION		LARGE WOODY DEBRIS IN STREAM (m)	FLOWS*				EMBEDDEDNESS (CRITERIA) 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: ≥ 50%	COMMENTS
					WET	BANK CHANNEL	BED-ROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R		TYPE	FLOW (cms)	TIME	TEMP (°C) W	TEMP (°C) A		
1		24	1	75	15	25						organics?	x	40	X		5	5	5		0					
2		24	1	60	1	3					organics		x	75	X		2	2	x		1-2					
3		24	1	60	1	3		ORGANICS						75	X		2	2	x		1-2					

CHECKLIST OF LAND USE ATTRIBUTES (COMMENTS)

1. ACTIVE BEAVER DAM
2. INACTIVE BEAVER DAM
3. WOODY DEBRIS (OBSTRUCTION)
4. MAN-MADE DAM OBSTRUCTION
5. ROCK DAM (SWIMMING POOL)
6. BRAIDED STREAM CHANNELS
7. OBSTRUCTION IN STREAM
8. ROAD FORD

POLLUTION CAUSED BY:

9. FOOD PROCESSING INDUSTRY
10. FOREST INDUSTRY
11. CAMPSITES OR RESIDENTIAL
12. MINING
13. LITTER
14. OIL
15. AGRICULTURE WASTE
16. HEALTH HAZARD

17. CLEAR CUT TO STREAM EDGE
18. SELECTIVE CUT
19. BUFFER STRIP PRESENT

20. CATTLE CROSSING
21. EROSION FROM AGRICULTURE
22. SUSPENDED SILT NOTED
23. UNUSUAL STREAM SCOURING
24. LARGE BEDLOAD DEPOSIT
25. BANK EROSION - MODERATE
26. BANK EROSION - EXCESSIVE
27. STREAM DREDGING/BULLDOZING
28. GRAVEL REMOVAL
29. CHANNELIZATION (RIPRAP, ETC)
30. STREAM DIVERSION

31. WATER WITHDRAWAL
32. REGULATED STREAM FLOW
33. CAMP/COTTAGE PRESENT
34. RESIDENTIAL AREA
35. ACCESS - ATV'S
36. ACCESS - TRAILS
37. ACCESS - TRUCK/CAR
38. ACCESS - BOAT

39. ROAD CROSSING (BRIDGE)
40. ROAD CROSSING (CULVERT)
41. BOAT LANDING

42. ORGANIC LITTER
43. AQUATIC PLANTS ABUNDANT

reach 1
4> 100% vegetated

																											44. GOOD SPAWNING 45. GOOD NURSERY 46. ATLANTIC SALMON OBSERVED 47. BROOK TROUT OBSERVED
STREAM TYPE														CHANNEL TYPE			SUBSTRATE			FLOW TYPE	POOL RATING (reverse side)	
FASTWATER				POOLS																		CRITERIA NO.	% OF POOLS IN SITE (LETTER)
1. Falls 2. Cascade 3. Riffle (GR/RB) 4. Riffle (R/B) 5. Riffle (Sand)	6. Sheet (ledge) 7. Chute 8. Run 9. Rapid	10. Midchannel 11. Convergence 12. Lateral 13. Beaver	14. Trench 15. Plunge 16. 17. Bogan	18. Eddy 19. Gabion 20. Log Structure 21. Road Crossing	22. Wood Debris 23. Man-Made Dam 24. Natural Deadwater									1. Main (if measurement refers to main area of river) * 2. Side Channel (water diverted by islands) * 3. Split (if river is split into various different stream types) * 4. Bogan *Specify Left (L), Right (R) or Middle (M)			1. Bedrock, Ledge 2. Boulder = > 461 mm 3. Rock = 180 – 460 mm 4. Rubble = 54 – 179 mm 5. Gravel = 2.6 - 53 mm 6. Sand = 0.06 - 2.5 mm 7. Fines = 0.0005 - 0.05 mm			1. Survey stream 2. Spring 3. Brook / River Tributary 4. Spring Seep	POOL DEPTH ≥ 1.5m 1 - Instream Cover ≥ 30% 2 - Instream Cover < 30% POOL DEPTH .5 - 1.5m 3. Instream cover 5-30% 4 - Instream Cover > 30%	a - ≥ 30% b - ≥ 10 to 30% c - < 10% a - ≥ 50% b - < 50%

REACH NO.	SITE (50m - interval)	% SITE		SHADE (%)	STREAM BANKS												DEPTH						POOL RATING (CRITERIA ON OTHER SIDE)		POOL TAIL			% TURBU-LENCE
					VEGETATION (%)				EROSION (%)								¼ (m)		½ (m)		¾ (m)							
		RIFFLE/ RUN	POOLS		BARE GROUND	GRASSES	SHRUBS	TREES	LEFT BANK (0 - 50%)			RIGHT BANK (0 - 50%)			O_2 (mg/l)	pH	Wet	CHANNEL	Wet	CHANNEL	Wet	CHANNEL	NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: ≥ 50%	MEAN SUBSTRATE SIZE (cm)	% FINE	
									STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING														
1		X		0	0	80	15	5									40	5	40	5	40	5						
2		X		0	0	85	10	5									75	5	75	95	75	15						
3		—		0	0	85	10	5									75	5	75	95	75	15						

REACH NO.	UNIT NO.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM/4		COEFFICIENT (0.9 - SMOOTH) (0.8 - ROUGH)	LENGTH (3m)	FLOAT TIME (sec)				COMMENTS (LOCATION)
				¼ WAY	½ WAY	¾ WAY	CENTIMETERS (cm)	METERS (m)			¼ WAY	½ WAY	¾ WAY	AVERAGE	

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

WC 1

temp - 17.34°C

Cond. - 61 us/cm

Cond. - 0.052 ms/cm

TDS - 0.041 g/L

Sal. - 0.03

42.7% - DO

4.08 - DO mg/L

655 DO ch

pH - 5.69

Sept 2/16

Temp = 16.86 °C
Condu. = 36 us/cm
= 0.030 ms/cm
TDS = 0.023 g/L

Sal = 0.02
pH = 5.83
DO = ~~106.9%~~ 71.4%
DO = ~~9.66 mg/L~~ 7.57 mg/L

APPENDIX 1

FISH HABITAT SURVEY FORMS

04-98

DNR / DFO - NEW BRUNSWICK
STREAM HABITAT INVENTORY

_____ of _____

River: WC2 Start Point: _____ End Point: _____ Drainage Code: □□ □□ □□ □□ □□

No. _____ Personnel: VDG JJM Date: Sept 2/16 GIS Map No. _____ Drainage Name: Trib to Portage River

No. _____

REACH NO.	UNIT NO.	STREAM TYPE	CHANNEL TYPE	LENGTH (m)	AVG WIDTH (m) WET	AVG WIDTH (m) BANK CHANNEL	SUBSTRATE (%) BED-ROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES (organic ↓)	AVG DEPTH WET WIDTH (cm) *	0-50% UNDERCUT BANK L	0-50% UNDERCUT BANK R	0-50% OVERHANGING VEGETATION L	0-50% OVERHANGING VEGETATION R	LARGE WOODY DEBRIS IN STREAM (m)	FLOWS * TYPE	FLOW (cms)	TIME	TEMP (°C) W	TEMP (°C) A	EMBEDDEDNESS (CRITERIA) 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: ≥ 50%	COMMENTS
1		13	1	15	8	L-WL B 31							100	~~79~~	/		2	12	6-8	3	2		16.9	18		
2		13	1	75	7	49								~~75~~	/		2	2	8	3	2		16.9	18		
3		13	1	75	7	30		ORGANICS						~~75~~	/		2	6	10	3	2		16.9	18		

CHECKLIST OF LAND USE ATTRIBUTES (COMMENTS)

1. ACTIVE BEAVER DAM
2. INACTIVE BEAVER DAM
3. WOODY DEBRIS (OBSTRUCTION)
4. MAN-MADE DAM OBSTRUCTION
5. ROCK DAM (SWIMMING POOL)
6. BRAIDED STREAM CHANNELS
7. OBSTRUCTION IN STREAM
8. ROAD FORD

POLLUTION CAUSED BY:

9. FOOD PROCESSING INDUSTRY
10. FOREST INDUSTRY
11. CAMPSITES OR RESIDENTIAL
12. MINING
13. LITTER
14. OIL
15. AGRICULTURE WASTE
16. HEALTH HAZARD

17. CLEAR CUT TO STREAM EDGE
18. SELECTIVE CUT
19. BUFFER STRIP PRESENT

20. CATTLE CROSSING
21. EROSION FROM AGRICULTURE
22. SUSPENDED SILT NOTED
23. UNUSUAL STREAM SCOURING
24. LARGE BEDLOAD DEPOSIT
25. BANK EROSION - MODERATE
26. BANK EROSION - EXCESSIVE
27. STREAM DREDGING/BULLDOZING
28. GRAVEL REMOVAL
29. CHANNELIZATION (RIPRAP, ETC)
30. STREAM DIVERSION

31. WATER WITHDRAWAL
32. REGULATED STREAM FLOW
33. CAMP/COTTAGE PRESENT
34. RESIDENTIAL AREA
35. ACCESS - ATV'S
36. ACCESS - TRAILS
37. ACCESS - TRUCK/CAR
38. ACCESS - BOAT

39. ROAD CROSSING (BRIDGE)
40. ROAD CROSSING (CULVERT)
41. BOAT LANDING

42. ORGANIC LITTER
43. AQUATIC PLANTS ABUNDANT

* measured from bridge
b/c of depth.

44. GOOD SPAWNING
45. GOOD NURSERY
46. ATLANTIC SALMON OBSERVED
47. BROOK TROUT OBSERVED

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

REACH NO.	SITE (50m - Interval)	% SITE		SHADE (%)	STREAM BANKS												O₂ (mg/l)	pH	DEPTH						POOL RATING (CRITERIA ON OTHER SIDE)		POOL TAIL			% TURBU-LENCE
					VEGETATION (%)				EROSION (%)										¼ (m)		½ (m)		¾ (m)							
		RIFFLE/ RUN	POOLS		BARE GROUND	GRASSES	SHRUBS	TREES	LEFT BANK (0 - 50%)			RIGHT BANK (0 - 50%)							Wet	CHANNEL	Wet	CHANNEL	Wet	CHANNEL	NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: ≥ 50%	MEAN SUBSTRATE SIZE (cm)	% FINE	
									STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING																
1		X		5	0	85	10	5												avg 35cm across.									
2		X		5	0	85	10	5												avg. 75 across									
3		X		5	0	85	10	5												avg 75 across									

REACH NO.	UNIT NO.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM/4		COEFFICIENT (0.9 - SMOOTH) (0.8 - ROUGH)	LENGTH (3m)	FLOAT TIME (sec)				COMMENTS (LOCATION)
				¼ WAY	½ WAY	¾ WAY	CENTIMETERS (cm)	METERS (m)			¼ WAY	½ WAY	¾ WAY	AVERAGE	

FORMULA (CMS) = W (m) x D (m) x A x L (m) / T (sec)

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

Aug 11 minnow traps in @ 4:12pm — No differentiable readers.

WC3

Temp 21.25°C
Cond 49 µs/cm — 0.046 ms/cm
TDS 0.033 g/L
Sal 0.02

Do 71.2%
DO 6.05 mg/L
pH 6.77

46.1 CH

APPENDIX 1

FISH HABITAT SURVEY FORMS

04-98

DNR / DFO - NEW BRUNSWICK
STREAM HABITAT INVENTORY

_____ of _____

River: WC3 Start Point: _____ End Point: _____ Drainage Code: ☐☐ ☐☐ ☐☐ ☐☐ ☐☐

No. _____ Date: Aug 11/16 GIS Map No. _____ Drainage Name: Trib to Eel River.

Personnel: VDG, JJM

No. _____

REACH NO. *	UNIT NO.	STREAM TYPE	CHANNEL TYPE	LENGTH (m) *	AVG WIDTH (m) *		SUBSTRATE (%) * (inorganic)							AVG DEPTH WET WIDTH (cm) *	0 - 50 % UNDERCUT BANK		0 - 50 % OVERHANGING VEGETATION		LARGE WOODY DEBRIS IN STREAM (m) *	FLOWS *					EMBEDDEDNESS (CRITERIA) 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: ≥ 50%	COMMENTS
					WET	BANK CHANNEL	BED-ROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R		TYPE	FLOW (cms)	TIME	TEMP (°C) W	TEMP (°C) A		
1		13	1	30	3	5/6		ORGANICS.						>70	N/A		5	3	2							
2		13	1	30	3	5/6		ORGANICS						>70	N/A		5	3	1							
3		13	1	30	3	5/6		ORGANICS						>70	N/A		5	3	2							

CHECKLIST OF LAND USE ATTRIBUTES (COMMENTS)

1. ACTIVE BEAVER DAM
2. INACTIVE BEAVER DAM
3. WOODY DEBRIS (OBSTRUCTION)
4. MAN-MADE DAM OBSTRUCTION
5. ROCK DAM (SWIMMING POOL)
6. BRAIDED STREAM CHANNELS
7. OBSTRUCTION IN STREAM
8. ROAD FORD

POLLUTION CAUSED BY:

9. FOOD PROCESSING INDUSTRY
10. FOREST INDUSTRY
11. CAMPSITES OR RESIDENTIAL
12. MINING
13. LITTER
14. OIL
15. AGRICULTURE WASTE
16. HEALTH HAZARD

17. CLEAR CUT TO STREAM EDGE
18. SELECTIVE CUT
19. BUFFER STRIP PRESENT

20. CATTLE CROSSING
21. EROSION FROM AGRICULTURE
22. SUSPENDED SILT NOTED
23. UNUSUAL STREAM SCOURING
24. LARGE BEDLOAD DEPOSIT
25. BANK EROSION - MODERATE
26. BANK EROSION - EXCESSIVE
27. STREAM DREDGING/BULLDOZING
28. GRAVEL REMOVAL
29. CHANNELIZATION (RIPRAP, ETC)
30. STREAM DIVERSION

31. WATER WITHDRAWAL
32. REGULATED STREAM FLOW
33. CAMP/COTTAGE PRESENT
34. RESIDENTIAL AREA
35. ACCESS - ATV'S
36. ACCESS - TRAILS
37. ACCESS - TRUCK/CAR
38. ACCESS - BOAT

39. ROAD CROSSING (BRIDGE)
40. ROAD CROSSING (CULVERT)
41. BOAT LANDING

42. ORGANIC LITTER
43. AQUATIC PLANTS ABUNDANT

44. GOOD SPAWNING
45. GOOD NURSERY
46. ATLANTIC SALMON OBSERVED
47. BROOK TROUT OBSERVED

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

REACH NO.	SITE (50m - Interval)	% SITE		SHADE (%)	STREAM BANKS										O_2 (mg/l)	pH	DEPTH						POOL RATING (CRITERIA ON OTHER SIDE)		POOL TAIL			% TURBU-LENCE
					VEGETATION (%)				EROSION (%)								¼ (m)		½ (m)		¾ (m)							
		RIFFLE/ RUN	POOLS		BARE GROUND	GRASSES	SHRUBS	TREES	LEFT BANK (0 - 50%)			RIGHT BANK (0 - 50%)					Wet	CHANNEL	Wet	CHANNEL	Wet	CHANNEL	NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: > 50%	MEAN SUBSTRATE SIZE (cm)	% FINE	
									STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING														
1		—		0	5	90	5	0	—	—	—	—	—	—	6.05	6.7	—	—	>75cm		—							
2		—		0	5	90	5	0	—	—	—	—	—	—	6.05	6.7	—	—	>75cm		—							
3		—		0	5	90	5	0	—	—	—	—	—	—	6.05	6.7	—	—	>75cm		—							

REACH NO.	UNIT NO.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM/4		COEFFICIENT (0.9 - SMOOTH) (0.8 - ROUGH)	LENGTH (3m)	FLOAT TIME (sec)				COMMENTS (LOCATION)
				¼ WAY	½ WAY	¾ WAY	CENTIMETERS (cm)	METERS (m)			¼ WAY	½ WAY	¾ WAY	AVERAGE	

FORMULA (CMS) = W _____ (m) x D _____ (m) x A _____ x L _____ (m) / T _____ (sec)

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

no differentiable reaches

APPENDIX 1

FISH HABITAT SURVEY FORMS

04-98

DNR / DFO - NEW BRUNSWICK
STREAM HABITAT INVENTORY

_____ of _____

River: NC4 Start Point: at NC4 End Point: _____ Drainage Code: ☐☐ ☐☐ ☐☐ ☐☐ ☐☐

No. _____ Personnel: VDG, JJM Date: Aug. 11, 2016 GIS Map No. _____ Drainage Name: Trib to Eel River

No. _____

REACH NO.	UNIT NO.	STREAM TYPE	CHANNEL TYPE	LENGTH (m)	AVG WIDTH (m)		SUBSTRATE (%)							AVG DEPTH WET WIDTH (cm)	0 - 50 % UNDERCUT BANK		0 - 50 % OVERHANGING VEGETATION		LARGE WOODY DEBRIS IN STREAM (m)	FLOWS					EMBEDDEDNESS (CRITERIA) 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: ≥ 50%	COMMENTS
					WET	BANK CHANNEL	BED-ROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R		TYPE	FLOW (cms)	TIME	TEMP (°C) W	TEMP (°C) A		
1		24	1	25	1.25 m	1.75 m							100	25	NA		35%	30%	0 NA	0	N/A	N/A			N/A	
2		24	1	25	1.25	1.75 m							100	25	N/A		30	30	0	0	/	/			N/A	
3		24	1	25	1.25	1.75 m							100	25	N/A		30	30	0	0	/	/			N/A	

CHECKLIST OF LAND USE ATTRIBUTES (COMMENTS)

1. ACTIVE BEAVER DAM
2. INACTIVE BEAVER DAM
3. WOODY DEBRIS (OBSTRUCTION)
4. MAN-MADE DAM OBSTRUCTION
5. ROCK DAM (SWIMMING POOL)
6. BRAIDED STREAM CHANNELS
7. OBSTRUCTION IN STREAM
8. ROAD FORD

POLLUTION CAUSED BY:

9. FOOD PROCESSING INDUSTRY
10. FOREST INDUSTRY
11. CAMPSITES OR RESIDENTIAL
12. MINING
13. LITTER
14. OIL
15. AGRICULTURE WASTE
16. HEALTH HAZARD

17. CLEAR CUT TO STREAM EDGE
18. SELECTIVE CUT
19. BUFFER STRIP PRESENT

20. CATTLE CROSSING
21. EROSION FROM AGRICULTURE
22. SUSPENDED SILT NOTED
23. UNUSUAL STREAM SCOURING
24. LARGE BEDLOAD DEPOSIT
25. BANK EROSION - MODERATE
26. BANK EROSION - EXCESSIVE
27. STREAM DREDGING/BULLDOZING
28. GRAVEL REMOVAL
29. CHANNELIZATION (RIPRAP, ETC)
30. STREAM DIVERSION

31. WATER WITHDRAWAL
32. REGULATED STREAM FLOW
33. CAMP/COTTAGE PRESENT
34. RESIDENTIAL AREA
35. ACCESS - ATV'S
36. ACCESS - TRAILS
37. ACCESS - TRUCK/CAR
38. ACCESS - BOAT

39. ROAD CROSSING (BRIDGE)
40. ROAD CROSSING (CULVERT)
41. BOAT LANDING

42. ORGANIC LITTER
43. AQUATIC PLANTS ABUNDANT

44. GOOD SPAWNING
45. GOOD NURSERY
46. ATLANTIC SALMON OBSERVED
47. BROOK TROUT OBSERVED

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

Water Quality

Pt. Wc

°C 19.98 °C

Cond 117 µS/cm 0.105 mS/cm

TDS 0.075 g/L

Sal 0.05

DO % 24.4% DO 42.0 %

pH 6.45

REACH NO.	SITE (50m - interval)	% SITE		SHADE (%)	STREAM BANKS										O_2 (mg/l)	pH	DEPTH						POOL RATING (CRITERIA ON OTHER SIDE)		POOL TAIL			% TURBU-LENCE
					VEGETATION (%)				EROSION (%)								¼ (m)		½ (m)		¾ (m)							
		RIFFLE/ RUN	POOLS		BARE GROUND	GRASSES	SHRUBS	TREES	LEFT BANK (0 - 50%)			RIGHT BANK (0 - 50%)					Wet	CHANNEL	Wet	CHANNEL	Wet	CHANNEL	NO.	LETTER	EMBEDDEDNESS (CRITERIA) 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: ≥ 50%	MEAN SUBSTRATE SIZE (cm)	% FINE	
									STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING														
1		N/A		55		84	15	<1	N/A		/				2.8	6.45	.03	.07	.20	.20	.22	.22	N	A				
1		N/A		50		84	15	<1	N/A							6.4	.03	.07	.20	.20	.22	.22	N	A				
1		N/A		60		84	15	<1	N/A							6.4	.03	.07	.20	.20	.22	.22	N	A				

REACH NO.	UNIT NO.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM/4		COEFFICIENT (0.9 - SMOOTH) (0.8 - ROUGH)	LENGTH (3m)	FLOAT TIME (sec)				COMMENTS (LOCATION)
				¼ WAY	½ WAY	¾ WAY	CENTIMETERS (cm)	METERS (m)			¼ WAY	½ WAY	¾ WAY	AVERAGE	

FORMULA (CMS) = W _____ (m) x D _____ (m) x A _____ x L _____ (m)
T _____ (sec)

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