ROAD BETWEEN THE HAMLET OF CLYDE RIVER AND CAPE CHRISTIAN

Annual Report
2009 Season

Licence No. 8BW-CLY0810

Presented to:

Manager of Licensing

Nunavut Water Board

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March 2010

1 Summary of Work

Qikiqtaaluk Logistics upgraded the existing road between the Hamlet of Clyde River and Cape Christian from July to September 2009. However, due to extremely muddy conditions, a portion of the road could not be stabilized and had to be re-routed on to higher, drier ground. Culverts were installed at all the water crossings and a permanent steel free-standing bridge was constructed over the Clyde River. Because most of the water bodies crossed by the road were either determined to be fish bearing or were inferred to be, several habitat compensations measures were implemented.

Only a small section of the road around crossing 3A remains to be completed next season as well as some certain fish habitant enhancement and reclamation measures.

Figure 1 illustrates the re-routing of the road and the approximate local of several of the crossings. Table 1 summarizes the pertinent information on the water crossings, fish habitat enhancements and reclamation work

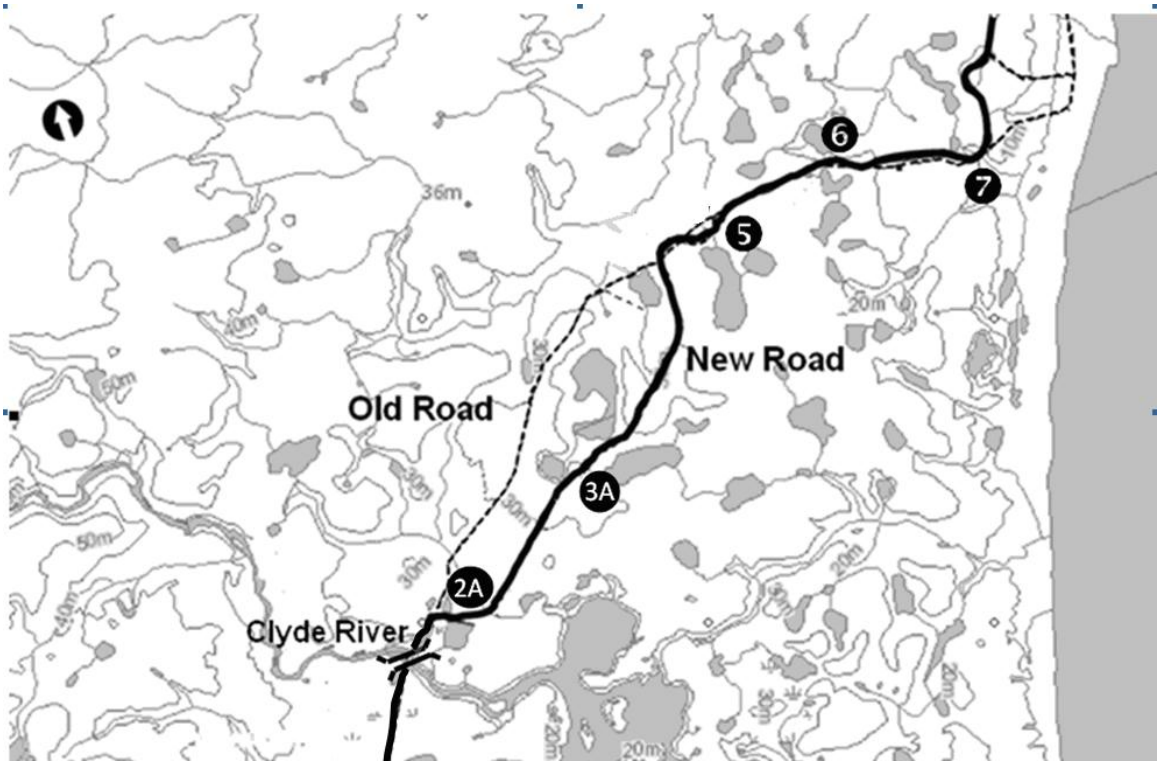

Figure 1: Approximate Location of the New Road

Table 1: Summary of Road Construction and Fish Habitat Enhancements

Crossing	Structure Type	Habitat Enhancements	Remaining Work
Clyde River	Permanent steel bridge (open span)	- reclamation of the Clyde River riverbed and banks - A ditch was built besides the road on the south-west section of the bridge	none
2 (Old Road)	N/A	watercourse restored	opening to the Clyde River
3 (Old Road)	N/A	permanent channel opened between an adjacent lake and the Clyde River	Installation of rock bedding on about 10 ft within the channel bed
2A	1x 48'' culvert	No	none
3A	2 x 24'' culverts	No	Completion of the road on both sides of the crossing Field survey
5	1 x 36'' culvert	Creation of an off-channel water body onto a lake	-Removal of sediment deposits in the first 20 meters of the stream channel -excavation to final grade & addition of boulder cover -field survey
7A	1 x 36'' culvert 1 x 24" culvert	No	Field survey
9	4 x 48'' culverts	No	none
10	1 x 24'' culvert	No	none
11	1 x 24'' culvert	-Fish ladder	none

2 Construction Activities

2.1 Clyde River Bridge

The 65 tonnes of structural material, stored over the winter at the Clyde River barging area, were transported to the bridge site at the end of June 2009.

The bridge abutments were constructed by filling-in galvanized steel bin boxes with backfill. The road approaches on the transition to the bridge were supported with galvanized wire-mesh baskets in-filled with rock. A layer of geotextile membrane was installed at the base of the abutments and well-graded rip rap placed around the abutments and along the bridge approaches, in order to guarantee better erosion protection.

The superstructure was pre-assembled on the west approach. The work included the assembly of the four main-girder bolted splices and the installation of the floor beams and part of the lateral bracing. After being assembled, the superstructure was pulled into place over the span using two excavators as seen in Figure 2.

Figure 2: Pulling the Bridge Superstructure into Place

Timber stringers, each weighing approximately 150 kg, were carried and placed into position one at a time by 6 men. Running boards were arranged on top and fastened to the stringers. Individual sections of the bridge rail were carried into position by an excavator travelling on the installed timber deck as seen in Figure 3.

Figure 3: Installing the Bridge Rail

The bridge superstructure is a 29.3 m long, single lane, twin steel girder structure with a 4.2 m wide timber deck. The girders are fabricated of rust resisting bridge steel (G40-21M, 350AT, Impact Category 3). The deck is covered with creosote treated timber planks and is boarded with 0.7 m high hot dip galvanized steel bridge rails. The east portion of the completed bridge can be seen in Figure 4.

Figure 4: Completed Bridge

2.2 Crossing 2A

Crossing 2A was constructed on August 24th, 2009. Crossing 2A is located in the re-routed section of the road. A one 48 inch culvert was installed with a geotextile wrap and soil cover. Rip-rap was then used to stabilise the soil cover and prevent it from eroding into the waterway. Rock silt barriers were built in the ditches along each side of the road and a geomembrane silt fence was installed at the base of the crossing in order to minimize the amount of sediments being flushed into the waterways.

Figure 5 : Geotextile Placement

Figure 6 : Soil Placement

Figure 7 : Crossing - South Side

Figure 8 : Final Rip Rap Cover- North Side

Figure 9 : Rock Silt Barrier – North Ditch

Figure 10 : Rock Silt Barrier – South Ditch

2.3 Crossing 3A

Crossing 3A is also in the re-routed section of the road. The two 24 inch culverts of crossing 3A were installed at the very end of the 2009 field season. A geotextile was used to stabilize the soil cover and rip rap was added by hand on the soil side slopes to prevent sediment erosion into waterway.

Figure 11 : Laying out the Culverts

Figure 12 : Culvert Installation

Figure 13 : Crossing 3A – North Side

Figure 14 : Crossing 3A – South Side

2.4 Crossing 5

One 36 inch culvert was installed at Crossing 5 on August 22nd 2009. A geotextile was used to stabilize the soil cover. A silt fence was installed down stream of the crossing in order to block the passage of sediments into the waterway during the construction of the crossing. The silt fence was later removed to allow for fish passage. Permanent silt barriers made from available rip rap were constructed in the north and south ditches running parallel to the road. Small settling ponds were excavated upstream of the silt barriers to improve their efficiency. Following a field inspection by DFO, the sediments in the stream bed were removed as well as a small stockpile of disturbed gravel located on the north-east part of the culvert outlet.

Figure 15 : Culvert Bedding

Figure 16 : Culvert Installation

Figure 17 : Silt Fence during Construction

Figure 18 : Crossing 5 without Silt Fence

Figure 19 : Sediment removed from the Inlet

Figure 20 : Silt Barrier – South Ditch

Figure 21 : Silt Barrier – North Ditch

Figure 22 : Stockpile of Soil Removed

2.5 Crossing 7A

Crossing 7A was first constructed in July 2009 with a one 36 inch culvert. However, the culvert was reinstalled on August 30th to ensure that the inlet was better embedded and the outlet better oriented within the natural stream channel. Also, an additional section of 24" diameter culvert was added to guarantee that the creek crossing was not undersized during high flow events. Silt fences and rock silt barriers across the road ditches were used to control the propagation of sediments in the waterways during both construction stages of Crossing 7A. Settling ponds were dug in the ditches upstream of the rock barriers to improve their efficiency.

Figure 23 : Placement of Soil Cover

Figure 24 : Silt Fence at Crossing 7A

Figure 25 : Removal of Soil Cover

Figure 26 : Realignment of 36" Culvert

Figure 27 : Final Soil Cover

Figure 28 : Settling Pond in South Ditch

2.6 Crossing 9

On July 5-6, 2009 four 48 inch culverts were installed at crossing 9 and covered with geotextile and soil. However, in August one of culverts was removed and reinstalled and embedded deeper to allow for better fish passage. Silt fences were used during the construction of the crossing to minimize sediment propagation into the waterway. An old wooden bridge was removed as it may have impacted the flow of water. The old structure was dismantled piece by piece in order to avoid any contact between the water and the demolished infrastructure.

Figure 29 : Geotextile Placement

Figure 30 : Creek Crossing 9

Figure 31 : Wooden Bridge Removal

Fig 32: Silt Fence prior to Culvert Removal

Figure 33 : Grading the Streambed

Figure 34 : Inlet of Reinstalled Culvert

2.7 Crossing 10

Crossing 10 was constructed on July 6, 2009. A 24 inch culvert was placed and held in place with a geotextile and soil cover. The crossing allows the flow of the upstream pond into the large downstream pond across the roadway.

Figure 35 : Downstream Pond

Figure 36 : Geotextile Placement

2.8 Crossing 11

At Crossing 11 a 24 inch culvert was placed across the stream in July 9, 2009 and kept in place with a geotextile and soil cover. At the end of August 2009, rocks were added around the culvert as a final cover to prevent erosion.

Figure 37 : Laying out the Culvert

Figure 38 : Final Rock Cover

3 Habitat Enhancements and Reclamation Work

The installation of culverts along the 16 km upgraded road resulted in an estimated fish habitat loss of 438 square meters. Several fish habitat compensation and restoration measures were implemented between the Hamlet of Clyde River and Cape Christian, both along the original road and the re-routed section of the upgraded road.

3.1 Clyde River

The riverbed and banks of Clyde River were reclaimed to their pre-disturbed. A ditch was also built beside the road on the south-west section of the bridge installed over the Clyde River.

3.2 Former Crossing 2 Restoration

As it is a fish bearing passage, the watercourse immediately upstream of the Clyde River (what would have been Crossing 2 if the road had not been re-routed) was restored to its undisturbed condition. The sediments were removed along the whole length of the channel and the slopes were excavated at a 3:1 ratio.

Figure 39 : Excavation of the Watercourse

Figure 40: Opening to the River Closed

3.3 Former Crossing 3 Restoration

At the end of the 2009 season, a permanent channel was opened between an adjacent lake and the Clyde River around former Crossing 3 (old road). The silt fences were also removed to allow fish passage. Rock bedding will need to be installed on about 10 feet within the channel bed to mitigate the impact of the passage of ATVs.

Figure 41 : Before Rehabilitation

Figure 42 : Excavation of the Sediments

Figure 43 : Removal of Silt Fences

Figure 44 : Restored Open Channel

3.4 Off-Channel Construction (near Crossing 5)

The construction of the off-channel initiated in late August 2009 as a compensation measure for the loss of fish habitat consists in the actual

creation of a fish habitat, in both surface area and structure. The final channel bed elevation of 0.5 m below the Low Water Level of the lake could not be reached due to permafrost. In 2010, the area will be scraped in consecutive layers as the ground melts until the design grade is reached. The sides and the base will be backfilled with rock for stabilisation and boulders will be used for in-stream fish cover.

Figure 45 : Excavation of the Off-Channel

Figure 46: Off-Channel in September 2009

3.5 Fish Ladder at Crossing 11

A fish ladder was constructed at Crossing 11. The fish ladder is essentially a series of five consecutive ponds created by piling up rocks into relatively low barriers. While migrating upstream, char can easily leap up the low “steps” of the fish ladder until they reach the culvert.

Figure 47: Fish Ladder leading to Crossing

Figure 48: Close up of Fish Ladder

4 Unauthorized Discharges

No unauthorized discharges occurred during the 2009 work season.

5 Spill Contingency Plan Update

The following contact information was added to the Spill Contingency Plan:

Nunavut 24-hour Spill Report Line	Telephone: (867) 920-8130
	Fax: (867) 873-6924

6 Monitoring Program

6.1 Sediment and Erosion Control

Two sediment control techniques were used during the upgrade of the road between the Hamlet of Clyde River and Cape Christian: silt fences and rock silt barriers. Both techniques reduce the transport of coarse sediment in waterways by providing a physical barrier to sediment and reducing the runoff velocities of overland flow. The silt fences were used as a temporary sediment control measure while the rock silt barriers will remain in place even after the road has been completed. The rock silt barriers were built inside the ditches running parallel to the road as seen in the figures below. Settling ponds were excavated upstream of the barriers to improve their efficiency.

Figure 49 : Check Dam in Road Ditch

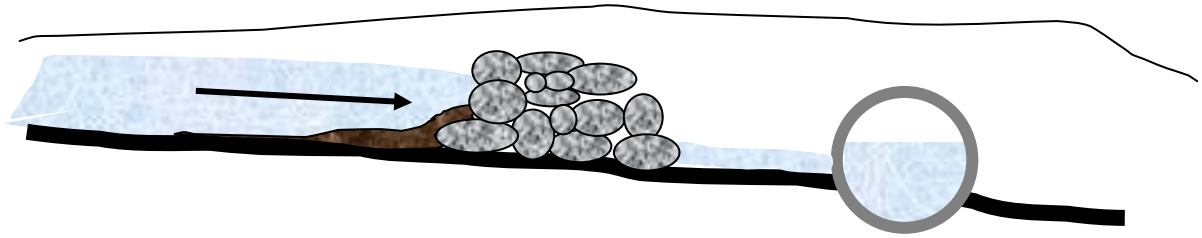

Figure 50 : Section A-A (not to scale)

The following maintenance standards were implemented with regards to the rock silt barriers:

- Any damages were repaired.

- Sediments will be removed when two-thirds of the available storage has been filled.

Installation of the silt fences was done according to the figure below.

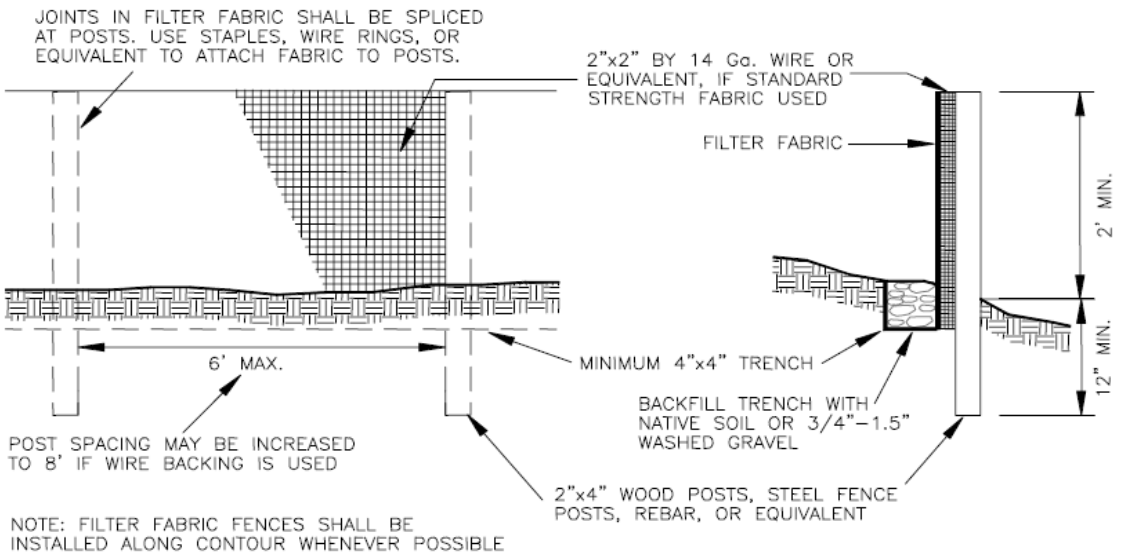

Figure 51 : Silt Fence Installation Details
(Erosion and Sediment Control Standards, King County Department of Natural Resources and Parks, 2005)

Figure 52 and Figure 53 : Examples of Silt Fence used during the Road Upgrade

The following maintenance standards were implemented with regards to the silt fences:

- Any damage was repaired immediately.
- The upstream side of the fence was checked for signs of clogging or channelization of flows parallel to the fence. If this occurred, the fence was replaced or the trapped sediment removed.
- Sediments would have been removed if they had accumulated more then 150 mm high.
- At the completion of the project, the silt fences will be disposed of as non-hazardous waste in accordance with Section 31 22 15 – Grading.

6.2 Waste Locations

All waste associated with the 2009 operations where discharges in the Clyde River landfill facility. Waste mainly consisted of metal strapping and remains of wooden crates.

6.3 Water Quality Testing

Basic water quality testing was conducted upstream and downstream of the Clyde River bridge construction site, prior to and upon completion. All sampling, sample preservation and analyses were conducted in accordance with methods prescribed in *Standard Methods for the Examination of Water and Wastewater*. The analyses were performed by AGAT Laboratoires, accredited according to ISO/IEC Standard 17025.

As can be from the results presented in Table 2, the construction of the free spanning bridge over the Clyde River did not impact the water quality.

Table 2: Water Quality Testing Results

Parameters (units)	Prior to Bridge		After Bridge	
	Upstream	Downstream	Upstream	Downstream
pH	6.24	6.35	6.75	6.43
Conductivity (umhos/cm)	14	11	<10	<10
Total Oil & Grease (mg/L)	<4.5	<4.5	<4.5	<4.5
Total Suspended Solids (mg/L)	<2	<2	<2	<2

ANNEXE A: CERTIFICATES OF ANALYSIS

9770 ROUTE TRANSCANADIENNE
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CANADA H4S 1V9

AGAT Laboratories

PH: (514)337-1000
FAX: (514)333-3046
http://www.agatlabs.com

CLIENT NAME: STABILIS INC
3333 QUEEN MARY, BUREAU 580
MONTREAL, QC H3V1A2

ATTENTION TO: Philippe Simon / Jonathan Rémillard

PROJECT NO: Cape Christian

AGAT WORK ORDER: 09M343213

WATER ANALYSIS REVIEWED BY: André Labonne, chimiste

DATE REPORTED: 2009-07-16

VERSION*: 1

PAGES (INCLUDING COVER): 4

Should you require any information regarding this analysis please contact your client services representative at (514) 337-1000, or at 1-866-417-5227

*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: 09M343213

PROJECT NO: Cape Christian

CLIENT NAME: STABILIS INC

ATTENTION TO: Philippe Simon / Jonathan Rémillard

SAMPLED BY:Jonathan Rémillard,

SAMPLING SITE:Clyde River,

Surface Water Analyses

DATE RECEIVED: 2009-07-09

DATE REPORTED: 2009-07-15

	Unit	SAMPLE DESCRIPTION: / SAMPLE TYPE: / DATE SAMPLED: G / S	RDL	Aval - Clyde River Surface Wa 2009-07-06 1388521	Amont - Clyde River Surface Wa 2009-07-06 1388523
Conductivity	umhos/cm		10	11	14
Total oil and grease	mg/L		4.5	<4.5	<4.5
pH		6.5-8.5	NA	6.35	6.24
Total Suspended Solids	mg/L		2	<2	<2

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME (DW)

1388523 The holding time for pH expired prior to analysis

Certified By:

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Quality Assurance

CLIENT NAME: STABILIS INC

AGAT WORK ORDER: 09M343213

PROJECT NO: Cape Christian

ATTENTION TO: Philippe Simon / Jonathan

SAMPLED BY:Jonathan Rémillard,

SAMPLING SITE:Clyde River,

Water Analysis

RPT Date:			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			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
Surface Water Analyses															
Conductivity (umhos/cm)	1	NA	NA	NA	0.0%	< 10	96%	90%	110%	101%	90%	110%	NA	0%	0%
Total oil and grease (mg/L)	1	MR	26.8	25.4	5.4%	< 4.5	103%	70%	130%	NA	70%	130%	NA	70%	130%
pH	1	NA	NA	NA	0.0%	NA	98%	80%	120%	97%	80%	120%	NA	80%	120%
Total Suspended Solids (mg/L)	1	NA	NA	NA	0.0%	< 2	87%	80%	120%	NA	80%	120%	89%	80%	120%
Surface Water Analyses															
pH	2	NA	NA	NA	0.0%	NA	97%	80%	120%	98%	80%	120%	NA	80%	120%

Certified By:

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Method Summary

CLIENT NAME: STABILIS INC

AGAT WORK ORDER: 09M343213

PROJECT NO: Cape Christian

ATTENTION TO: Philippe Simon / Jonathan

SAMPLED BY:Jonathan Rémillard,

SAMPLING SITE:Clyde River,

PARAMETER	DATE PREPARED	DATE ANALYZED	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis					
Conductivity	2009-07-10	2009-07-10	INOR-101-6016F	MA.115-Cond. 1.0 r3	EC METER
Total oil and grease	2009-07-14	2009-07-14	ORG-100-5105	MA.415-HGT 1.0	MICROBALANCE
pH	2009-07-10	2009-07-13	INOR-101-6020F	SM 4500-H+ B 21éd. 2005	PC-TITRATE
Total Suspended Solids	2009-07-14	2009-07-15	INOR-101-6028F	MA.104-S.S. 1.0 r4	OVEN

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CLIENT NAME: STABILIS INC
3333 QUEEN MARY, BUREAU 580
MONTREAL, QC H3V1A2

ATTENTION TO: Philippe Simon/Jonathan Rémillard

PROJECT NO: Cape Christian

AGAT WORK ORDER: 09M345879

TRACE ORGANICS REVIEWED BY: Philippe Morneau, chimiste

WATER ANALYSIS REVIEWED BY: André Labonne, chimiste

DATE REPORTED: 2009-07-31

VERSION*: 1

PAGES (INCLUDING COVER): 6

Should you require any information regarding this analysis please contact your client services representative at (514) 337-1000, or at 1-866-417-5227

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 09M345879

PROJECT NO: Cape Christian

CLIENT NAME: STABILIS INC

ATTENTION TO: Philippe Simon/Jonathan Rémillard

SAMPLED BY:Jonathan Rémillard,

SAMPLING SITE:Clyde River,

Total oil and grease (water)

DATE RECEIVED: 2009-07-24

DATE REPORTED: 2009-07-31

	Unit	G / S	RDL	Aval-Clyde River DW 2009-07-17 1406270	Amont-Clyde River DW 2009-07-17 1406272
SAMPLE DESCRIPTION:				Aval-Clyde River	Amont-Clyde River
SAMPLE TYPE:				DW	DW
DATE SAMPLED:				2009-07-17	2009-07-17
Total oil and grease	mg/L		4.5	<4.5	<4.5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

AGAT Laboratories
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Certificate of Analysis

AGAT WORK ORDER: 09M345879

PROJECT NO: Cape Christian

CLIENT NAME: STABILIS INC

ATTENTION TO: Philippe Simon/Jonathan Rémillard

SAMPLED BY:Jonathan Rémillard,

SAMPLING SITE:Clyde River,

Inorganics

DATE RECEIVED: 2009-07-24

DATE REPORTED: 2009-07-31

	Unit	G / S	RDL	SAMPLE DESCRIPTION: Aval-Clyde River SAMPLE TYPE: DW DATE SAMPLED: 2009-07-17 1406270	SAMPLE DESCRIPTION: Amont-Clyde River SAMPLE TYPE: DW DATE SAMPLED: 2009-07-17 1406272
Conductivity			10	<10	<10
pH		6.5-8.5	NA	6.43	6.75
Total Suspended Solids			2	<2	<2

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME (DW)

Certified By:

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Quality Assurance

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AGAT WORK ORDER: 09M345879

PROJECT NO: Cape Christian

ATTENTION TO: Philippe Simon/Jonathan

SAMPLED BY:Jonathan Rémillard,

SAMPLING SITE:Clyde River,

Trace Organics Analysis

RPT Date: 2009-07-31			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			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 oil and grease (water)															
Total oil and grease (mg/L)	1	MR	27.5	29.3	6.3%	< 4.5	106%	70%	130%	NA	70%	130%	NA	70%	130%

Certified By:

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AGAT WORK ORDER: 09M345879

PROJECT NO: Cape Christian

ATTENTION TO: Philippe Simon/Jonathan

SAMPLED BY:Jonathan Rémillard,

SAMPLING SITE:Clyde River,

Water Analysis

RPT Date: 2009-07-31			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			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
Inorganics															
Conductivity	1	1406270	< 10	< 10	0.0%	< 10	98%	80%	120%	101%	80%	120%	NA	80%	120%
pH	1	NA	NA	NA	0.0%	NA	99%	80%	120%	102%	80%	120%	NA	80%	120%
Total Suspended Solids	1	NA	NA	NA	0.0%	< 2	104%	80%	120%	NA	80%	120%	92%	80%	120%

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Method Summary

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AGAT WORK ORDER: 09M345879

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ATTENTION TO: Philippe Simon/Jonathan Rémillard

SAMPLED BY:Jonathan Rémillard,

SAMPLING SITE:Clyde River,

PARAMETER	DATE PREPARED	DATE ANALYZED	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis					
Total oil and grease	2009-07-28	2009-07-28	ORG-100-5105	MA.415-HGT 1.0	MICROBALANCE
Water Analysis					
Conductivity	2009-07-30	2009-07-30			
pH	2009-07-24	2009-07-24			
Total Suspended Solids	2009-07-28	2009-07-29			