Environmental Impact Assessment
Component Study

MARINE FISH AND FISH HABITAT COMPONENT STUDY

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July 2007

Newfoundland and Labrador Refinery Project
Southern Head, Placentia Bay, NL
Marine Habitat Characterization

Submitted to:

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July 2007

EXECUTIVE SUMMARY

On behalf of Newfoundland and Labrador Refinery Corporation, a qualitative and quantitative characterization of the marine habitat was conducted within the footprint of proposed marine facilities associated with the construction and operation of the Newfoundland and Labrador Refinery Project located near Southern Head at the head of Placentia Bay, Newfoundland.

For the purposes of the marine habitat quantification, the survey area was divided into four distinct zones including:

- Zone 1 - Marine Terminal/Tug Berth;
- Zone 2 - Marine Jetty;
- Zone 3 - Marine Water Intake; and
- Zone 4 - Marine Outfall.

The marine habitat characterization included substrate distributions, depth profiles, macrofauna and macroflora distributions, and baseline sediment and water chemistry.

Underwater video transects were conducted via diving and ROV within each zone. Field notations and video review provided quantitative information with respect to substrate, macrofloral, macrofaunal distributions, and depth profiles. Representative sediment samples were diver collected from all four zones and analyzed for the following parameters:

- Metals – Hydrides
- BTEX/TPH (RBCA)
- PAH
- PCB
- TOC
- Particle Size

Seawater samples were collected from Zone 3 – Marine Water Intake and Zone 4 – Marine Outfall. Samples were collected via Nisken Bottle from the surface (0.5 m below surface), mid-column, and bottom (0.5 m from seafloor) at an offshore and inshore location. Seawater samples were analyzed for the following parameters:

- Metals – Hydrides
- General Chemistry
- BTEX/TPH (RBCA)
- PAH
- VOC
- TOC

Habitat Characterization – Zone 1 – Marine Terminal and Tug Berth

The marine habitat of Zone-1 Marine Terminal and Tug Berth was representative of a semi-exposed marine ecosystem. Shelter is provided to the west and north via the backshore land mass. The wave exposure fetches are approximately 3 km to the west (eastern shoreline of Come By Chance Harbour), 13 km to the south (Merasheen Islands

Archipelago). It should be noted that the Merasheen Island Archipelago, due to its unconsolidated nature provides only partial shelter.

The shoreline consisted of small cobble/gravel beaches with scattered boulder and bedrock margins (50 to 100 m in width) rising to steep rock cliffs in the backshore interspersed with rocky headlands (10 to 40 m in width). Shoreline surveys quantified 5 beaches and 8 headlands within Zone-1.

Generalized substrate distributions within the entire zone consisted of cobble and small boulder near the shoreline. Following this, the southern portion of Zone 1 transitioned into a region of coarse gravels interspersed with occasional bedrock outcrops followed by a region predominated by sand and fine gravel. The northern section of Zone 1 transitioned from the nearshore cobble and small boulder to a region typified by sand and fine gravels.

Sea urchins and starfish in low to moderate numbers were ubiquitous on both hard/coarse and soft/fine substrates from the shoreline to the outer limits of Zone 1. Slightly higher numbers of urchins were associated with sections consisting primarily of large boulder and bedrock. Blue mussels and horse mussels were encountered sporadically on large boulders and bedrock outcrops. Horse mussels were generally encountered in deeper water (10+ m) although blue mussels were also encountered further out on the transect lines on the tops of large boulders. Periwinkles were observed primarily on large substrates within 50 m of the shoreline in water depths < 10 m but were also observed on large shallow substrates at greater distances.

Species encountered more sporadically on large substrates (independent of depth) included frilled anemone in low to high numbers and low numbers of tube worms (1-2 per transect line). Eleven winter flounder observed within Zone 1 were usually associated with gravel and sand substrates. Sand dollars were encountered in moderate to high numbers in association with fine gravel and sand substrates. Deep-sea scallop in abundances ranging from 0-6 individuals per 5 m section and three American plaice were encountered primarily on soft substrates along the furthest reaches of the transect lines (deeper water).

Species encountered infrequently included hermit crab, barnacles (large substrates), sponge, and northern lobster (one individual in a crevice).

Crustose algae was consistently encountered on hard substrates in densities ranging from <25 to 50%. Sour weed was also ubiquitous (< 25 to 75%) on all substrates except fine sand although the highest densities were usually observed on small boulder substrate. Edible kelp (*Alaria sp.*) was commonly observed (<25 to 100%) on large substrates with the highest densities generally associated with the shoreline and intertidal areas. Sea colander was occasionally observed in deeper water at distances greater than 100 m from the shoreline.

Shoreline algal species were dominated by rockweed and knotted wrack interspersed with lesser amounts of green filamentous, black whip weed, sea lettuce, coral weed, red tubed weed, and dulse.

Species observed infrequently included ribbed lace, *Halosaccion sp.*, laver, and ribbon weed.

Habitat Characterization – Zone 2 – Marine Jetty

The marine habitat of Zone-2 Marine Jetty was representative of a semi-exposed, open water, marine ecosystem. Shelter is provided to the west and north via the backshore land mass. The wave exposure fetches are approximately 3 km to the east (eastern shoreline of Come By Chance Harbour), 13 km to the south (Merasheen Islands Archipelago). It should be noted that the Merasheen Island Archipelago, due to its unconsolidated nature provides only partial shelter. Approximately 250 m of the southwestern extent of T-8 is exposed to a 9 km wave fetch to the west (Sound Island).

Substrates were uniform throughout the entire zone consisting primarily of sand with small amounts of gravel and isolated small boulders.

Sea urchins, starfish and deep-sea scallop were consistently encountered in relatively low numbers on sand and gravel substrates throughout the entire transect length. Scallop densities averaged approximately one to three individuals per five meter transect section. Species observed infrequently included American plaice (five individuals), Atlantic cod (three individuals), skate (one individual), frilled anemone, and tube worms.

Crustose algae was encountered sporadically in association with intermittent cobble and boulder substrate. Sour weed and edible kelp were noted upon isolated hard substrtaes. Storm tossed sour weed, sea colander, kelp (*Laminaria sp.*), and rockweed were noted sporadically throughout the entire section.

Habitat Characterization – Zone 3 – Marine Water Intake

The marine habitat of Zone-3 Marine Water Intake was a combination of both semi-sheltered and semi-exposed marine ecosystems. Shelter for the first 400 m is provided to the north, west, and east via the shoreline of Hollets Cove. The southern wave exposure fetch is approximately 13 km with partial shelter provided by the Merasheen Islands Archipelago. Shelter for the remaining 560 m is provided to the north via the backshore landmass and to the east via Come By Chance Point. The southern wave exposure fetch is approximately 12 km with partial shelter provided by the Merasheen Islands Archipelago. The western wave exposure fetch is approximately 8 km to Sound Island.

Substrates from the shoreline to 60 m were predominantly cobble with lesser amounts of sand and gravel with isolated small boulder and bedrock. From 60 m to 470 m substrates were primarily gravel and sand with lesser amounts of cobble and isolated boulder. From 470 m to 960 m substrates were larger, consisting of large bedrock outcrops interspersed with small boulder and gulches dominated by cobble.

Sea urchins and starfish were consistently encountered throughout the entire (960 m) transect length. Horse mussels, blue mussels, and frilled anemone were sporadically encountered on large boulder and bedrock substrates. Species encountered infrequently included hermit crab (one individual), eel pout (two individuals), deep-sea scallop (one individual), and polychaetes (one individual).

Crustose algae was consistently encountered on all hard substrates from 200 m to 960 m. Sour weed was fairly abundant on all substrates from 10 m to 630 m. The

predominant shoreline and intertidal species were species were edible kelp, kelp (*Laminaria sp.*), black whip weed, hollow green weed, smooth chord weed, coral weed, green filamentous, red tubed weed, and rockweed, . Sea colander were noted to occur from over the outside transect portion from 260 to 910 m. Intermittent species included red fern and banded weed.

Habitat Characterization – Zone 4 – Marine Outfall

The marine habitat of Zone-4 Marine Outfall was representative of a semi-exposed marine ecosystem. Shelter is provided to the north via the backshore land mass and to the west via Southern Head. The southern wave exposure fetch is approximately 13 km with partial shelter provided by the Merasheen Islands Archipelago. The western wave exposure fetch is approximately 6 km to Sound Island.

Substrates from the shoreline to 40 m were predominantly small boulder with lesser amounts of cobble and gravel and isolated small boulder. From 40 m to 200 m substrates were primarily bedrock and large boulder interspersed with cobble and gravel. From 200 to 330 m substrates were dominated by sand and gravels with occasional cobble patches.

Sea urchins and starfish were consistently encountered on all substrates throughout the transect length. Deep-sea scallop were encountered in densities ranging from one to two individuals per five meter transect section. Sand dollars were encountered on sections of fine substrate. Periwinkles were encountered on large substrate within the shoreline/intertidal zone. Blue and horse mussels, frilled anemone, and barnacles were observed sporadically on large substrates. Species observed infrequently included hermit crab (one individual), winter flounder (two individuals, and skate (two individuals).

Crustose algae was encountered consistently on hard substrates and sour weed on all substrates throughout the transect length. Edible kelp was noted in the shoreline/intertidal area and in a narrow band from 100 to 120 m. Shoreline/intertidal species included rockweed, knotted wrack, coral weed, red fern, sea lettuce, black whip weed, and green filamentous.

Commercial Fisheries

Although lobsters were not observed in significant numbers within Zones 1, 2, 3, or 4 the nearshore areas are known to contain lobster habitat. This is evidenced by the large numbers of lobster pots observed during the surveys and the long timeline of the traditional lobster fishery in the area. Due to the primarily nocturnal nature of lobster movements it is common for them not to be observed during daylight video surveys.

Based upon conversations with local fisher people it has been ascertained that lumpfish, capelin, and scallop are not present in commercial quantities within the boundaries of the proposed marine facilities. There is currently no commercial fishery being prosecuted for either of these species within the marine boundaries of the project.

Marine Sediment Chemistry

The only metals which exceeded CCME ISQG (2006) were arsenic in two samples from Zone 2 - Marine Jetty and one sample from Zone 4 - Marine Outfall; and copper in two

samples from Zone1 – Marine Terminal/Tug Berth and one sample from Zone 4 – Marine Outfall. Both arsenic and copper are commonly encountered in marine sediments from pristine areas of Newfoundland and Labrador. The exceedances noted are most likely attributable to natural background levels. All other metals analyzed were either not detected or were below CCME ISQG (2006).

BTEX/TPH were not detected at the laboratory MDLs (laboratory method detection limits) for any of the samples submitted for analysis.

PAHs were either not detected or were below the CCME ISQG (2006) for all samples from all zones.

PCBs were not detected at the laboratory MDL (laboratory method detection limits) for all samples from all zones.

TOC was detected in all samples in a range from 4,200 to 5,2058 (ug/g).

Seawater Chemistry

The only metal which exceeded the available CCME guideline (2006) was cadmium which exceeded at both the Zone 3 – Intake Location and Zone 4 – Outfall Location. Cadmium is a commonly occurring natural metal in the Newfoundland and Labrador Environment. It is likely that the cadmium levels detected are attributable to natural background levels.

BTEX/TPH were either not detected or were below the CCME guideline (2006) for all samples from all zones.

PAHs were not either not detected at the laboratory MDL (laboratory method detection limits) or were below the CCME guideline (2006) for all samples from all zones.

VOCs were not detected at the laboratory MDL (Method Detection Limit) in all samples.

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1.0 SCOPE AND METHODOLOGY

On behalf of Newfoundland and Labrador Refinery Corporation, a qualitative and quantitative characterization of the marine habitat was conducted within the footprint of proposed marine facilities associated with the construction and operation of the Newfoundland and Labrador Refinery Project located near Southern Head at the head of Placentia Bay, Newfoundland (Figure 1.1).

For the purposes of the marine habitat quantification, the survey area was divided into four distinct zones (Figure 1.2) including:

- Zone 1 - Marine Terminal/Tug Berth;
- Zone 2 - Marine Jetty;
- Zone 3 - Marine Water Intake; and
- Zone 4 - Marine Outfall.

The marine habitat characterization included substrate distributions, depth profiles, macrofauna and macroflora distributions, and baseline sediment and water chemistry.

1.1 Transect Methodology

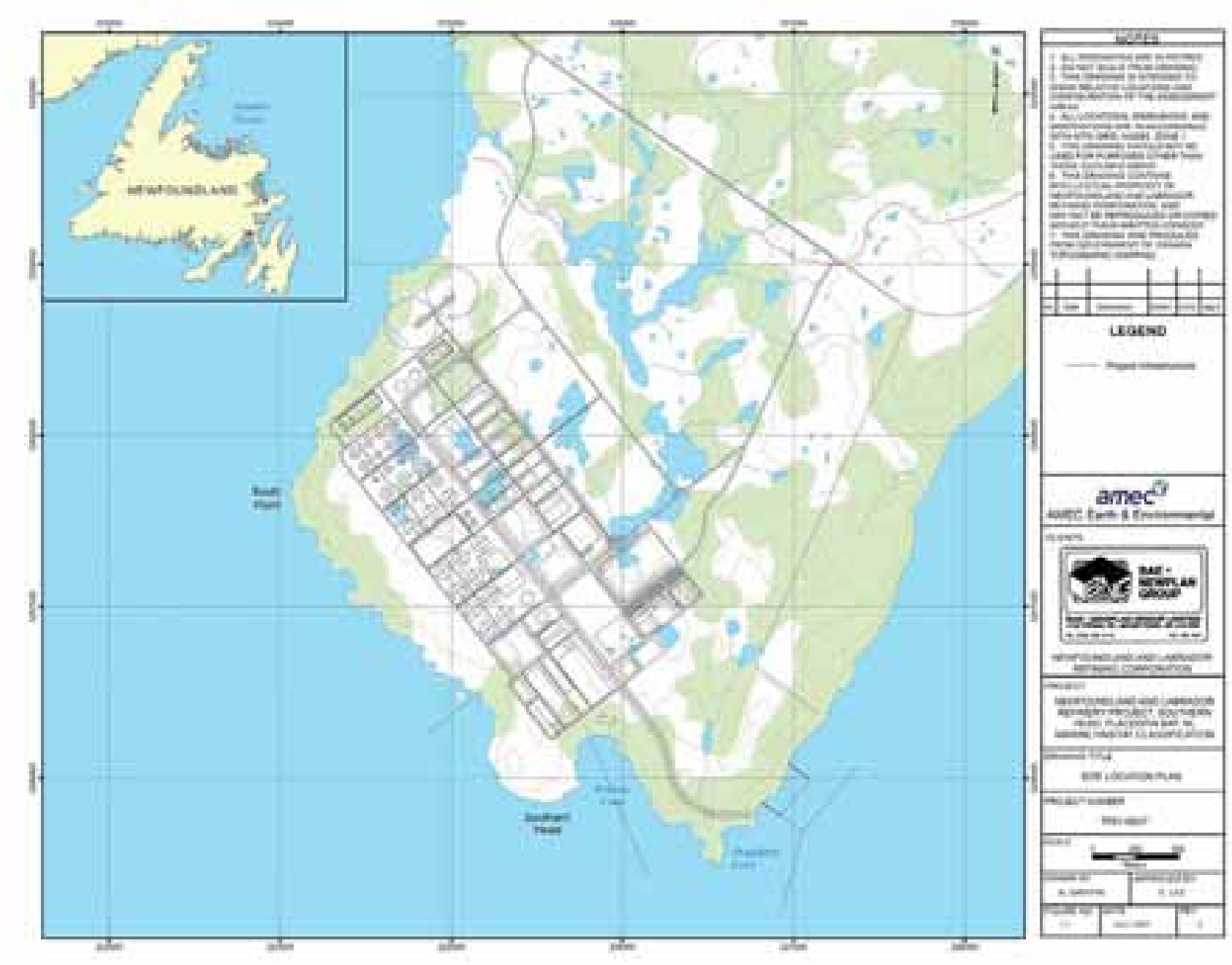
Video transects are depicted in Figure 1.3 and summarized in Table 1.1. For the purposes of habitat quantification the shoreline within the proposed marine terminal/tug berth footprint was subdivided into headland and beach zones (Figure 1.4).

Nine video survey transects were conducted in a grid pattern within the proposed marine terminal/tug berth area (T-1, T-2, T-3, T-4, T-6, T-7, T-13, and T-14). Transects T-1 to T-7 were run perpendicular from the shoreline and spaced in 100 m increments encompassing the entire marine terminal/tug berth footprint. Transect T-13 was parallel to the shoreline and ran north to south along the outside extremity of the marine terminal/tug berth footprint. Transect T-14 ran north to south along the shoreline within the marine terminal/tug berth footprint.

Three video transects were conducted along the linear footprint of the proposed marine jetty (T-8, T-9, and T-10). Transect T-8 ran south to north along the southern extension, transect T-9 ran north to south along the northern extension, and transect T-10 ran west to east along the causeway to the shoreline.

One video transect (T-11) was conducted from the shoreline in a southerly direction along the linear footprint of the proposed marine water intake pipeline.

One video transect (T-12) was conducted from the shoreline in a southerly direction along the linear footprint of the proposed marine outfall pipeline.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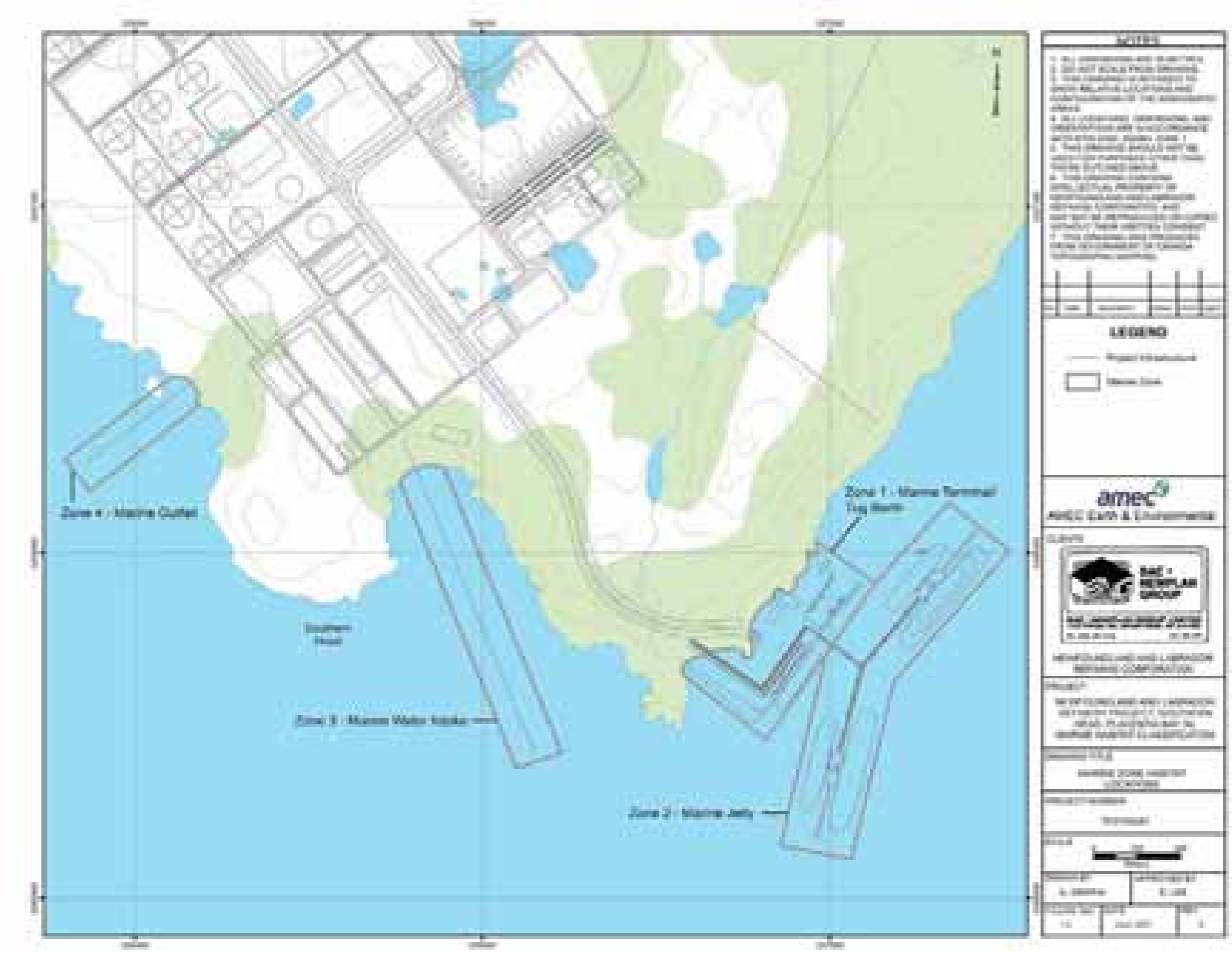
Zone 4 - Marine Outfall
Zone 1 - Marine Terminal
Zone 3 - Marine Water Intake
Zone 2 - Marine Jetty
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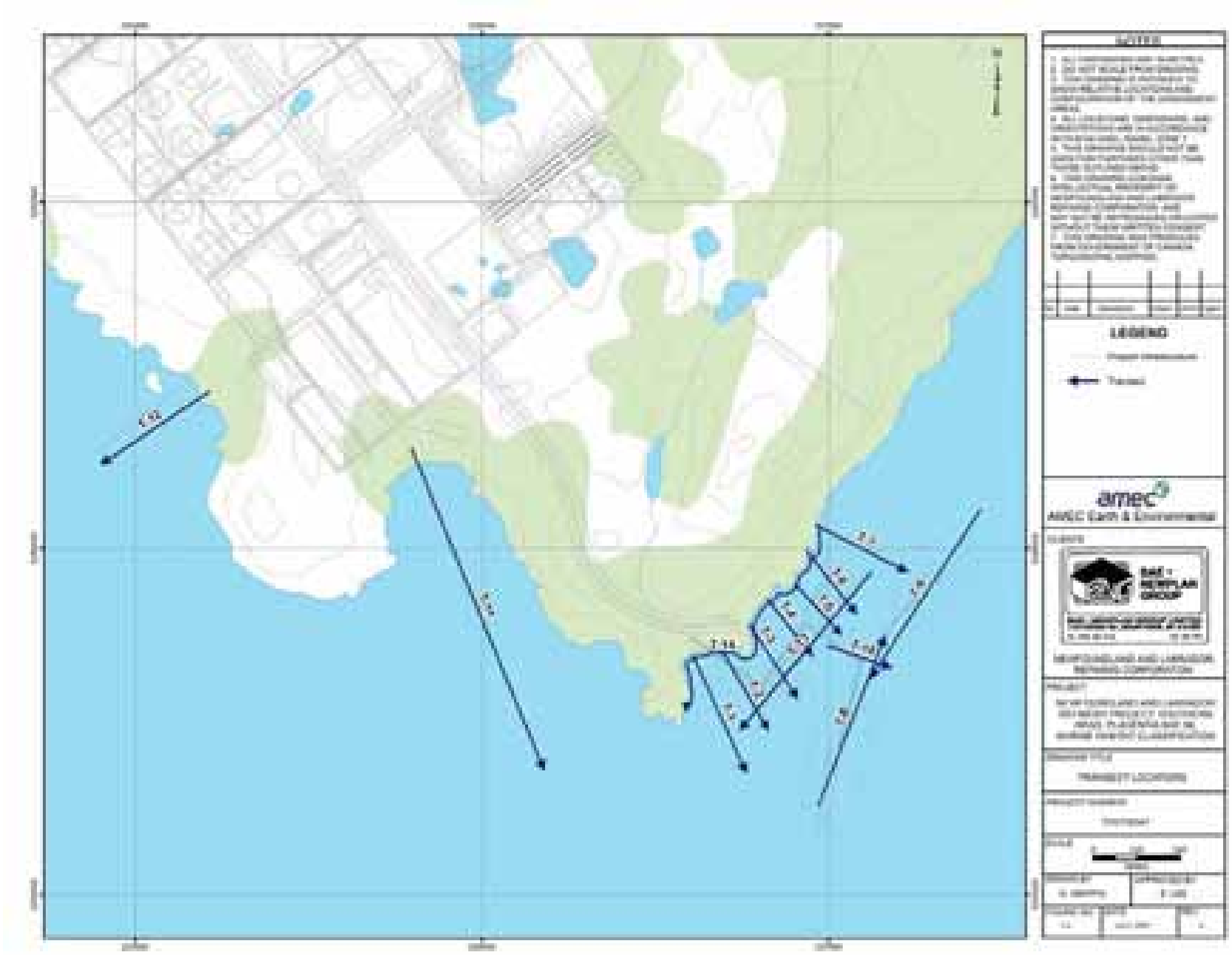
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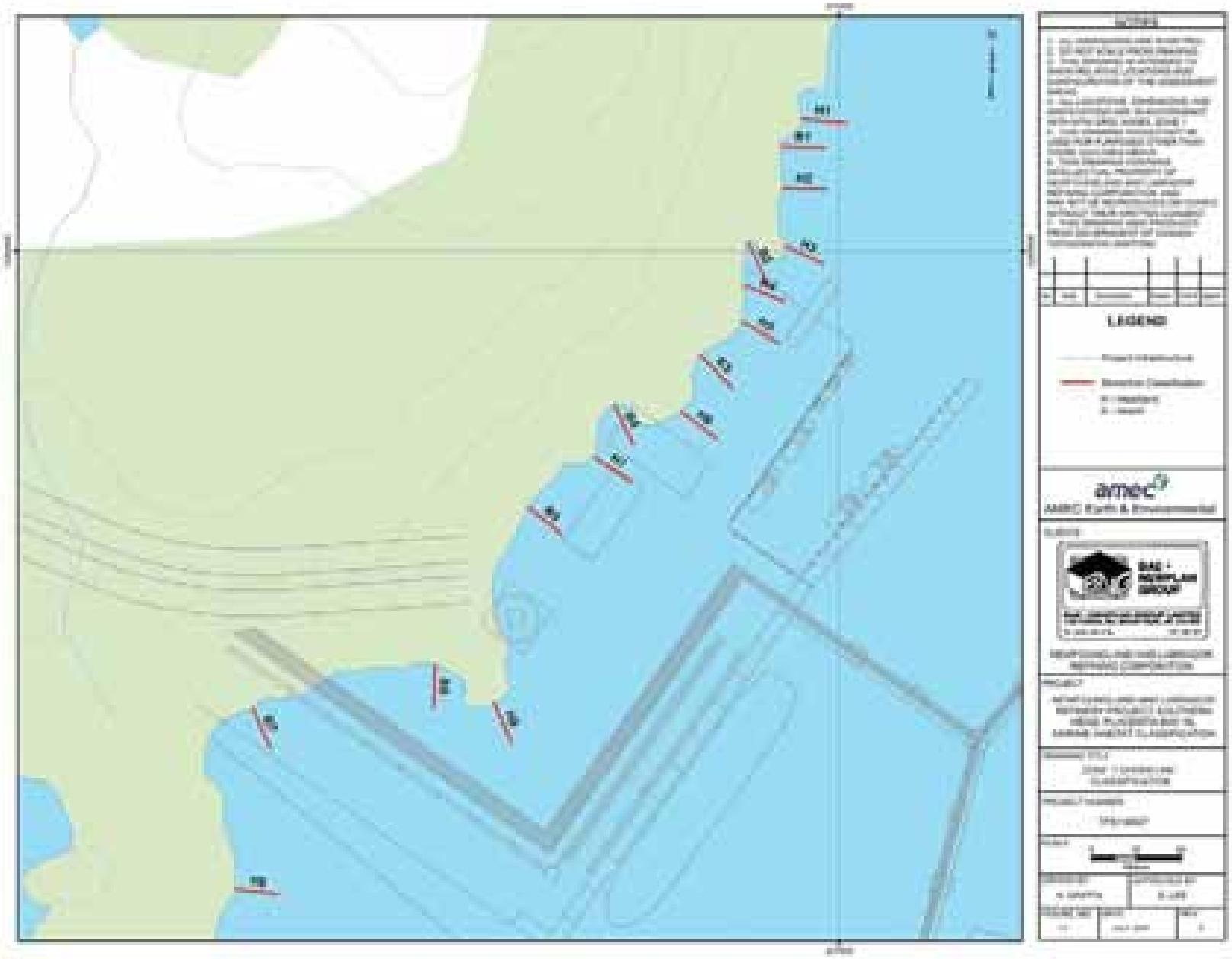
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Table 1.1.1 Video transects survey lengths, headings, and location coordinates. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

Transect #	Date (d/m/y)	Survey Method	Transect Length (m)	Heading	Start Coordinates (Lat-Long)	End Coordinates (Lat-Long)	Area	Zone
T-1	17/05/07	Diver	300	NW	N 47º 47' 37.3" W 54º 02' 26.8"	N 47º 47' 43.3" W 54º 02' 38.2"	Marine Terminal/Tug Berth	1
T-2	17/05/07	Diver	250	NW	N 47º 47' 44.6" W 54º 02' 33.5"	N 47º 47' 37.3" W 54º 02'26.8"	Marine Terminal/Tug Berth	1
T-3	18/05/07	Diver	200	NW	N 47º 47' 45.5" W 54º 02' 28.6"	N 47º 47' 40.7" W 54º 02' 21.4"	Marine Terminal/Tug Berth	1
T-4	18/05/07	Diver	200	NW	N 47º 47' 48.8" W 54º 02' 27.1"	N 47º 47' 43.4" W 54º 02' 21.2"	Marine Terminal/Tug Berth	1
T-5	18/05/07	Diver	170	NW	N 47º 47' 53.7" W 54º 02' 20.8"	N 47º 47' 46.0" W 54º 02' 16.8"	Marine Terminal/Tug Berth	1
T-6	17/05/07	Diver	200	NW	N 47º 47' 53.5" W 54º 02' 21.1"	N 47º 47' 47.8" W 54º 02' 15.4"	Marine Terminal/Tug Berth	1
T-7	17/05/07	Diver	200	NW	N 47º 47' 56.3" W 54º 02' 20.0"	N 47º 47' 31.6 W 54º 02' 20.7	Marine Terminal/Tug Berth	1
T-8	24/05/06	ROV	700	SW	N 47º 47' 27.3" W 54º 02' 19.8"	N 47º 47' 45.6" W 54º 02' 13.9"	Marine Jetty	2
T-9	24/05/06	ROV	700	SW	N 47º 47' 58.3" W 54º 02' 56.8"	N 47º 47' 45.7" W 54º 02' 10.7"	Marine Jetty	2
T-10	25/05/06	ROV	200	NW	N 47º 47' 44.8" W 54º 02' 19.0"	N 47º 47' 42.7" W 54º 02' 09.8 "	Marine Jetty	2
T-11	23/05/06	Diver	950	NW	N 47º 48' 02.5" W 54º 03' 16.6"	N 47º 47' 33.3" W 54º 02' 57.8"	Water Intake Pipeline	3
T-12	22/05/06	Diver	330	NE	N 47º 48' 08.1" W 54º 03' 45.1"	N 47º 48' 00.6"	Water Outfall	4

Transect #	Date (d/m/y)	Survey Method	Transect Length (m)	Heading	Start Coordinates (Lat-Long)	End Coordinates (Lat-Long)	Area	Zone
						W 54º 04' 00.4"	Pipeline	
T-13	26/05/07	ROV	585	NE	N 47º 47' 52.2" W 54º 02' 12.6"	N 47º 47' 36.5" W 54º 02' 31.0"	Marine Terminal/Tug Berth	1
T-14	26/05/07	ROV		NE	N 47º 47' 55.8" W 54º 02' 16.7"	N 47º 47' 41.4" W 54º 02' 36.1"	Marine Terminal/Tug Berth	1

Transects were run along a lead line marked in five meter increments. The location of transects were determined in the field based upon coordinates provided by Newfoundland and Labrador Refinery Corporation. Transect start and end positions were determined in the field via by GPS. Transects were surveyed utilizing an underwater video camera operated by a CSA approved diver with surface supplied air and via a tethered ROV unit. Transects T-1, 2, 3, 4, 5, 6, 7, 11, and 12 were conducted by diving and transects T-8, 9, 10, 13, and 14 were conducted by ROV. The ROV unit was deployed in depths greater than 20 m which were prohibitive with respect to dive time limitations. The ROV was also utilized for the nearshore survey (T-14).

The underwater video surveillance generally encompassed a span of approximately two meters to either side of the transect line. In some instances, such as the investigation of large boulder clusters or large algal concentrations, video surveillance was conducted at distances greater than one meter from the transect line.

For transects T-1, 2, 3, 4, 5, 6, and 7 observations were quantified for each 5 m section. For transects T-11 and T-12 observations were quantified for each 10 m section. For Transects T-8, 9, 10, 13, and 14 observations were quantified based upon changes in habitat type. Habitat characterization consisted of field observations and a quantitative review of the video.

Substrate distributions were determined as a percentage of each relevant section and included the following classifications:

- Bedrock
- Large Boulder (> 1000 mm)
- Small Boulder (> 250 mm)
- Cobble (6 – 25 mm)
- Gravel (2 – 6 mm)
- Shell (.05 – 2 mm)
- Sand

Macroflora distributions were determined as a percentage of each relevant section to the lowest possible taxonomic classification.

Macrofaunal distributions to the lowest possible taxonomic level were based upon four categories which included:

A = Abundant
Numerous (not quantifiable) observations made throughout the entire section.
C = Common
Numerous (not quantifiable) observations made intermittently along the section.
O = Occasional
Quantifiable observations made intermittently along the section.
U = Uncommon
Quantifiable observations made infrequently along the section.

Central Diving of Gander, NL was subcontracted by AMEC to provide diving and video services. Narwhal ECS of St. John's was subcontracted by AMEC to provide ROV support and video services. Vessel support for both the diving and ROV programs was provided by the Eastern Point out of North Harbour.

1.2 Sediment Sampling

Representative sediment samples were diver collected from all four zones and analyzed for the following parameters:

- Metals – Hydrides
- BTEX/TPH (RBCA)
- PAH
- PCB
- TOC
- Particle Size

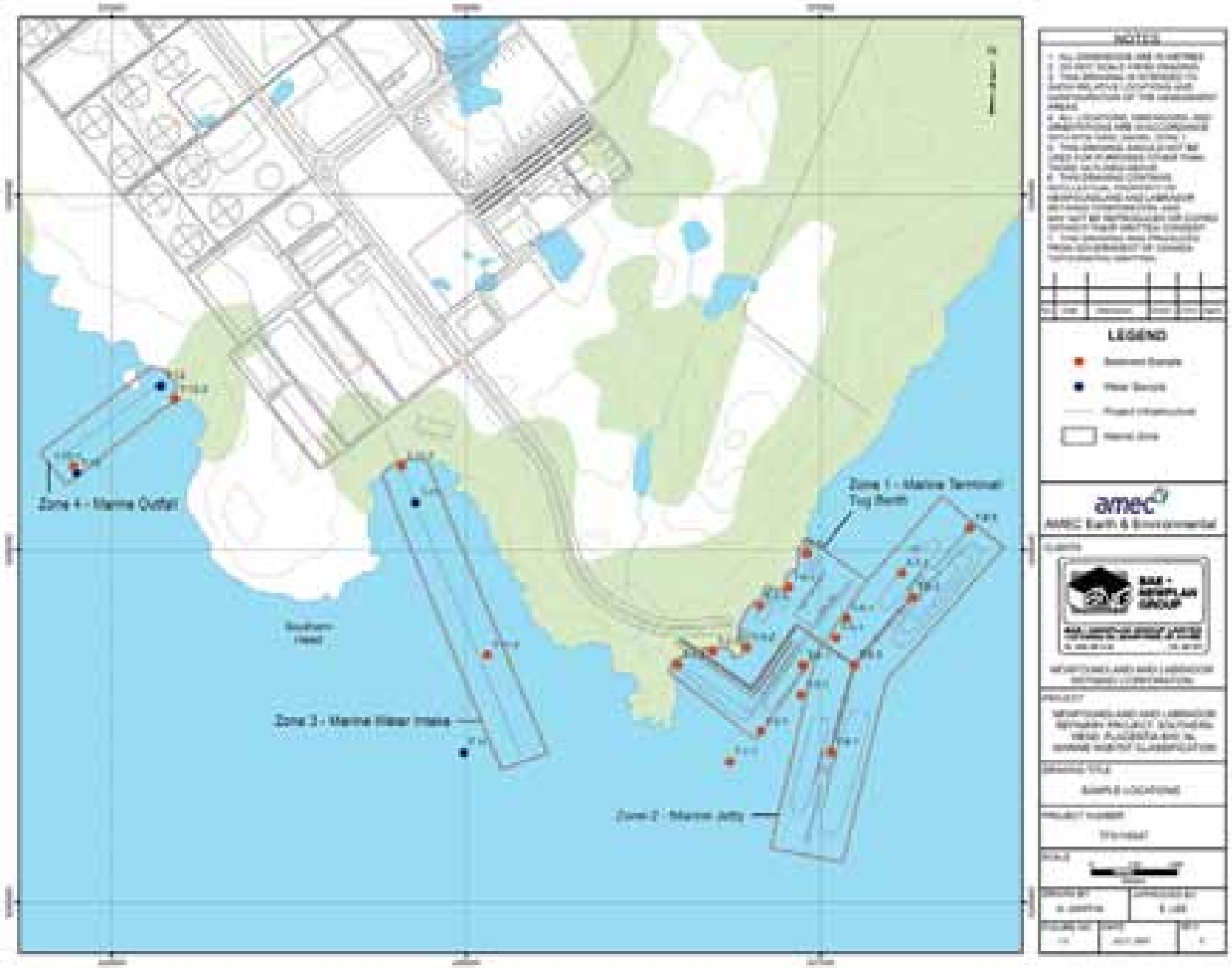
Sediment sample collection distributions/locations are summarized and presented in Table 1.2.1 and illustrated in Figure 1.5. Sediment sampling was restricted to fine-grained materials from the upper 10 cm of the benthic sediment horizon.

Sampling methodology was as per AMEC Standard Operating Procedures and included field and laboratory QA/QC procedures that incorporated strict handling methods, detailed chain of custody documentation and the collection of 10% replicate samples. Sediment samples were held at 4ºC until shipment to AMEC's Mississauga Analytical Laboratory (CAEL Approved). Laboratory QA/QC procedures included the incorporation of laboratory blanks and 10% laboratory replicate analysis.

Table 1.2.1 Sediment sample coordinates, methods, and zones. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

Transect #	Date (d/m/y)	Collection Method	Depth (m)	Coordinates (Lat-Long)	Comments	Zone
T-1-1 Offshore	17/05/07	Diver	10.5	N 47º 47' 34.5" W 54º 02' 30.9"	Marine Terminal/Tug Berth Area	1
T-1-2 Inshore	N/A	Diver	2.0	N 47º 47' 43.3" W 54º 02' 38.2"	Marine Terminal/Tug Berth Area No sample taken, sediment too coarse	1
T-2-1 Offshore	17/05/07	Diver	15.0	N 47º 47' 37.3" W 54º 02' 26.8"	Marine Terminal/Tug Berth Area	1
T-2-2 Inshore	17/05/07	Diver	3.2	N 47º 47' 44.6" W 54º 02' 33.5"	Marine Terminal/Tug Berth Area	1
T-3-1 Offshore	18/05/07	Diver	25.0	N 47º 47' 40.7" W 54º 02' 21.4"	Marine Terminal/Tug Berth Area	1
T-3-2 Inshore	18/05/07	Diver	3.8	N 47º 47' 45.0" W 54º 02' 28.8"	Marine Terminal/Tug Berth Area	1
T-4-1 Offshore	18/05/07	Diver	22.0	N 47º 47' 43.4" W 54º 02' 21.2"	Marine Terminal/Tug Berth Area	1
T-4-2 Inshore	18/05/07	Diver	3.0	N 47º 47' 48.8" W 54º 02' 27.1"	Marine Terminal/Tug Berth Area	1
T-5-1 Offshore	18/05/06	Diver	23.0	N 47º 47' 46.0" W 54º 02' 16.8"	Marine Terminal/Tug Berth Area	1
T-5-2 Inshore	18/05/06	Diver	2.7	N 47º 47' 53.7" W 54º 02' 20.8"	Marine Terminal/Tug Berth Area	1
T-6-1 Offshore	17/05/06	Diver	24.5	N 47º 47' 47.8" W 54º 02' 15.4"	Marine Terminal/Tug Berth Area	1
T-6-2 Inshore	17/05/06	Diver	3.0	N 47º 47' 53.5" W 54º 02' 21.1"	Marine Terminal/Tug Berth Area	1
T-7-1 Offshore	17/05/06	Diver	33.5	N 47º 47' 52" W 54º 02' 08"	Marine Terminal/Tug Berth Area	1

Transect #	Date (d/m/y)	Collection Method	Depth (m)	Coordinates (Lat-Long)	Comments	Zone
T-7-2 Inshore	17/05/07	Diver	3.7	N 47º 47' 56.3" W 54º 02' 20.0"	Marine Terminal/Tug Berth Area	1
T-8-1 Offshore	17/05/07	Diver	31.0	N 47º 47' 35.5" W 54º 02' 17.2"	Marine Jetty	2
T-8-2 Offshore	22/05/07	Diver	32.8	N 47º 47' 43.5" W 54º 02' 14.2"	Marine Jetty	2
T-9-4 Offshore	22/05/07	Diver	34.5	N 47º 47' 49.8" W 54º 02' 06.5"	Marine Jetty	2
T-9-5 Offshore	17/05/07	Diver	32.0	N 47º 47' 56.2" W 54º 01' 58.8"	Marine Jetty	2
T-11-1 Offshore	23/05/07	Diver	33.5	N 47º 47' 33.3" W 54º 02' 57.8"	Water Intake Pipeline	3
T-11-2 Mid	23/05/07	Diver	18.0	N 47º 47' 44.0" W 54º 03' 04.0"	Water Intake Pipeline	3
T-11-2R Mid	23/05/07	Diver	18.0	N 47º 47' 44.0" W 54º 03' 04.0"	Water Intake Pipeline	3
T-11-3 Inshore	23/05/07	Diver	3.0	N 47º 48' 02.5" W 54º 03' 16.6"	Water Intake Pipeline	3
T-11-3R Inshore	23/05/07	Diver	3.0	N 47º 48' 02.5" W 54º 03' 16.6"	Water Intake Pipeline	4
T-12-1 Offshore	22/05/07	Diver	18.0	N 47º 48' 00.6" W 54º 04' 00.4"	Water Outfall Pipeline	4
T-12-2 Inshore	N/A	Diver	2.5	N 47º 48' 08.1" W 54º 03' 45.1"	Water Outfall Pipeline No sample taken, sediment too coarse	4


Zone 4 - Marine Outfall
Zone 3 - Marine Water Intake
Zone 2 - Marine Jetty
Zone 1 - Marine Terminal
Tug Berth
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1.3 Seawater Sampling

Seawater samples were collected from Zone 3 – Marine Water Intake (T-11) and Zone 4 – Marine Outfall (T-12). Samples were collected via Nisken Bottle from the surface (0.5 m below surface), mid-column, and bottom (0.5 m from seafloor) at an offshore and inshore location. Seawater samples were analyzed for the following parameters:

- Metals – Hydrides
- General Chemistry
- BTEX/TPH (RBCA)
- PAH
- VOC
- TOC

Sediment sample collection distributions/locations are summarized and presented in Table 1.3 and illustrated in Figure 1.5. Sediment sampling was restricted to fine-grained materials from the upper 10 cm of the benthic sediment horizon.

Sampling methodology was as per AMEC Standard Operating Procedures and included field and laboratory QA/QC procedures that incorporated strict handling methods, detailed chain of custody documentation and the collection of 10% replicate samples. Water samples were held at 4ºC and preserved with appropriate chemicals until shipment to AMEC's Mississauga Analytical Laboratory (CAEL Approved). Laboratory QA/QC procedures included the incorporation of laboratory blanks and 10% laboratory replicate analysis.

Table 1.3.1 Seawater sample coordinates, methods, and zones. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

Transect #	Date (d/m/y)	Collection Method	Maximum Depth (m)	Sample Depth (m)	Coordinates (Lat-Long)	Comments	Zone
T-11 Offshore	18/06/06	Nisken Bottle	18.00	Surface 0.50 Mid 9.00 Bottom 17.50	N 47º 47' 35.0" W 54º 03' 07.0"	Water Intake Pipeline	3
T-11 Inshore	18/06/06	Nisken Bottle	7.25	Surface 0.50 Mid 3.60 Bottom 6.75	N 47º 47' 57.7" W 54º 03' 14.7"	Water Intake Pipeline	3
T-12 Offshore	18/06/06	Nisken Bottle	21.50	Surface 0.50 Mid 10.75 Bottom 21.00	N 47º 48' 00.0" W 54º 04' 00.0"	Water Outfall Pipeline	4
T-12 Inshore	18/06/06	Nisken Bottle	8.50	Surface 0.50 Mid 4.25 Bottom 8.00	N 47º 48' 08.1" W 54º 03' 48.8"	Water Outfall Pipeline	4

2.0 RESULTS

Detailed results of the transect surveys are presented in the following Appendices:

1. **Appendix A** (Zone 1 - Marine Terminal and Tug Berth; Tables A.1, A.2, A.3, A.4, A.5, A.6, A.7, A.13, and A.14);

2. **Appendix B** (Zone 2 – Marine Jetty; Tables B.8, B.9, and B.10);

3. **Appendix C** (Zone 3 – Marine Water Intake; Table C.11); and

4. **Appendix D** (Zone 4 – Marine Outfall; Table D.12).

The following information is presented for each increment (5m, 10m, or by habitat variability) of transect line:

- visual determination of percent substrate type;
- macrofaunal species identification and percent coverage; and
- macrofloral species identification and percentage abundance.

A summary of the results from Appendices A, B, C, and D is provided in the following sections. If results were similar across a number of sections these were combined for clarity of presentation.

2.1 Substrate

Note that in the following text summaries the predominant substrates for each representative section are underlined and the remaining substrate classifications are presented in descending order of percentage occurrence. In order to simplify the summary interpretations the percentage estimates for the various substrates are omitted. These are provided in the detailed appendices A, B, C, and D.

2.1.1 Zone 1 - Marine Terminal and Tug Berth

2.1.1.1 T-1

0-105 m
- cobble and small boulder
- gravel (both interstitial and in small patches)
- shell
- isolated boulders and bedrock outcrops

105-115 m
- gravel and cobble
- shell and isolated small boulder

115-125 m
- bedrock

- gravel and shell material
- isolated small boulder

125-140 m

- gravel
- cobble and isolated small boulder

140-150 m

- bedrock
- small boulder, cobble, and gravel

150-180 m

- gravel and cobble
- small boulder
- isolated large boulder and bedrock

180-210 m

- small boulder
- large boulder
- bedrock and cobble

210-300 m

- bedrock
- small boulder and cobble
- large boulder
- shell, gravel, and sand

2.1.1.2 T-2

0-15 m

- cobble
- bedrock
- small and large boulder
- low amounts of interstitial gravel

15-70 m

- small boulder and cobble
- gravel and shell
- isolated large boulder and bedrock

70-80 m

- gravel and cobble
- bedrock
- small boulder, shell, and sand

80-95 m

- bedrock
- small boulder and cobble
- gravel and shell

95-155 m

- cobble and small boulder
- gravel, shell, and sand
- isolated bedrock and large boulder

155-185 m

- bedrock
- small boulder
- cobble, gravel, and shell

185-225 m

- small boulder and cobble
- gravel and shell
- isolated large boulder
- sand

225-250 m

- sand
- small boulder and cobble
- gravel
- isolated large boulder

2.1.1.3 T-3

0-15 m

- bedrock
- small and large boulder
- cobble
- gravel and shell

15-50 m

- small boulder and cobble
- gravel and shell
- isolated large boulder and bedrock

50-55 m

- bedrock
- large and small boulder
- cobble
- gravel and shell

55-70 m

- cobble
- small boulder and gravel
- gravel and shell
- isolated bedrock

70-80 m

- bedrock
- small boulder and cobble
- gravel and shell

80-125 m

- cobble and small boulder
- gravel, sand, and shell
- isolated large boulder

125-200 m

- sand and gravel
- cobble
- isolated small boulder

2.1.1.3 T-4

0-25 m
- cobble
- small boulder
- isolated large boulder

25-105 m
- bedrock
- large boulder
- small boulder and cobble
- gravel and shells

105-115 m
- cobble and small boulder
- gravel
- sand and shell

115-200 m
- sand
- gravel
- cobble and isolated small boulder

2.1.1.4 T-5

-5-5 m (note negative # was due to tide rising above shore mark)
- bedrock
- large and small boulder
- isolated large boulder

5-15 m
- gravel
- small boulder and cobble
- shell and sand

15-30 m
- bedrock
- cobble and gravel
- shell and isolated small boulder

30-40 m
- cobble
- gravel
- shell and sand

40-90 m
- gravel
- cobble and shell
- sand

90-170 m
- sand and gravel
- cobble
- shell

2.1.1.5 T-6

0-25 m
- small boulder
- cobble
- isolated large boulder
- sand

25-85 m
- cobble
- small boulder and gravel
- shell and sand

85-135 m
- sand and gravel
- shell
- isolated large and small boulder
- cobble

135-155 m
- small boulder
- sand
- gravel
- cobble and shell

155-200 m
- sand and gravel
- cobble and shell
- isolated small boulder

2.1.1.6 T-7

0-40 m
- small boulder and cobble
- gravel and shell
- isolated bedrock

40-65 m
- cobble and gravel
- small boulder and gravel
- sand and shell
- isolated small boulder

65-120 m
- sand and gravel
- cobble and shell
- isolated small boulder

120-145 m
- small boulder and sand
- cobble and gravel
- shell and isolated large boulder

145-175 m
- sand and gravel
- cobble and small boulder

- shell

2.1.1.7 T-13

0-450 m
- sand
- cobble
- gravel and shell
- isolated small and large boulder

450-490 m
- sand
- small and large boulder
- cobble and gravel
- shell

490-545 m
- small boulder
- cobble and large boulder
- gravel
- shells and sand

545-560 m
- sand
- gravel
- cobble and shell

560-585 m
- small boulder
- cobble
- sand and shell

585-600 m
- bedrock
- small boulder
- cobble

2.1.1.8 T-14

Headland-1
- bedrock
- large boulder
- small boulder

Beach-1
- cobble
- small boulder
- gravel

Headland-2
- bedrock
- large boulder

Headland-3
- small boulder
- cobble

- gravel

Beach-2

- small boulder
- cobble and gravel
- isolated bedrock and large boulder

Headland-4

- bedrock
- large boulder
- small boulder

Headland-5

- small boulder
- cobble
- gravel

Beach-3

- cobble
- small boulder
- gravel

Headland-6

- small boulder
- cobble

Beach-4

- small boulder
- cobble
- sand and gravel
- isolated large boulder

Headland-7

- bedrock
- cobble
- isolated large boulder

Beach-5

- small boulder
- cobble and gravel
- isolated bedrock and large gravel

Headland-8

- bedrock
- large boulder
- gravel and cobble
- small boulder

Beach-6

- bedrock
- large boulder
- gravel and cobble
- small boulder

Beach-7

- cobble
- gravel
- isolated large boulder and bedrock

Headland-9

- bedrock

- large boulder
- gravel and cobble
- small boulder

2.1.2 Zone 2 - Marine Jetty

2.1.2.1 T-8

0-30 m
- cobble
- sand
- small boulder and gravel

30-700 m
- sand
- cobble
- gravel
- isolated small boulder

2.1.2.2 T-9

0-700 m
- sand
- cobble and gravel
- isolated small boulder

2.1.2.3 T-10

0-200 m
- sand
- cobble and gravel
- shell

2.1.3 Zone 3 - Marine Water Intake

2.1.3.1 T-11

0-60 m
- cobble
- sand and gravel
- isolated small boulder and bedrock

60-170 m
- gravel
- sand

170-210 m
- sand
- gravel
- cobble

210-230 m
- bedrock
- small and large boulder
- gravel and sand
- cobble and shell

230-470 m
- gravel
- sand
- cobble and small boulder
- shell

470-480
- small boulder
- cobble and gravel
- bedrock
- sand and shells

480-520 m
- bedrock
- cobble and small boulder
- shell
- isolated large boulder

520-550 m
- cobble
- small boulder
- bedrock
- shells

550-640 m
- bedrock
- small boulder and cobble
- shell

640-770 m
- cobble
- small boulder
- isolated large boulder and bedrock
- shell

770-810 m
- bedrock
- cobble and small boulder
- shell

810-960 m
- cobble
- bedrock
- small boulder
- shell

2.1.4 Zone 4 - Marine Outfall

2.1.4.1 T-12

0-40 m

- small boulder
- cobble
- gravel
- isolated large boulder

40-200 m

- bedrock
- large boulder and small boulder
- cobble and gravel
- shell

200-330 m

- sand
- gravel
- cobble
- shell

2.2 Macrofauna

For the purposes of the video survey review and macrofaunal species identification and enumeration, four categories were developed to characterize the observed abundances.

A = Abundant
Numerous (not quantifiable) observations made throughout the entire 5 m segment.

C = Common
Numerous (not quantifiable) observations made intermittently along the 5 m segment.

O = Occasional
Quantifiable observations made intermittently along the 5 m segment.

U = Uncommon
Quantifiable observations made infrequently along the 5 m segment.

Within the individual tables, organisms are presented in the order of occurrence along each individual transect.

2.2.1 Zone 1 - Marine Terminal and Tug Berth

2.2.1.1 T-1

Table 2.2.1 Transect T-1, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 17, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	5-95	O		
	95-120	U		
	120-125	O		
	125-130	U		
	130-165	O		
	165-170	U		
	170-225	O		
	225-275	U		
	280-290	U		
	290-295	O		
	295-300	U		
Periwinkle (*Littorina sp.*)	5-60	O		
	60-80	U		
	80-95	O		
	105-110	U		
Starfish (*Asterias sp.*)	10-110	U		
	110-115	U		
	115-135	U		
	140-145	U		
	150-155	O		
	155-160	U		
	160-165	O		
	165-170	U		
	170-190	O		
	190-200	C		
	200-295	U		
Blue Mussel (*Mytilus edulis*)	20-25	U		
	270-280	U		
	295-300	O		
Winter Flounder (*Pseudopleuronectes americanus*)	40-45	U	1	
	60-65	U	1	
	290-295	U	1	
Hermit Crab (*Pagurus sp.*)	65-75	U	2	
	195-210	U		
Frilled Anemone (*Metridium senile*)	120-125	U		
	150-155	U		
	180-185	U		
Tube Worm (*Spirobis sp.*)	140-145	U		
Horse Mussel (*Modiolus modiolus*)	195-200	U		
	210-215	U		
Deep Sea Scallop (*Placopecten magellanicus*)	230-235	U	1	
	285-290			

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.1.2 T-2

Table 2.2.2 Transect T-2, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 17, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Blue Mussel (*Mytilus edulis*)	0-5	U		
	35-40	U		
	190-195	O		
	240-245	O		
Periwinkle (*Littorina sp.*)	10-20	O		On rocks and kelp
	30-50	U		
	50-65	O		
Sea Urchins (*Strongylocentrotus droebachiensis*)	35-85	O		
	85-170	U		
	170-195	O		
	195-200	U		
	200-210	O		
	210-215	U		
	215-230	O		
	230-235	U		
	240-245	U		
Starfish (*Asterias sp.*)	35-40	U		
	40-45	O		
	45-50	U		
	75-80	U		
	85-150	U		
	150-165	O		
	165-185	U		
	185-195	O		
	195-215	U		
	235-250	U		
Frilled Anemone (*Metridium senile*)	65-70	O		
	150-155	U		
Hermit Crab (*Pagurus sp.*)	75-80	U	1	
Tube Worm (*Spirobis sp.*)	95-100	U	2	
	150-155	U	1	
	240-245	U	1	
Horse Mussel *(Modiolus modiolus*)	130-140	O		
	140-145	U		
	145-165	O		
	165-170	U		
	170-185	O		
	185-190	C		
Deep Sea Scallop (*Placopecten magellanicus*)	155-170	U		
	185-220	U		
	220-225	O		
	225-250	U	6	1 - 3 every 5m
Sand Dollar (*Echinarachnius parma*)	225-230	O		

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.1.3 T-3

Table 2.2.3 Transect T-3, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	0-15	O		
	15-20	C		
	20-65	O		
	65-70	U		
	70-95	O		
	95-100	U		
	100-200	O		
Frilled Anemone (*Metridium senile*)	0-20	O		
Periwinkle (*Littorina sp.*)	0-10	O		
	15-20	O		
Starfish (*Asterias sp.*)	20-25	U		
	25-30	O		
	55-65	U		
	65-75	O		
	75-175	U		
	175-190	O		
	190-200	U		
Blue Mussel (*Mytilus edulis*)	20-25	U		
	35-40	U		
	50-55	O		
	85-95	U		
Deep Sea Scallop (*Placopecten magellanicus*)	45-60	U	1	
	80-85	O		
	85-150	U		
	150-155	O	6	
	160-170	O	7	1 – 6 every 5m
	170-175	U	1	
	180-185	U	1	
Horse Mussel (*Modiolus modiolus*)	55-65	U		
	70-80	O		
	105-110	U		
Sand Dollar (*Echinarachnius parma*)	105-110	U		
	110-150	O		
	155-175	O		
	180-190	O		
Winter Flounder (*Pseudopleuronectes americanus*)	150-155	U	1	
	165-170	O	2	

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.1.4 T-4

Table 2.2.4 Transect T-4, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Periwinkle (*Littorina sp.*)	5-10	U		
	10-50	O		
	70-85	U		
Sea Urchins (*Strongylocentrotus droebachiensis*)	10-35	U		
	35-115	O		
	115-120	C		
	120-125	O		
	125-155	U		
	155-165	O		
	165-170	U		
	170-200	O		
Frilled Anemone (*Metridium senile*)	25-45	U		
	45-60	O		
	60-65	C		
	65-70	A		
	70-75	O		
	75-110	U		
Blue Mussel (*Mytilus edulis*)	35-45	U		
	50-55	U		
	85-105	U		
Starfish (*Asterias sp.*)	40-50	U		
	65-70	O		
	75-85	U		
	90-95	U		
	100-110	U		
	130-135	U		
	145-150	U		
	155-160	U		
	190-200	U		
Horse Mussel (*Modiolus modiolus*)	60-70	O		
	80-85	O		
	100-105	U		
Barnacle (*Balanus sp.*)	75-85	U		
Deep Sea Scallop (*Placopecten magellanicus*)	90-95	U		
	105-125	U		
	125-135	O		
	140-165	U		
	165-170	O		
	170-175	U		
	175-195	O		
	195-200	U	1	
Sand Dollar (*Echinarachnius parma*)	125-160	U		
	165-175	U		

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.1.5 T-5

Table 2.2.5 Transect T-5, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	-5-5	O		
	5-25	U		
	25-30	O		
	50-65	U		
	65-130	O		
	130-170	U		
Frilled Anemone (*Metridium senile*)	0-5	O		
	25-30	U		
Sponge – *Porifera sp.*	0-5	U	2	
Starfish (*Asterias sp.*)	5-10	U		
	25-30	U		
	55-135	U		
	140-155	U		
Horse Mussel (*Modiolus modiolus*)	15-30	U		
	35-40	U		
Deep Sea Scallop (*Placopecten magellanicus*)	55-60	U	1	
	80-100	U		
	100-110	O		
	110-115	U	1	
	120-125	U	1	
	125-130	O		
	130-135	U	2	
	140-145	U	1	
Sand Dollar (*Echinarachnius parma*)	65-70	U		
	100-125	U		
	125-160	O		
	160-165	U		
	165-170	O		
Winter Flounder (*Pseudopleuronectes americanus*)	85-90	U	1	
	125-130	U	1	
	140-145	U	1	
	155-160	U	1	
	165-170	U	1	

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.1.6 T-6

Table 2.2.6 Transect T-6, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 17, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	0-45	O		
	110-130	U		
	140-145	U		
	145-150	O		
	150-155	U		
	155-195	O		
	195-200	U		
Periwinkle (*Littorina sp.*)	0-20	O		
Blue Mussel (*Mytilus edulis*)	0-10	U		
	20-35	U		
	40-45	U		
Rock Crab (*Cancer sp.*)	0-5	U	1	
Starfish (*Asterias sp.)*	5-30	U		
	55-60	U		
	120-125	C		
	150-155	U		
	165-170	U		
	195-200	U		
Frilled Anemone (*Metridium senile*)	5-10	U		
	10-20	O		
	20-25	U		
	120-125	U		
Barnacle (*Balanus sp.*)	5-25	O		
Sand Dollar (*Echinarachnius parma*)	95-115	O		
	115-120	C		
	120-125	U		
	125-135	C		
	135-165	O		
	165-170	U		
	170-175	O		
	175-180	U		
Horse Mussel (*Modiolus modiolus*)	120-125	U		
	140-145	U		
Deep Sea Scallop (*Placopecten magellanicus*)	125-130	U		
	140-145	U		
	150-155	U		
	155-200	O		

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.1.7 T-7

Table 2.2.7 Transect T-7, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 17, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	5-30	O		
	30-35	U		
	35-40	O		
	40-65	U		
	115-120	U		
	120-125	O		
	125-130	U		
	130-140	O		
	140-155	U		
Blue Mussel (*Mytilus edulis*)	5-35	U		
Periwinkle (*Littorina sp.*)	5-30	O		
Starfish (*Asterias sp.*)	10-65	U		
	115-175	U		
Frilled Anemone (*Metridium senile*)	10-15	U		
	15-20	O		
	20-25	U		
	25-30	O		
	40-45	U		
Horse Mussel (*Modiolus modiolus*)	30-45	U		
	45-55	O		
	120-125	U		
	130-145	U		
	150-160	U		
	165-170	U		
Lobster (*Homerus americanus*)	30-35	U	1	
Deep-Sea Scallop (*Placopecten magellanicus*)	45-55	U		
	145-155	U		
Rock Crab (*Cancer sp.*)	45-50	U	1	
Sand Dollar (*Echinarachnius parma*)	80-95	U		
	95-115	C		
	115-120	O		
	120-125	U		
	125-160	O		
	160-170	C		
	170-175	O		

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.1.8 T-13

Table 2.2.8 Transect T-13, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 26, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	0-20	U		
	30-125	U		
	125-260	O		
	260-365	O		5-10 individuals every 5m
	365-450	U		2-4 individuals every 5m
	450-560	O		5-10 individuals every 5m
	560-600	O		10-15 individuals every 5m
Starfish (*Asterias sp.*)	0-20	U		
	30-260	U		
	260-450	U		1-2 individuals every 5m
	560-585	U		1-2 individuals every 5m
	585-600	O		10-15 individuals every 5m
Sand Dollar (*Echinarachnius parma*)	30-260	U		
Deep-Sea Scallop (*Placopecten magellanicus*)	30-125	O		4-6 individuals every 5m
	125-300	O		3-6 individuals every 5m
	300-450	U		1-2 individuals every 5m
	450-545	O		4-6 individuals every 5m
	545-560	O		1-2 individuals every 5m
	560-585	U		1 individuals every 5m
Horse Mussel (*Modiolus modiolus*)	30-125	U		
	400-450	U		1-2 individuals every 5m
	450-545	O		On Boulders
	545-560	U		1-2 individuals every 5m
	560-585	O		On Boulders
	585-600	O		
American plaice (Hippoglossoides platessoides)	125-260	U	2	
	400-450	U	1	

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.1.9 T14

Table 2.2.9 Transect T-14, Zone-1, Marine Terminal and Tug Berth, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 26, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed	Abundance	#	Comments
Sea Urchins (Strongylocentrotus droebachiensis)	Headland 1	O		
	Beach 1	U		
	Headland 2-Headland 5	O		
	Beach 3	U		
	Headland 6-Headland 9	O		
Periwinkle (*Littorina sp.*)	Headland 1	O		
	Beach 1	U		
	Headland 2-Headland 5	O		
	Beach 3-Beach 4	U		
	Headland 7-Headland 8	O		
	Beach 6	U		
	Beach 7	O		
Blue Mussel (*Mytilus edulis*)	Headland 2	U		
	Headland 8	U		
	Headland 9	U		
Starfish (*Asterias sp.)*	Beach 4-Headland 7	U		
	Headland 8	U		
	Headland 9	U		
Frilled Anemone (*Metridium senile*)	Beach 5	O		
	Headland 8	U		

2.2.2 Zone 2 - Marine Jetty

2.2.2.1 T-8

Table 2.2.10 Transect T-8, Zone-2, Marine Jetty, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 24, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	0-450	U		2-4 individuals every 5m
	450-600	O		5-15 individuals every 5m
	600-700	U		2-4 individuals every 5m
Deep-Sea Scallop (*Placopecten magellanicus*)	0-30	U		1 individual every 30m
	100-130	U		1 individual every 30m
	130-180	U		1 individual every 5m
	180-360	U		2-4 individuals every 5m
	360-400	O		4-6 individuals every 5m
	400-450	U		1 individual every 5m
	450-600	O		4-5 individuals every 5m
	600-700	O		1-2 individuals every 5m
American plaice (Hippoglossoides platessoides)	0-30	U		2 individuals
	360-400	O		3 individuals
Starfish (*Asterias sp.)*	30-100	U		
	100-180	U		1-2 individuals every 5m
	400-600	O		3-6 individuals every 5m
	600-700	O		1-3 every 5m
Frilled Anemone (*Metridium senile*)	100-130	U		2 individuals every 30m
Tube Worm (*Spirobis sp.*)	180-360	U		2 individuals every 180m
	400-450	U		2 individuals every 50m
Atlantic Cod (*Gadus morhua*)	360-400	U		2 individuals
	400-450	O		1 individual

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.2.2 T-9

Table 2.2.11 Transect T-9, Zone-2, Marine Jetty, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 24, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	0-60	U		2-4 individuals every 5m
	60-410	U		1-2 individuals every 5m
	400-500	O		2-6 individuals every 5m
	500-615	U		2-4 individuals every 5m
	615-700	U		1-2 individuals every 5m
Starfish (*Asterias sp.*)	0-310	U		2 individuals every 5m
	310-400	U		2-3 individuals every 5m
	400-500	O		4-6 individuals every 5m
	500-700	O		3-5 individuals every 5m
Deep-Sea Scallop (*Placopecten magellanicus*)	0-60	O		2-4 individuals every 5m
	60-230	O		3-5 individuals every 5m
	230-310	O		2-3 individuals every 5m
	310-400	O		1-2 individuals every 5m
	400-700	O		1-3 individuals every 5m
Starfish (*Solaster sp.*)	60-230	U	1	
American plaice (Hippoglossoides platessoides)	60-310	U		2 individuals at 18:34 and 38:25

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.2.3 T-10

Table 2.2.12 Transect T-10, Zone-2, Marine Jetty, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 25, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	0-30	U		1-5 individuals every 5m
	30-100	U		1-2 individuals every 5m
	100-200	U		1-2 individuals every 5m
Deep-Sea Scallop (*Placopecten magellanicus*)	0-100	U		1 individual every 30m
	100-200	U		1-2 individuals every 5m
Skate (*Raja sp.*)	100-200	U	1	17:59 buried

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.3 Zone 3 - Marine Water Intake

2.2.3.1 T-11

Table 2.2.13 Transect T-11, Zone-3, Marine Water Intake, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 23, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sand Dollar (*Echinarachnius parma*)	60-90	U		
	90-140	O		
	140-150	U		
	150-160	O		
	160-170	U		
	180-200	U		
	220-230	U		
	230-250	U		
Hermit Crab (*Pagurus sp.*)	90-100	U	1	
Sea Urchins (*Strongylocentrotus droebachiensis*)	120-130	U		
	170-190	U		
	200-210	U		
	210-230	O		
	230-300	U		
	300-310	O		
	310-480	U		
	480-500	O		
	500-550	U		
	550-960	O		
Starfish (*Asterias sp.*)	200-210	U		
	360-400	U		
	410-480	U		
	480-510	O		
	510-540	U		
	540-550	O		
	550-760	U		
	760-830	O		
	830-930	U		
Horse Mussel (*Modiolus modiolus*)	210-230	U		
	290-300	U		
	370-380	U		
	380-390	O		
	490-540	U		
	540-550	O		
	550-750	U		
	750-860	O		
	860-880	U		
Frilled Anemone (*Metridium senile*)	320-330	U		
	490-500	U		
	600-610	U		
Blue Mussel (*Mytilus edulis*)	470-480	U		

	480-490	O		
	490-500	C		
Eel Pout (*Lycodes sp.)*	470-480	U	1	
	950-960	U	1	
Deep-Sea Scallop (*Placopecten magellanicus*)	640-650	U	1	
Polychaete	640-650	U	1	

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.2.4 Zone 4 - Marine Outfall

2.2.4.1 T-12

Table 2.2.14 Transect T-12, Zone-4, Marine Outfall, Macrofauna observations, abundances, and individual species numbers. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 22, 2007. (A = Abundant, C = Common, O = Occasional, U = Uncommon)

Species	Mark Observed (m)	Abundance	#	Comments
Sea Urchins (*Strongylocentrotus droebachiensis*)	0-330	O		
Periwinkle (*Littorina sp.*)	0-10	U		
	10-120	O		
	120-130	U		
Starfish (*Asterias sp.*)	50-60	U		
	100-130	U		
	140-160	O		
	160-330	U		
Hermit Crab (*Pagurus sp.*)	80-90	U	1	
Blue Mussel (*Mytilus edulis*)	100-120	O		
	140-150	U		
	150-160	O		
	160-170	U		
Frilled Anemone (*Metridium senile*)	100-110	O		
	110-120	U		
	160-170	O		
Horse Mussel (*Modiolus modiolus*)	150-190	O		
	190-200	U		
	270-310	U		
Deep-Sea Scallop (*Placopecten magellanicus*)	160-180	U	2	
	200-230	U	5	
	230-240	O	4	
	240-280	U	7	
	290-330	U	4	
Barnacle (*Balunus sp.*)	190-200	O		
	200-210	U		
Sand Dollar (*Echinarachnius parma*)	200-330	O		
Winter Flounder (*Pseudopleuronectes americanus*)	200-210	U	1	
	230-240	U	1	
Skate (*Raja sp.*)	210-220	U	2	

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

2.3 Macroflora

Due to the substantial variability encountered with respect to macrofloral percentage distribution, four categories were developed to summarize the data in the following tables, these include:

- <25%;
- 25-50%;
- 50-75%; and
- 75-100%.

Please note that the actual percentages for individual transect sections are presented in Appendices A, B, C, and D.

2.3.1 Zone 1 - Marine Terminal and Tug Berth

2.3.1.1 T-1

Table 2.3.1 Transect T-1, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 17, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Black Whip Weed (*Chordaria flagelliformis*)	5-15	75-100	
	15-20	50-75	
Edible Kelp (*Alaria sp.*)	5-15	<25	
	15-25	25-50	
	25-30	<25	
Crustose Algae (*Lithothamnium sp.*)	5-100	<25	
	100-115	25-50	
	115-125	<25	
	125-130	25-50	
	130-155	<25	
	155-170	25-50	
	170-180	<25	
	180-270	25-50	
	270-290	<25	
Green Filamentous (*Chaetomorpha sp.*)	10-15	<25	
Sour Weed (*Desmarestia sp.*)	30-300	<25	
Ribbed Lace Weed (*Membranoptera sp.*)	95-210	<25	
Leaf Weed (*Phyllophora sp.*)	210-300	<25	

2.3.1.2 T-2

Table 2.3.2 Transect T-2, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 17, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Rockweed (*Fucus sp.*)	0-15	<25	
Sour Weed (*Desmarestia sp.)*	0-15	<25	
	25-35	<25	
	45-245	<25	
Knotted Wrack (*Ascophyllum nodosum*)	0-10	<25	
Edible Kelp (*Alaria sp.*)	10-15	<25	
	15-20	25-50	
	25-30	50-75	
	30-40	25-50	
	40-55	<25	
Coral Weed (*Corallina officinalis*)	5-25	<25	
Green Filamentous (*Chaetomorpha sp.*)	10-50	<25	
Sea Lettuce (*Ulva lactuca*)	15-20	<25	
Black Whip Weed (*Chordaria flagelliformis*)	25-35	<25	
	40-50	<25	
Crustose Algae (*Lithothamnium sp.*)	25-205	<25	
	205-220	25-50	
	220-250	<25	
Ribbed Lace Weed (*Membranoptera sp.*)	70-125	<25	
	135-140	<25	
	160-165	<25	
	200-210	<25	
	215-225	<25	
	240-250	<25	

2.3.1.3 T-3

Table 2.3.3 Transect T-3, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Rockweed (*Fucus sp.*)	0	25-50	
	0-5	<25	
	25-50		Storm Toss
	80-85	<25	
Knotted Wrack (Ascophyllum nodosum)	0	<25	
Edible Kelp (*Alaria sp.*)	0-5	25-50	
	5-20	<25	
	25-35		Storm Toss

Species	Mark Observed (m)	Abundance (%)	Comments
Black Whip Weed (Chordaria flagelliformis)	0-5	<25	
	10-20	<25	
Green Filamentous (*Chaetomorpha sp.*)	0-5	<25	
	15-20	<25	
Dulse (Palmeria palmate)	0-5	<25	
	105-110	<25	
Sour Weed (Desmarestia sp.)	0-15	<25	
	25-135	<25	
	170-175	<25	
	180-190	<25	
Red Tubed Weed (*Rhodomela sp.*)	10-15	<25	
Crustose Algae (*Lithothamnium sp.*)	15-80	<25	
	80-90	25-50	
	90-200	25-50	
Coral Weed (Corallina officinalis)	20-25	<25	
Ribbed Lace Weed (*Membranoptera sp.*)	85-100	<25	
	110-115	<25	
Sea Colander (*Agarum sp.*)	85-90	<25	

2.3.1.4 T-4

Table 2.3.4 Transect T-4, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Black Whip Weed (*Chordaria flagelliformis*)	5-10	<25	
Edible Kelp (*Alaria sp.*)	10-15	75-100	
	15-20	50-75	
	20-25	<25	
	25-35	25-50	
	40-45	25-50	
	45-50	<25	
	60-65	<25	
	195-200		Storm Toss
Sour Weed (*Desmarestia sp.*)	15-90	<25	
	95-145	<25	
	155-160	<25	
	165-200	<25	
Red Tubed Weed (*Rhodomela sp.*)	15-20	<25	
Crustose Algae (*Lithothamnium sp.*)	20-60	<25	
	65-110	<25	
	180-200	<25	
Knotted Wrack (*Ascophyllum nodosum*)	30-35	<25	
Green Filamentous (*Chaetomorpha sp.*)	40-50	<25	
Sea Colander (*Agarum sp.*)	60-70	<25	
	80-85	<25	
	195-200		Storm Toss
Coral Weed (*Corallina officinalis*)	65-70	<25	
Rockweed (*Fucus sp.*)	110-200		Storm Toss

2.3.1.5 T-5

Table 2.3.5 Transect T-5, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Rockweed (*Fucus sp.*)	Shore- -5	50-75	
	-5-0	<25	
	65-70	<25	
Edible Kelp (*Alaria sp.*)	Shore- -5	<25	
	-5-0	75-100	
	0-10	50-75	
	10-15	25-50	
	15-70	<25	
	80-95	<25	
	100-110		Storm Toss
	115-125		Storm Toss
	155-160		Storm Toss
	165-170		Storm Toss
Sour Weed (*Desmarestia sp.*)	-5-40	<25	
	40-60	25-50	
	60-170	<25	
Dulse (*Palmeria palmate*)	-5-0	<25	
Callophyllis sp.	-5-0	<25	
Coral Weed (*Corallina officinalis*)	-5-0	<25	
Kelp (*Laminaria sp.)*	-5-0	<25	
	30-50	<25	
	55-65	<25	
	75-80	<25	
	85-95	<25	
Red Tubed Weed (*Rhodomela sp.*)	-5-0	<25	
Green Filamentous (*Chaetomorpha sp.*)	0-15	<25	
	25-40	<25	
	50-55	<25	
	85-90	<25	
Black Whip Weed (*Chordaria flagelliformis*)	0-5	<25	
	30-55	<25	
	65-70	<25	
	85-90	<25	
Crustose Algae (*Lithothamnium sp.*)	5-170	<25	
Sea Lettuce (*Ulva lactuca*)	30-35	<25	
Sea Colander (*Agarum sp.*)	120-125		Storm Toss
	145-150		Storm Toss
	155-160		Storm Toss

2.3.1.6 T-6

Table 2.3.6 Transect T-6, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 17, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Rockweed (*Fucus sp.*)	Shore-0	<25	
	35-45	<25	
Edible Kelp (*Alaria sp.*)	Shore-10	<25	
	15-20	<25	
	35-95	<25	
	95-100	25-50	
	100-150	<25	
	170-175	<25	
	180-185		Storm Toss
	190-200		Storm Toss
Smooth Chord Weed (*Chorda filum*)	0-10	<25	
	45-50	<25	
	50-55	25-50	
	55-70	<25	
Sour Weed (*Desmarestia sp.*)	0-70	<25	
	70-100	25-50	
	100-120	<25	
	120-125	25-50	
	125-140	<25	
	140-150	25-50	
	150-155	<25	
	155-160	50-75	
	160-165	25-50	
	165-200	<25	
Green Filamentous (*Cladophora sp.*)	0-5	<25	
Sea Lettuce (*Ulva lactuca*)	0-5	<25	
	55-60	<25	
Halosaccion sp.	0-5	<25	
Red Tubed Weed (*Rhodomela sp.*)	0-5	<25	
Crustose Algae (*Lithothamnium sp.*)	15-85	<25	
	110-145	<25	
	150-200	<25	
Kelp (*Laminaria sp.)*	45-70	<25	
	70-80	25-50	
	80-100	<25	
	115-120	<25	
Dulse (*Palmeria palmate*)	55-60	<25	
Black Whip Weed (*Chordaria flagelliformis*)	95-100	<25	
Sea Colander (*Agarum sp.*)	120-125	<25	
	145-180	<25	
	180-200		Storm Toss

2.3.1.7 T-7

Table 2.3.7 Transect T-7, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 17, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Knotted Wrack (Ascophyllum nodosum)	Shoreline	75-100	
	5-10	<25	
Rockweed (*Fucus sp.*)	Shoreline	<25	
	0-10	<25	
Edible kelp (*Alaria sp.*)	Shoreline	<25	
	0-30	<25	
	45-55	<25	
	115-120	<25	
	145-150	<25	
Kelp (*Laminaria sp.*)	0-10	<25	
	40-55	<25	
	55-60	50-75	
	60-75	75-100	
	75-80	50-75	
	80-90	25-50	
	90-95	50-75	
	95-160	<25	
	0-10	<25	
Red Tubed Weed (*Rhodomela sp.*)	0-10	<25	
Crustose Algae (*Lithothamnium sp.*)	0-5	<25	
	10-65	<25	
	115-175	<25	
Sour Weed (*Desmarestia sp.*)	0-5	<25	
	10-55	<25	
	55-60	25-50	
	60-155	<25	
	155-160	50-75	
	160-165	<25	
Dulse (*Palmeria palmata*)	0-5	<25	
	60-85	<25	
	170-175	<25	
Green Filamentous (*Chaetomorpha sp.*)	15-20	<25	
	25-30	<25	
	130-135	<25	
Sea Lettuce (*Ulva lactuca*)	45-50	<25	
	70-120	<25	
Laver (*Porphyra sp.*)	60-70	<25	
	80-95	<25	
	115-120	<25	
Banded Weed (*Ceramium sp.)*	85-95	<25	
	150-165	<25	
Sea Colander (*Agarum cribrosum*)	120-150	<25	
	170-175	<25	
Ribbon Weed (*Petalonia sp.*)	125-135	<25	
	145-150	<25	
Black Whip Weed (*Chordaria flagelliformis*)	130-135	<25	
	150-155	<25	

2.3.1.8 T-13

Table 2.3.8 Transect T-13, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 26, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Sour Weed (Desmarestia sp.)	0-260	25-50	
	260-365	<25	
	450-585	<25	
Crustose Algae (*Lithothamnium sp.*)	0-20	<25	
	30-125	<25	
	365-490	<25	
	490-545	25-50	
	545-600	<25	
Black Whip Weed (*Chordaria flagelliformis*)	0-20	<25	
Sea Colander (*Agarum sp.*)	30-300	<25	
Edible Kelp (*Alaria sp.*)	30-125	<25	

2.3.1.9 T-14

Table 2.3.9 Transect T-14, Zone-1, Marine Terminal and Tug Berth, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 26, 2007.

Species	Mark Observed	Abundance (%)	Comments
Edible Kelp (*Alaria sp.*)	Headland 1	25-50	
	Beach 1	<25	
	Headland 2 – Headland 3	50-75	
	Beach 2 –Headland 5	<25	
	Beach 3	25-50	
	Beach 4	25-50	
	Headland 7 – Headland 8	<25	
	Beach 6	25-50	
	Beach 7 – Headland 9	<25	
Crustose Algae (*Lithothamnium sp.*)	Headland 1 – Headland 9	<25	
Sour Weed (*Desmarestia sp.*)	Headland 1 – Headland 9	<25	
Sea Lettuce (*Ulva lactuca*)	Headland 3	<25	
	Beach 3	<25	
	Beach 4	<25	
	Headland 8 – Headland 9	<25	
Smooth Chord Weed (*Chorda filum*)	Beach 2 – Headland 5	<25	
	Beach 4 – Headland 7	<25	
	Headland 8	<25	
	Beach 7 – Headland 9	<25	
Kelp (*Laminaria sp.)*	Beach 3	<25	
Green Filamentous (*Chaetomorpha sp.*)	Headland 8	<25	
Knotted Wrack (*Ascophyllum nodosum*)	Beach 7	<25	
	Headland 9	25-50	

2.3.2 Zone 2 - Marine Jetty

2.3.2.1 T-8

Table 2.3.10 Transect T-8, Zone-2, Marine Jetty, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 24, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Crustose Algae (*Lithothamnium sp.*)	0-30	25-50	
	30-100	<25	
	100-360	25-50	
	400-450	25-50	
Sour Weed (*Desmarestia sp.*)	400-600		Storm Toss
Sea Colander (*Agarum cribrosum*)	450-700		Storm Toss
Kelp (*Laminaria sp.*)	450-700		Storm Toss
Rockweed (*Fucus sp.*)	600-700		Storm Toss

2.3.2.2 T-9

Table 2.3.11 Transect T-9, Zone-1, Marine Jetty, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 24, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Sea Colander (*Agarum cribrosum*)	0-700		Storm Toss
Kelp (*Laminaria sp.*)	500-615		Storm Toss

2.3.2.3 T-10

Table 2.3.12 Transect T-10, Zone-1, Marine Jetty, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 25, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Sour Weed (*Desmarestia sp.*)	0-100	<25	
Crustose Algae (*Lithothamnium sp.*)	0-100	<25	
Kelp (*Laminaria sp.*)	30-100	<25	
Edible Kelp (*Alaria sp.*)	30-100	<25	

2.3.3 Zone 3 - Marine Water Intake

2.3.3.1 T-11

Table 2.3.13 Transect T-11, Zone-3, Marine Water Intake, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 23, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Edible Kelp (*Alaria sp.*)	10-20	<25	
	20-30	25-50	
	30-50	50-75	
	50-60	<25	
	160-220	<25	
	230-250	<25	
	260-280	<25	
	300-310	<25	
Hollow Green Weed (*Enteromorpha sp.*)	10-40	<25	
Sour Weed (*Desmarestia sp.)*	10-40	<25	
	40-50	25-50	
	50-60	<25	
	60-70		Storm Toss
	80-90		Storm Toss
	90-200	<25	
	200-220	25-50	
	220-230	<25	
	230-260	25-50	
	260-270	<25	
	270-290	25-50	
	290-350	<25	
	350-370	25-50	
	370-430	50-75	
	430-490	<25	
	500-520	<25	
	550-570	<25	
	570-580		Storm Toss
	580-630	<25	
	670-690		Storm Toss
	730-750		Storm Toss
	930-940		Storm Toss
Kelp (*Laminaria sp.*)	10-20	<25	
	80-90		Storm Toss
	150-200	<25	
Smooth Chord Weed (*Chorda filum*)	10-20	<25	
Coral Weed (*Corallina officinalis*)	10-20	<25	
Green Filamentous (*Cladophora sp.*)	10-20	<25	
	160-180	<25	
	300-310	<25	
Green Filamentous (*Chaetomorpha sp.*)	10-20	<25	
	30-40	<25	
	50-60	<25	
Red Tubed Weed (*Rhodomela sp.*)	20-60	<25	
Rockweed (*Fucus sp.*)	20-30	<25	

Species	Mark Observed (m)	Abundance (%)	Comments
Black Whip Weed (*Chordaria flagelliformis*)	30-40	<25	
	50-60	<25	
	160-180	<25	
	180-210	50-75	
	210-220	25-50	
	230-260	25-50	
	260-300	<25	
	310-320	<25	
Red Fern (*Ptilota serrata*)	30-40	<25	
	50-60	<25	
	160-210	<25	
	230-410	<25	
	420-440		Storm Toss
Sea Lettuce (*Ulva lactuca*)	30-40	<25	
	160-210	<25	
Green Filamentous (*Ulothrix sp.)*	30-40	<25	
Dulse (*Palmeria palmate*)	160-170	<25	
Crustose Algae (*Lithothamnium sp.*)	200-370	<25	
	370-430	25-50	
	430-500	<25	
	500-520	25-50	
	520-530	50-75	
	530-640	25-50	
	640-650	50-75	
	650-690	75-100	
	690-700	50-75	
	700-730	75-100	
	730-740	50-75	
	740-760	75-100	
	760-770	50-75	
	770-780	25-50	
	780-820	50-75	
	820-960	75-100	
Sea Colander (*Agarum sp.*)	260-270	<25	
	430-440	<25	
	470-490	<25	
	510-520	<25	
	620-640	<25	
	760-840	<25	
	870-880	<25	
	890-900	<25	
	900-910		Storm Toss
Banded Weed (*Ceramium sp.*)	430-440	<25	
	490-500	<25	
	530-540	<25	
	620-640	<25	
	650-830	<25	
	840-870	<25	
Leaf Weed (*Phyllophora sp.)*	430-440		Storm Toss
	730-760		Storm Toss
	800-810		Storm Toss
	900-960		Storm Toss
Tubed Weed (*Polysiphonia sp.*)	520-530	<25	

2.3.4 Zone 4 - Marine Outfall

2.3.4.1 T-12

Table 2.3.14 Transect T-12, Zone-4, Marine Outfall, Macroflora observations and estimated (%) abundances. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 22, 2007.

Species	Mark Observed (m)	Abundance (%)	Comments
Rockweed (*Fucus sp.*)	0-10	25-50	
	10-30	50-75	
	30-40	25-50	
	40-50	<25	
	310-330		Storm Toss
Knotted Wrack (Ascophyllum nodosum)	0-10	<25	
	260-270		Storm Toss
	320-330		Storm Toss
Edible Kelp (*Alaria sp.*)	0-40	<25	
	40-50	50-75	
	50-60	25-50	
	100-120	<25	
Crustose Algae (*Lithothamnium sp.*)	0-80	<25	
	80-200	25-50	
	200-330	<25	
Coral Weed (Corallina officinalis)	0-50	<25	
Sour Weed (Desmarestia sp.)	10-70	<25	
	90-120	<25	
	170-180	<25	
	190-310	<25	
Red Fern (Ptilota serrata)	10-20	<25	
Sea Lettuce (*Ulva lactuca*)	10-60	<25	
Black Whip Weed (Chordaria flagelliformis)	10-40	<25	
Green Filamentous (*Cladophora sp.*)	10-20	<25	
	230-240	<25	
Unidentified Brown	20-30	<25	
	40-50	<25	

2.4 Marine Sediment Chemistry

Results for marine sediment chemistry are summarized in the following sections and detailed laboratory analytical results are presented in Appendix F.

2.4.1 Metals-Hydrides

The only metals which exceeded CCME ISQG (2006) were arsenic in two samples from Zone 2 - Marine Jetty and one sample from Zone 4 - Marine Outfall; and copper in two samples from Zone1 – Marine Terminal/Tug Berth and one sample from Zone 4 – Marine Outfall (Table 2.4.1). Both arsenic and copper are commonly encountered in

marine sediments from pristine areas of Newfoundland and Labrador. The exceedances noted are most likely attributable to natural background levels.

All other metals analyzed were either not detected or were below CCME ISQG (2006).

2.4.2 BTEX/TPH

BTEX/TPH were not detected at the laboratory MDLs (laboratory method detection limits) for any of the samples submitted for analysis (Table 2.4.2).

2.4.3 PAH

PAHs were either not detected or were below the CCME ISQG (2006) for all samples from all zones (Table 2.4.3).

2.4.4 PCB

PCBs were not detected at the laboratory MDL (laboratory method detection limits) for all samples from all zones (Table 2.4.4).

2.4.5 TOC

TOC was detected in all samples in a range from 4,200 to 5,2058 (ug/g) (Table 2.4.5).

Table 2.4.1 Marine sediment analytical summary – metals and hydrides. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

		CCME		Marine Terminal														Jetty						Water Intake					Outfall	
Parameters	MDL (µg/g)	ISQG (µg/g)	PEL (µg/g)	T1-1	T1-2	T2-1	T2-2	T3-1	T3-2	T4-1	T4-2	T5-1	T5-2	T6-1	T6-2	T7-1	T7-2	T8-1	T8-2	T9-4*	T9-4	T9-5*	T9-5	T11-1	T11-2	T11-2R	T11-3	T11-3R	T12-1	T12-2
Aluminum	5	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Antimony	0.5	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS
Arsenic	0.5	7.24	41.6	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Barium	0.5	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Beryllium	0.2	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Bismuth	0.2	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS
Cadmium	0.5	0.7	4.2	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	NS
Calcium	25	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Chromium	1	52.3	160	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Cobalt	1	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Copper	1	18.7	108	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Iron	5	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Lead	5	30.2	112	x	NS	x	ND	x	ND	x	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x	x	x	ND	ND	ND	ND	x	NS
Magnesium	10	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Manganese	1	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Mercury	0.01	0.13	0.7	x	NS	x	ND	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Molybdenum	2	ng	ng	x	NS	ND	ND	ND	ND	ND	ND	x	x	ND	x	ND	ND	x	ND	x	x	ND	ND	x	x	x	ND	ND	x	NS
Nickel	5	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Phosphorus	5	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Potassium	10	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Selenium	0.1	ng	ng	x	NS	ND	ND	x	x	x	ND	x	x	ND	x	ND	x	x	x	x	x	x	x	x	x	x	ND	ND	x	NS
Silver	0.25	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS
Sodium	25	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Vanadium	5	ng	ng	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS
Zinc	2	124	271	x	NS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	NS

NS – Not sampled
ND – Not detected
* - Lab Duplicate
x – Exceeds Metals (CCME ISQG 2006)

Table 2.4.2 Marine sediment analytical summary – BTEX/TPH. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

		CCME		Marine Terminal														Jetty			
Parameters	**MDL (µg/g)**	**ICQG**	**PEL**	**T1-1**	**T1-2**	**T2-1**	**T2-2**	**T3-1**	**T3-1***	**T3-2**	**T4-1**	**T4-2**	**T5-1**	**T5-2**	**T6-1**	**T6-2**	**T7-1**	**T7-2**	**T8-1**	**T8-2**	**T9-4**	**T9-5**
Benzene	0.01	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.01	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.01	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m+p-Xylene	0.02	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	0.01	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPH (C6-C10)	10	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPH (C6-C10) less BTEX	10	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPH (>C10-C21)	10	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPH (>C21-< C32)	50	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Modified TPH (Tier 1)		ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hydrocarbon Identification		ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX, TPH Purgeable Surrogate Recovery																						
Difluorobenzene (%)		ng	ng	111	NS	112	112	109	113	118	113	101	117	104	116	107	116	115	115	105	104	116
4-Bromofluorobenzene (%)		ng	ng	111	NS	109	107	104	115	101	110	100	103	103	109	98	106	103	105	108	104	102
Trifluorotoluene (%)		ng	ng	93	NS	110	106	96	93	113	107	106	100	103	127	79	103	88	121	116	111	72
TPH Extractable Surrogate Recovery		ng	ng																			
O-Terphenyl (%)		ng	ng	83	NS	103	90	78	92	96	94	81	101	101	94	94	82	95	87	91	89	96
% Moisture		ng	ng	23	NS	32	21	31	NR	16.1	46	38	14	41	35	45.4	33.2	23	51	41	48	37.7

ND – Not Detected
NS – Not Sampled
ng – Not Given
* - Lab Replicate

		CCME		Water Intake						Outfall	
Parameters	**MDL (µg/g)**	**ICQG**	**PEL**	**T11-1**	**T11-2**	**T11-2R**	**T11-3**	**T11-3R***	**T11-3R**	**T12-1**	**T12-2**
Benzene	0.01	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
Toluene	0.01	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
Ethylbenzene	0.01	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
m+p-Xylene	0.02	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
o-Xylene	0.01	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
TPH (C6-C10)	10	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
TPH (C6-C10) less BTEX	10	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
TPH (>C10-C21)	10	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
TPH (>C21-< C32)	50	ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
Modified TPH (Tier 1)		ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
Hydrocarbon Identification		ng	ng	ND	ND	ND	ND	ND	ND	ND	NS
BTEX, TPH Purgeable Surrogate Recovery											
Difluorobenzene (%)		ng	ng	104	117	112	112	109	118	111	NS
4-Bromofluorobenzene (%)		ng	ng	103	102	105	116	101	114	111	NS
Trifluorotoluene (%)		ng	ng	95	108	115	102	108	102	108	NS
TPH Extractable Surrogate Recovery											
O-Terphenyl (%)		ng	ng	96	76	101	93	94	95	90	NS
% Moisture		ng	ng	42	37.1	23	29	30	NR	43	NS

ND – Not Detected
NS – Not Sampled
ng – Not Given
* - Lab Replicate

Table 2.4.3 Marine sediment analytical summary – PAH. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

		CCME		Marine Terminal															Jetty			
Parameters	**MDL (µg/g)**	**ISQG**	**PEL**	**T1-1**	**T1-2**	**T2-1**	**T2-2**	**T3-1**	**T3-2**	**T4-1**	**T4-2**	**T5-1**	**T5-2**	**T6-1**	**T6-1***	**T6-2**	**T7-1**	**T7-2**	**T8-1**	**T8-2**	**T9-4**	**T9-5**
Naphthalene	0.002	0.0346	0.391	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	0.001	0.00587	0.128	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x
Acenaphthene	0.002	0.00671	0.0889	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	0.001	0.0212	0.144	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	0.001	0.0419	0.515	x	NS	ND	ND	x	ND	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x	x
Anthracene	0.001	0.0469	0.245	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	ND	ND
Fluoranthene	0.001	0.111	2.355	x	NS	ND	ND	x	ND	x	ND	x	ND	x	x	ND	x	ND	x	x	x	x
Pyrene	0.003	0.053	0.875	x	NS	ND	ND	x	ND	x	ND	ND	ND	ND	x	ND	ND	ND	x	x	x	x
Benzo(a)anthracene	0.001	0.0317	0.385	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	ND	x
Chrysene	0.001	0.0571	0.862	x	NS	ND	ND	x	ND	x	ND	ND	ND	x	x	ND	ND	ND	x	x	x	x
Benzo(b)fluoranthene	0.004	ng	ng	x	NS	ND	ND	x	ND	x	ND	ND	ND	ND	ND	ND	ND	ND	x	x	x	x
Benzo(k)fluoranthene	0.004	ng	ng	x	NS	ND	ND	ND	ND	x	ND	ND	x	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.003	0.0319	0.782	x	NS	ND	ND	x	ND	x	ND	ND	x	ND	ND	ND	ND	ND	x	x	x	x
Indeno(123 cd.)pyrene	0.003	ng	ng	x	NS	ND	ND	ND	ND	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x
Dibenzo(ah)anthracene	0.004	ng	ng	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(ghi)perylene	0.002	ng	ng	x	NS	ND	ND	x	ND	x	ND	ND	ND	ND	ND	ND	ND	ND	x	ND	x	x
Dilution Factor				1	NS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Surrogate Recovery																						
Naphthalene-d8 (%)		ng	ng	63	NS	75	72	72	61	66	66	79	60	66	63	77	80	83	66	66	66	68
Antracene-d10 (%)		ng	ng	84	NS	93	89	84	81	72	75	94	77	70	77	90	92	92	81	75	74	82
Perylene-d12 (%)		ng	ng	91	NS	93	89	90	88	79	86	100	79	79	81	91	93	95	85	86	79	89

NS – Not Sampled
ng – Not Given
* - Lab Replicate
ND – Not Detected

		CCME		Water Intake							Outfall	
Parameters	**MDL (µg/g)**	**ISQG**	**PEL**	**T11-1**	**T11-1***	**T11-2**	**T11-2R**	**T11-3**	**T11-3R**	**T12-1**	**T12-1***	**T12-2**
Naphthalene	0.002	0.0346	0.391	ND	ND	ND	ND	ND	ND	ND	ND	NS
Acenaphthylene	0.001	0.00587	0.128	x	x	ND	ND	ND	ND	ND	ND	NS
Acenaphthene	0.002	0.00671	0.0889	ND	ND	ND	ND	ND	ND	ND	ND	NS
Fluorene	0.001	0.0212	0.144	ND	ND	ND	ND	ND	ND	ND	ND	NS
Phenanthrene	0.001	0.0419	0.515	x	x	ND	ND	ND	ND	ND	ND	NS
Anthracene	0.001	0.0469	0.245	ND	ND	ND	ND	ND	ND	ND	ND	NS
Fluoranthene	0.001	0.111	2.355	x	x	ND	ND	ND	ND	x	x	NS
Pyrene	0.003	0.053	0.875	x	x	ND	ND	ND	ND	x	x	NS
Benzo(a)anthracene	0.001	0.0317	0.385	x	x	ND	ND	ND	ND	ND	x	NS
Chrysene	0.001	0.0571	0.862	x	x	ND	ND	ND	ND	ND	ND	NS
Benzo(b)fluoranthene	0.004	ng	ng	x	x	ND	ND	ND	ND	x	ND	NS
Benzo(k)fluoranthene	0.004	ng	ng	x	x	ND	ND	ND	ND	ND	ND	NS
Benzo(a)pyrene	0.003	0.0319	0.782	x	x	ND	ND	ND	ND	x	ND	NS
Indeno(123 cd.)pyrene	0.003	ng	ng	x	x	ND	ND	ND	ND	x	x	NS
Dibenzo(ah)anthracene	0.004	ng	ng	x	x	ND	ND	ND	ND	ND	ND	NS
Benzo(ghi)perylene	0.002	ng	ng	x	x	ND	ND	ND	ND	x	x	NS
Dilution Factor				1	1	1	1	1	1	1	1	NS
Surrogate Recovery												
Naphthalene-d8 (%)		ng	ng	66	66	72	66	66	66	63	63	NS
Antracene-d10 (%)		ng	ng	86	79	89	74	74	73	72	73	NS
Perylene-d12 (%)		ng	ng	92	88	97	80	74	81	72	74	NS

NS – Not Sampled
ng – Not Given
* - Lab Replicate
ND – Not Detected

Table 2.4.4 Marine sediment analytical summary – PCB. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

		CCME		Marine Terminal														Jetty			
Parameters	**MDL (µg/g)**	**ISQG**	**PEL**	**T1-1**	**T1-2**	**T2-1**	**T2-2**	**T3-1**	**T3-2**	**T4-1**	**T4-2**	**T5-1**	**T5-2**	**T6-1**	**T6-2**	**T7-1**	**T7-2**	**T8-1**	**T8-2**	**T9-4**	**T9-5**
Total PCB	0.005	0.0341	0.277	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Surrogate Recovery (Decachloro-biphenyl) (%)		0.0341	0.277	99	NS	112	103	105	106	102	62	107	88	89	96	102	105	102	93	96	103

		CCME		Water Intake					Outfall	
Parameters	**MDL (µg/g)**	**ISQG**	**PEL**	**T11-1**	**T11-2**	**T11-2R**	**T11-3**	**T11-3R**	**T12-1**	**T12-2**
Total PCB	0.005	0.0341	0.277	ND	ND	ND	ND	ND	ND	NS
Surrogate Recovery (Decachloro-biphenyl) (%)		0.0341	0.277	97	104	100	103	101	108	NS

NS – Not Sampled
ND – Not Detected

Table 2.4.5 Marine sediment analytical summary – TOC. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

		CCME		Marine Terminal														
Parameters	**MDL (µg/g)**	**ISQG**	**PEL**	**T1-1**	**T1-2**	**T2-1**	**T2-1***	**T2-2**	**T3-1**	**T3-2**	**T4-1**	**T4-2**	**T5-1**	**T5-2**	**T6-1**	**T6-2**	**T7-1**	**T7-2**
Total Organic Carbon	ng	ng	ng	25000	NS	9400	8000	2600	13300	13200	520258	4200	29000	13000	5600	11100	17800	5200

		CCME		Jetty					Water Intake					Outfall	
Parameters	**MDL (µg/g)**	**ISQG**	**PEL**	**T8-1**	**T8-1***	**T8-2**	**T9-4**	**T9-5**	**T11-1**	**T11-2**	**T11-2R**	**T11-3**	**T11-3R**	**T12-1**	**T12-2**
Total Organic Carbon	ng	ng	ng	520258	520258	520258	520258	11000	12900	9200	35000	520258	1500	49000	NS

NS – Not Sampled
ng – Not Given
* - Lab Replicate

2.5 Seawater Chemistry

Results for marine seawater chemistry are summarized in the following sections and detailed laboratory analytical results are presented in Appendix G.

2.5.1 General Chemistry

All analytes were either not detected or detected at levels which fall within the range commonly encountered in seawater samples (Table 2.5.1). There are no CCME guidelines available with respect to any of the analytical parameters in seawater.

2.5.2 Metals - Hydrides

The only metal which exceeded the available CCME guideline (2006) was cadmium which exceeded at both the Zone 3 – Intake Location and Zone 4 – Outfall Location (Table 2.5.2). Cadmium is a commonly occurring natural metal in the Newfoundland and Labrador Environment. It is likely that the cadmium levels detected are attributable to natural background levels.

2.5.3 BTEX/TPH

BTEX/TPH were either not detected or were below the CCME guideline (2006) for all samples from all zones (Table 2.5.3).

2.5.4 PAH

PAHs were not either not detected at the laboratory MDL (laboratory method detection limits) or were below the CCME guideline (2006) for all samples from all zones (Table 2.5.4).

2.5.5 VOC

VOCs were not detected at the laboratory MDL (Method Detection Limit) in all samples (Table 2.5.5).

Table 2.5.1 Marine seawater analytical summary – General Chemistry. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

			Marine Water Outfall					
Parameters	**MDL µg/L**	**CCME µg/L**	**T12-1-Top**	**T12-1-Mid**	**T12-1-Bot**	**T12-2-Top**	**T12-2-Mid**	**T12-2-Bot**
Ammonia as N	0.01	ng	ND	ND	ND	ND	ND	ND
Chloride	0.1	ng	x	x	x	x	x (x)	x
Fluoride	0.5 *	ng	ND	ND	ND	ND	ND (ND)	ND
NaCl		ng	x	x	x	x	x	x
Nitrate as N	0.5 *	ng	ND	ND	ND	ND	ND (ND)	ND
pH		ng	x	x	x	x	x	x (x)
Phenols	0.001	ng	x	x	x	x	x	x
Phosphate	0.5 *	ng	ND	ND	ND	ND	ND (ND)	ND
Sulphate	0.1	ng	x	x	x	x	x (x)	x
Total Dissolved Solids	10	ng	x	x	x	x	x	x
Total Organic Carbon	0.5	ng	ND	0.7	ND	ND	ND	ND
Total Suspended Solids	2	ng	x	x	x	x	x	x
	MDL NTU	**CCME µg/L**						
Turbidity	0.1	ng	x	ND	x	x	x	x (x)
	MDL µS/cm	**CCME µg/L**						
Conductivity	5	ng	x	x	x	x	x	x (x)
Cations	**MDL µg/L**	**CCME µg/L**						
Calcium	0.5	ng	x	x	x	x	x	x
Magnesium	0.02	ng	x	x	x	x	x	x
Potassium	0.02	ng	x	x	x	x	x	x
Sodium	0.5	ng	x	x	x	x	x	x

NR – No Lab Replicate
ND – Not Detected
ng – No Guideline
Results in (brackets) represent lab replicate

* Higher MDL reported due to interferences. x - Detected

			Marine Water Intake					
Parameters	**MDL µg/L**	**CCME µg/L**	**T11-1-Top**	**T11-1-Mid**	**T11-1-Bot**	**T11-2-Top**	**T11-2-Mid**	**T11-2-Bot**
Ammonia as N	0.01	ng	ND	ND	ND	ND	ND	ND
Chloride	0.1	ng	x	x	x	x	x	x
Fluoride	0.5 *	ng	ND	ND	ND	ND	ND	ND
NaCl		ng	x	x	x	x	x	x
Nitrate as N	0.5 *	ng	ND	ND	ND	ND	ND	ND
pH		ng	x	x	x	x	x	x (x)
Phenols	0.001	ng	x	x	x	x (x)	x	x
Phosphate	0.5 *	ng	ND	ND	ND	ND	ND	ND
Sulphate	0.1	ng	x	x	x	x	x	x
Total Dissolved Solids	10	ng	x	x	x	x	x	x
Total Organic Carbon	0.5	ng	x	x	x	x	x	x
Total Suspended Solids	2	ng	x	x	x	x	x	x
	MDL NTU	**CCME µg/L**						
Turbidity	0.1	ng	x	x	ND	ND	x	ND (x)
	MDL µS/cm	**CCME µg/L**						
Conductivity	5	ng	x	x	x	x	x	x (x)
Cations	**MDL µg/L**	**CCME µg/L**						
Calcium	0.5	ng	x	x	x	x	x	x
Magnesium	0.02	ng	x	x	x	x	x	x
Potassium	0.02	ng	x	x	x	x	x	x
Sodium	0.5	ng	x	x	x	x	x	x

NR – No Lab Replicate
ND – Not Detected
ng – No Guideline
Results in (brackets) represent lab replicate
* Higher MDL reported due to interferences
x - Detected

Table 2.5.2 Marine seawater analytical summary – Metals-Hydrides. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

			Marine Water Outfall					
Parameters	**MDL µg/L**	**CCME µg/L**	**T12-1-Top**	**T12-1-Mid**	**T12-1-Bot**	**T12-2-Top**	**T12-2-Mid**	**T12-2-Bot**
Aluminum	0.001	ng	ND	ND	ND	ND	ND	ND
Arsenic	0.001	0.0125	ND	ND	ND	ND	ND (ND)	ND
Barium	0.0005	ng	x	x	x	x	x	x
Beryllium	0.0001	ng	ND	ND	ND	ND	ND	ND
Bismuth	0.0005	ng	x	ND	x	x	x	ND
Cadmium	0.000015	0.00012	x	x	x	x	x	x
Calcium	0.5	ng	x	x	x	x	x	x
Chromium	0.001	ng	ND	ND	ND	ND	ND	ND
Cobalt	0.001	ng	x	x	x	x	x	x
Copper	0.001	ng	ND	ND	ND	ND	ND	ND
Iron	0.001	ng	x	x	x	x	x	x
Lead	0.001	ng	x	x	x	x	x	x
Magnesium	0.02	ng	x	x	x	x	x	x
Manganese	0.001	ng	x	x	x	x	x	x
Molybdenum	0.002	ng	x	x	x	x	x	x
Nickel	0.001	ng	x	x	x	x	x	x
Phosphorous	0.002	ng	x	x	x	x	x	x
Potassium	0.02	ng	x	x	x	x	x	x
Selenium	0.001	ng	ND	ND	ND	ND	ND	ND
Silver	0.0001	ng	ND	ND	ND	ND	ND	ND
Sodium	0.5	ng	x	x	x	x	x	x
Vanadium	0.002	ng	ND	ND	ND	ND	ND	ND
Zinc	0.001	ng	x	x	x	x	x	x

NR – No Lab Replicate
ND – Not Detected
ng – No Guideline
Results in (brackets) represent lab replicate
x - Exceeds CCME 2006 Guidelines
x – Detected

			Marine Water Intake					
Parameters	**MDL µg/L**	**CCME µg/L**	**T11-1-Top**	**T11-1-Mid**	**T11-1-Bot**	**T11-2-Top**	**T11-2-Mid**	**T11-2-Bot**
Aluminum	0.001	ng	ND	ND	ND	x	x	x
Arsenic	0.001	0.0125	ND	ND	ND	ND	ND	ND
Barium	0.0005	ng	x	x	x	x	x	x
Beryllium	0.0001	ng	ND	ND	ND	ND	ND	ND
Bismuth	0.0005	ng	x	x	ND	ND	ND	x
Cadmium	0.000015	0.00012	x	x	x	x	x	x
Calcium	0.5	ng	x	x	x	x	x	x
Chromium	0.001	ng	ND	ND	ND	x	ND	ND
Cobalt	0.001	ng	x	x	x	x	x	x
Copper	0.001	ng	ND	ND	ND	ND	ND	x
Iron	0.001	ng	x	x	x	x	x	x
Lead	0.001	ng	x	x	x	x	x	x
Magnesium	0.02	ng	x	x	x	x	x	x
Manganese	0.001	ng	x	x	x	x	x	x
Molybdenum	0.002	ng	x	x	x	x	x	x
Nickel	0.001	ng	x	x	x	x	x	x
Phosphorous	0.002	ng	x	x	x	x	x	x
Potassium	0.02	ng	x	x	x	x	x	x
Selenium	0.001	ng	ND	ND	ND (ND)	ND	ND	ND
Silver	0.0001	ng	ND	ND	x	ND	ND	ND
Sodium	0.5	ng	x	x	x	x	x	x
Vanadium	0.002	ng	ND	ND	ND	ND	ND	ND
Zinc	0.001	ng	x	x	x	x	x	x

NR – No Lab Replicate
ND – Not Detected
ng – No Guideline
Results in (brackets) represent lab replicate
x - Exceeds CCME 2006 Guidelines
x - Detected

Table 2.5.3 Marine seawater analytical summary – BTEX/TPH (RBCA). Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

			Marine Water Outfall						
Parameters	**MDL µg/L**	**CCME µg/L**	**T12-1-Top**	**T12-1-Top***	**T12-1-Mid**	**T12-1-Bot**	**T12-2-Top**	**T12-2-Mid**	**T12-2-Bot**
Benzene	0.2	110	ND	ND	ND	ND	ND	ND	ND
Toulene	0.2	215	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	25	ND	ND	ND	ND	ND	ND	ND
M+p-Xylene	0.4	ng	ND	ND	ND	ND	ND	ND	ND
o-Xylene	0.2	ng	ND	ND	ND	ND	ND	ND	ND
TPH (C6-C10)	50	ng	ND	ND	ND	x	ND	ND	ND
TPH (C6-C10) less BTEX	50	ng	ND	ND	ND	x	ND	ND	ND
TPH (>C10-C21)	50	ng	ND	NR	ND	ND	ND	ND	ND
TPH(>C21-<C32)	50	ng	ND	NR	ND	ND	ND	ND	ND
Modified TPH (Tier 1)	150	ng	ND	ND	ND	ND	ND	ND	ND
Hydrocarbon Identification		ng	ND	ND	ND	ND	ND	ND	ND
BTEX, TPH Purgeable Surrogate Recovery									
1,4 Difluorobenzene (%)		ng	104	97	98	95	104	98	100
4-Bromofluorobenzene (%)		ng	100	99	100	98	103	97	105
TPH Extractable Surrogate Recovery									
O-Terphenyl (%)		ng	80	NR	88	90	80	82	112

NR – No Lab Replicate
ND – Not Detected
* - Lab Replicate
ng – No Guideline
x - Detected

			Marine Water Intake						
Parameters	**MDL µg/L**	**CCME µg/L**	**T11-1-Top**	**T11-1-Mid**	**T11-1-Bot**	**T11-2-Top**	**T11-2-Top***	**T11-2-Mid**	**T11-2-Bot**
Benzene	0.2	110	ND	ND	ND	ND	NR	ND	ND
Toulene	0.2	215	ND	ND	ND	ND	NR	ND	ND
Ethylbenzene	0.2	25	ND	ND	ND	ND	NR	ND	ND
M+p-Xylene	0.4	ng	ND	ND	ND	ND	NR	ND	ND
o-Xylene	0.2	ng	ND	ND	ND	ND	NR	ND	ND
TPH (C6-C10)	50	ng	ND	ND	ND	ND	NR	ND	ND
TPH (C6-C10) less BTEX	50	ng	ND	ND	ND	ND	NR	ND	ND
TPH (>C10-C21)	50	ng	ND	ND	ND	ND	ND	ND	ND
TPH(>C21-<C32)	50	ng	ND	ND	ND	ND	ND	ND	ND
Modified TPH (Tier 1)	150	ng	ND	ND	ND	ND	ND	ND	ND
Hydrocarbon Identification		ng	ND	ND	ND	ND	ND	ND	ND
BTEX, TPH Purgeable Surrogate Recovery									
1,4 Difluorobenzene (%)		ng	98	100	99	95	NR	100	100
4-Bromofluorobenzene (%)		ng	101	99	96	100	NR	97	96
TPH Extractable Surrogate Recovery									
O-Terphenyl (%)		ng	90	78	85	87	67	84	83

NR – No Lab Replicate
ND – Not Detected
* - Lab Replicate
ng – No Guideline
x - Detected

Table 2.5.4 Marine seawater analytical summary – PAH. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

			Marine Water Outfall					
Parameters	**MDL µg/L**	**CCME µg/L**	**T12-1-Top**	**T12-1-Mid**	**T12-1-Bot**	**T12-2-Top**	**T12-2-Mid**	**T12-2-Bot**
Naphthalene	0.03	1.4	ND	ND	ND	ND	x	x
Acenaphthylene	0.03	a	ND	x	ND	x	ND	ND
Acenaphthene	0.04	a	ND	ND	ND	ND	ND	ND
Fluorene	0.03	a	ND	ND	ND	ND	ND	ND
Phenanthrene	0.04	a	ND	ND	ND	ND	ND	x
Anthracene	0.01	a	x	ND	ND	ND	ND	ND
Fluoranthene	0.03	a	ND	ND	ND	ND	ND	ND
Pyrene	0.01	a	x	x	ND	ND	ND	ND
Benzo(a)anthracene	0.01	a	x	x	ND	ND	ND	ND
Chrysene	0.04	a	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.05	ng	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	0.05	ng	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.005	a	x	x	ND	ND	ND	ND
Indeno(123 cd.)pyrene	0.05	ng	ND	ND	ND	ND	ND	ND
Dibenzo(ah)anthracene	0.05	ng	ND	ND	ND	ND	ND	ND
Benzo(ghi)perylene	0.03	ng	ND	ND	ND	ND	ND	ND
Surrogate Recovery								
Naphthalene-d8 (%)		ng	78	73	96	73	72	73
Antracene-d10 (%)		ng	113	119	128	110	130	120
Perylene-d12 (%)		ng	122	124	119	106	114	120

NR – No Lab Replicate
ND – Not Detected
* - Lab Duplicate
ng – No Guideline
a – insufficient data
x – Detected'

			Marine Water Intake					
Parameters	**MDL µg/L**	**CCME µg/L**	**T11-1-Top**	**T11-1-Mid**	**T11-1-Bot**	**T11-2-Top**	**T11-2-Mid**	**T11-2-Bot**
Naphthalene	0.03	1.4	ND	ND	ND	ND	ND	ND
Acenaphthylene	0.03	a	ND	ND	ND	ND	ND	ND
Acenaphthene	0.04	a	ND	ND	ND	ND	ND	ND
Fluorene	0.03	a	ND	ND	ND	ND	ND	ND
Phenanthrene	0.04	a	ND	ND	ND	ND	ND	ND
Anthracene	0.01	a	ND	ND	ND	ND	ND	ND
Fluoranthene	0.03	a	ND	ND	ND	ND	ND	ND
Pyrene	0.01	a	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	0.01	a	ND	ND	ND	ND	ND	ND
Chrysene	0.04	a	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.05	ng	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	0.05	ng	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.005	a	ND	ND	ND	ND	ND	ND
Indeno(123 cd.)pyrene	0.05	ng	ND	ND	ND	ND	ND	ND
Dibenzo(ah)anthracene	0.05	ng	ND	ND	ND	ND	ND	ND
Benzo(ghi)perylene	0.03	ng	ND	ND	ND	ND	ND	ND
Surrogate Recovery								
Naphthalene-d8 (%)		ng	73	73	73	73	73	73
Antracene-d10 (%)		ng	89	104	128	114	114	119
Perylene-d12 (%)		ng	104	122	117	117	117	129

NR – No Lab Replicate
ND – Not Detected
* - Lab Duplicate
ng – No Guideline
a – insufficient data
x - Detected

Table 2.5.5 Marine seawater analytical summary – VOC. Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 2007.

			Marine Water Outfall						
Parameters	**MDL µg/L**	**CCME µg/L**	**T12-1-Top**	**T12-1-Mid**	**T12-1-Bot**	**T12-2-Top**	**T12-2-Mid**	**T12-2-Bot**	**T12-2-Bot***
Methyl Chloride	0.3	a	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	0.2	ng	ND	ND	ND	ND	ND	ND	ND
Bromomethane	0.4	ng	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.4	ng	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	0.3	a	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.3	a	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5.0	a	ND	ND	ND	ND	ND	ND	ND
Methyl-t-butyl ether	0.5	5000	ND	ND	ND	ND	ND	ND	ND
T1,2-Dichloroethylene	0.2	ng	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.6	a	ND	ND	ND	ND	ND	ND	ND
C1,2-Dichloroethylene	0.7	ng	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.5	a	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.5	a	ND	ND	ND	ND	ND	ND	ND
Carbontetrachloride	0.3	a	ND	ND	ND	ND	ND	ND	ND
Benzene	0.4	110	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.4	a	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	0.4	a	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.4	ng	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.3	ng	ND	ND	ND	ND	ND	ND	ND
C1,3-Dichloropropene	0.4	ng	ND	ND	ND	ND	ND	ND	ND
Toluene	0.3	215	ND	ND	ND	x	ND	ND	ND
T1,3-Dichloropropene	0.3	ng	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.4	a	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	0.3	a	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.4	a	ND	ND	ND	ND	ND	ND	ND
Ethylene Dibromide	0.3	ng	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ng	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetracholoroethane	0.3	a	ND	ND	ND	ND	ND	ND	ND

Ethylbenzene	0.3	25	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.3	a	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	0.3	a	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	a	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.4	a	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.4	42	ND	ND	ND	ND	ND	ND	ND
m/p-Xylene	0.6	ng	ND	ND	ND	ND	ND	ND	ND
o-Xylene	0.2	ng	ND	ND	ND	ND	ND	ND	ND
Styrene	0.2	ng	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	0.5	5.4	ND	ND	ND	ND	ND	ND	ND
Acetone	10.0	ng	ND	ND	ND	ND	ND	ND	ND
Methyl Ethyl Ketone	10.0	ng	ND	ND	ND	ND	ND	ND	ND
MIBK	10.0	ng	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	10.0	ng	ND	ND	ND	ND	ND	ND	ND
Surrogate Recovery									
Dibromofluoromenthane (%)			109	110	116	109	109	112	110
Toluene-d8 (%)			97	96	99	97	97	95	95
4-Bromofluorobenzene (%)			93	92	92	91	92	92	92

NR – No Lab Replicate
ND – Not Detected
ng – No Guideline
Results in (brackets) represent lab replicate
* - Lab Replicate
x - Detected

			Marine Water Intake						
Parameters	**MDL µg/L**	**CCME µg/L**	**T11-1-Top**	**T11-1-Mid**	**T11-1-Bot**	**T11-2-Top**	**T11-2-Mid**	**T11-2-Bot**	**T11-2-Bot***
Methyl Chloride	0.3	a	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	0.2	ng	ND	ND	ND	ND	ND	ND	ND
Bromomethane	0.4	ng	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.4	ng	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	0.3	a	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.3	a	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5.0	a	ND	ND	ND	ND	ND	ND	ND
Methyl-t-butyl ether	0.5	5000	ND	ND	ND	ND	ND	ND	ND
T1,2-Dichloroethylene	0.2	ng	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.6	a	ND	ND	ND	ND	ND	ND	ND
C1,2-Dichloroethylene	0.7	ng	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.5	a	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.5	a	ND	ND	ND	ND	ND	ND	ND
Carbontetrachloride	0.3	a	ND	ND	ND	ND	ND	ND	ND
Benzene	0.4	110	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.4	a	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	0.4	a	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.4	ng	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.3	ng	ND	ND	ND	ND	ND	ND	ND
C1,3-Dichloropropene	0.4	ng	ND	ND	ND	ND	ND	ND	ND
Toluene	0.3	215	ND	ND	ND	ND	ND	ND	ND
T1,3-Dichloropropene	0.3	ng	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.4	a	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	0.3	a	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.4	a	ND	ND	ND	ND	ND	ND	ND
Ethylene Dibromide	0.3	ng	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ng	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetracholoroethane	0.3	a	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.3	25	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.3	a	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	0.3	a	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	a	ND	ND	ND	ND	ND	ND	ND

1,4-Dichlorobenzene	0.4	a	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.4	42	ND	ND	ND	ND	ND	ND	ND
m/p-Xylene	0.6	ng	ND	ND	ND	ND	ND	ND	ND
o-Xylene	0.2	ng	ND	ND	ND	ND	ND	ND	ND
Styrene	0.2	ng	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	0.5	5.4	ND	ND	ND	ND	ND	ND	ND
Acetone	10.0	ng	ND	ND	ND	ND	ND	ND	ND
Methyl Ethyl Ketone	10.0	ng	ND	ND	ND	ND	ND	ND	ND
MIBK	10.0	ng	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	10.0	ng	ND	ND	ND	ND	ND	ND	ND
Surrogate Recovery									
Dibromofluoromenthane (%)			109	110	109	110	109	108	112
Toluene-d8 (%)			95	95	95	97	95	94	94
4-Bromofluorobenzene (%)			93	93	93	97	93	94	94

NR – No Lab Replicate
ND – Not Detected
ng – No Guideline
Results in (brackets) represent lab replicate
* - Lab Replicate
x - Detected

3.0 TRANSECT SUMMARIES

3.1 Substrate

3.1.1 Zone 1 - Marine Terminal and Tug Berth

3.1.1.1 T-1

Substrate along T-1 consisted primarily of cobble, boulder, and bedrock from the shoreline to a distance of 125 m. Gravels interspersed with bedrock and boulder predominated from approximately 125 to 180 m and the final 120 m (180-300 m) was primarily bedrock.

Depths along T-1 ranged from 10.1m at the 150 m mark to 11.3 m at the 290 m mark.

3.1.1.2 T-2

Substrate along T-2 consisted primarily of cobble and small boulder from the shoreline to a distance of 70 m with gravels increasing towards the 70 m mark. From 70 to 85 m was bedrock with lesser amounts of boulder and cobble. Cobble and small boulder were predominant from 85 to 155 m. This was followed by bedrock, small boulder and cobble from 155 to 225 m. The final 25 m (225-250 m) was primarily sand with isolated larger substrates.

3.1.1.3 T-3

Substrate along T-3 consisted of bedrock from the shoreline to 15 m followed by a mixture of small boulder and cobble to 70 m. This was followed by another 10 m of bedrock (70-80) m leading into a 45 m section (80-125 m) of cobble and small boulder. The final 75 m (125-200 m) consisted primarily of sand and gravel.

3.1.1.4 T-4

Substrate along T-4 consisted of cobble and small boulder from the shoreline to 25 m, followed by 80 m of bedrock (25-105 m) and subsequently 10 m of cobble and small boulder (105-115 m). The remaining 85 m (115-200 m) was primarily sand and lesser amounts of gravel.

3.1.1.5 T-5

Substrate along T-5 was a mixture of bedrock, gravel, and cobble from the shoreline to 40 m. From 40 to 90 m consisted primarily of gravel and the final 80 m (90-170 m) was sand with lesser amounts of gravel.

3.1.1.6 T-6

Substrate along T-6 was characterized by small boulder and cobble from the shoreline to 85 m. The remaining 115 m (85 to 200 m) consisted primarily of sand and gravel.

3.1.1.7 T-7

Substrate along T-7 was characterized by small boulder and cobble from the shoreline to 65 m. From 65 m to 120 m was primarily sand leading to 25 m of small boulder and sand to 145 m. The remaining 30 m (145-175 m) consisted primarily of sand and gravel.

3.1.1.8 T-13

The first 500 m of T-13 (the offshore periphery of Zone-1) was primarily sand. Small boulder and eventually bedrock typified the final 40 m (560-600 m).

3.1.1.9 T-14

The shoreline of Zone-1 was generally characterized by bedrock and large boulder at the headlands and smaller substrates of small boulder, cobble, and gravels along the beach sections.

3.1.2 Zone 2 - Marine Jetty

3.1.2.1 T-8

Substrate along T-8 consisted of sand with lesser amounts of cobble and isolated small boulder for the entire 700 m.

3.1.2.2 T-9

Substrate along T-9 consisted entirely (700 m) of sand with isolated cobble and small amounts of gravel.

3.1.2.3 T-10

Substrate along T-10 consisted entirely (200 m) of sand with isolated cobble and small amounts of gravel.

3.1.3 Zone 3 - Marine Water Intake

3.1.3.1 T-11

Substrate along T-11 consisted of cobble from the shoreline to the 60 m mark followed by a 150 m section of gravel and sand (60-170 m) and alternating sections of bedrock and cobble to the 960 m mark.

3.1.4 Zone 4 - Marine Outfall

3.1.4.1 T-12

Substrate along T-12 consisted of small boulder and cobble from the shoreline to the 40 m mark, followed by a 160 m section (40-200 m) of bedrock and large boulder and 130 m of sand and gravel to the 330 m mark.

3.2 Macrofauna

3.2.1 Zone 1 - Marine Terminal and Tug Berth

3.2.1.1 T-1

Sea urchins were consistently encountered on large and small substrates throughout the entire transect length. Periwinkles were encountered on large substrates from the shoreline to a distance of 110 m. Starfish were encountered consistently from the 10 m mark to the 295 m mark on both large and small substrate. Blue mussel were encountered sporadically and primarily on isolated large boulder and bedrock. Frilled anemone were observed on large substrates from 120 to 185 m. Horse mussel were encountered in low numbers on large substrates in only two locations (195-200 and 210-215). Species observed infrequently included winter flounder (three individuals) hermit crab (two individuals) tube worms. Low numbers (1-2 per 5 m section) of deep-sea scallop were encountered only in small sand/gravel patches towards the outside of the transect (230-290 m).

All species observed were in relatively low numbers (uncommon to occasional) with only one section at 190-200m exhibiting higher numbers (common) of starfish.

3.2.1.2 T-2

Sea urchins and starfish were consistently encountered on large and small substrates throughout the transect length. Blue and horse mussel were encountered sporadically on large substrates through the transect length. Periwinkle were restricted to large substrates within 65 m of the shoreline. Frilled anemone, hermit crab, tube worms and sand dollars were observed infrequently. Deep-sea scallop were observed in relative low numbers in sand and gravel substrates from 155 to 250 m.

All species observed were in relatively low numbers (uncommon to occasional) with the exception of one section (185-190 m) with high numbers (common) of horse mussel.

3.2.1.3 T-3

Sea urchins and starfish were consistently encountered on large and small substrates throughout the transect length. Blue and horse mussel were encountered sporadically on large substrates through the transect length. Periwinkle were restricted to large substrates within 20 m of the shoreline. Both blue and horse mussel were encountered sporadically on large substrates throughout the transect length. Deep-sea scallop (1-6 per 5m) and sand dollar were occasionally encountered on sand and gravel substrates. Species encountered sporadically include frilled anemone (0-20 m) and winter flounder (three individuals)

All species observed were in relatively low numbers (uncommon to occasional) with the exception of one section (15-20 m) that exhibited high (common) numbers of sea urchins.

3.2.1.4 T-4

Sea urchins and starfish were consistently encountered on large and small substrates throughout the transect length. Frilled anemone were fairly common upon large substrates. Periwinkle were encountered sporadically on large substrates from 5 to 85 m. Both blue and horse mussel were encountered sporadically on large substrates throughout the transect length. Barnacles were observed only on large boulder from 75-85 m. Sand dollars were observed in low numbers within only two sections (125-160 m and 165-170 m). Deep-sea scallop were consistently encountered in low numbers on sand and gravel substrates from 90 to 200 m.

All species observed were in relatively low numbers (uncommon to occasional) with the exception of frilled anemone which were abundant on large substrate from 60 to 70 m and sea urchin which were observed in high numbers (common) from 115 to 120 m.

3.2.1.5 T-5

Sea urchins and starfish were consistently encountered on large and small substrates throughout the transect length. Deep-sea scallop and sand dollars were observed in low to moderate numbers on fine substrates from 55 to 170 m. Species observed infrequently included frilled anemone, horse mussel and winter flounder (three individuals).

3.2.1.6 T-6

Sea urchins and starfish were consistently encountered on large and small substrates throughout the transect length. Frilled anemone, blue mussel, and horse mussel were encountered infrequently on large substrates. Barnacle and periwinkle were observed only on large substrate within 25 m of the shoreline. Sand dollar and deep-sea scallop were observed in low numbers on sand and gravel substrates from 95 to 200 m. One rock crab was observed along the shoreline.

3.2.1.7 T-7

Sea urchins were consistently encountered on large and small substrates throughout the transect length. Starfish were only noted infrequently from 10 to 65 m and 115 to 175 m. Periwinkles were observed in low numbers from the shoreline to 30 m. Frilled anemone, horse mussel, and blue mussel were observed on large substrates. Sand dollars were observed consistently on sand/gravel from 80 to 175 m. Deep-sea scallop were infrequent from 45 to 55 m and 145 to 155 m. Species observed infrequently included lobster (one individual), rock crab (one individual).

3.2.1.8 T-13

Sea urchins, starfish, and deep-sea scallop were consistently encountered on large and small substrates throughout the transect length. Sand dollars were encountered from 30 to 260 m. Horse mussel were encountered sporadically on isolated boulder substrate along the entire transect length. American plaice (three individuals) were observed over the transect length.

3.2.1.9 T-14

Sea urchins and periwinkle were consistently encountered on large substrates along the shoreline. Blue mussel, starfish, and frilled anemone were observed less frequently on large substrates with some degree of shelter.

3.2.2 Zone 2 – Marine Jetty

3.2.2.1 T-8

Sea urchins, starfish and deep-sea scallop were consistently encountered on sand and gravel substrate throughout the transect length. Species observed infrequently included American plaice (five individuals), frilled anemone, tube worms, and Atlantic cod (three individuals.

3.2.2.2 T-9

Sea urchins, starfish and deep-sea scallop were consistently encountered on sand and gravel substrate throughout the transect length. Two American plaice were observed.

3.2.2.3 T-10

Sea urchins and deep-sea scallop were consistently encountered on sand and gravel substrate throughout the transect length. One skate was observed.

3.2.3 Zone 3 – Marine Water Intake

3.2.3.1 T-11

Sea urchins and starfish were consistently encountered from 120 to 960 m. Sand dollars were consistently encountered from 60 to 250 m. Horse mussels were intermittently encountered from 210 to 880 m. Frilled anemone and blue mussel were encountered on large substrates from 320 to 610 m. Species encountered infrequently included hermit crab (one individual), eel pout (two individuals), deep-sea scallop (one individual), and polychaetes (one individual).

3.2.4 Zone 4 – Marine Outfall

3.2.4.1 T-12

Sea urchins and starfish were consistently encountered on large and small substrates throughout the transect length. Deep-Sea scallop were consistently encountered (2-4 individuals per 10 m) on sand/gravel substrates from 160 to 330 m. Sand dollars were observed from 200 to 330 m. Periwinkles were encountered on large substrate from the shoreline to 130 m. Blue and horse mussels were encountered sporadically on large substrates from 100 to 310 m. Frilled anemone and barnacle were encountered infrequently on large substrates. Species observed infrequently included hermit crab (one individual), winter flounder (two individuals), and skate (two individuals).

3.3 Macroflora

3.3.1 Zone 1 - Marine Terminal and Tug Berth

3.3.1.1 T-1

Crustose algae was encountered consistently on hard substrates throughout the transect length in abundances ranging from < 25% to 25-50%. Sour weed was observed consistently in abundances of < 25% from 30 to 300 m. Black whip weed and edible kelp were observed within 30 m of the shoreline in abundances ranging from < 25 to 75-100%. Species observed infrequently in abundances <25% included ribbed lace weed (95-210 m) and leaf weed (210-300 m) and green filamentous (10 to 15 m from the shoreline.

3.3.1.2 T-2

Crustose algae was encountered consistently on hard substrates throughout the transect length in abundances ranging from < 25% to 25-50%. Sour weed was observed consistently in abundances of < 25% from 30 to 245 m.

Shoreline species consisted of rockweed, knotted wrack, coral weed, and sea lettuce in abundances of < 25%. Edible kelp was encountered from 10 to 55 m in abundances ranging from <25% to 50-75%. Green filamentous was noted from 10 to 50 m (<25%). Black whip weed was observed from 25 to 50 m (<25%). Ribbed lace weed was sporadically encountered from 70 to 250 m (<25%).

Black whip weed and edible kelp were observed within 30 m of the shoreline in abundances ranging from < 25 to 75-100%. Species observed infrequently in abundances <25% included ribbed lace weed (95-210 m) and leaf weed (210-300 m).

3.3.1.3 T-3

Crustose algae was encountered consistently on hard substrates throughout the transect length in abundances of < 25%. Sour weed was observed consistently in abundances of < 25% from the shoreline to 200 m. Edible kelp was encountered from the shoreline to 200 m in abundances of < 25 to <75%.

Shoreline and intertidal species consisted of black whip weed (<25%), red tubed weed (<25%), and knotted wrack (<25%). Species encountered infrequently included green filamentous, sea colander and coral weed.

3.3.1.4 T-4

Crustose algae was encountered consistently on hard substrates throughout the transect length in abundances of < 25%. Sour weed was observed consistently in abundances of < 25% to <50% from 15 to 200 m. Edible kelp was encountered from 10 to 200 m in abundances of < 25 to 100%.

Shoreline and intertidal species (<25%) included black whip weed, red tubed weed, and knotted wrack.

Species encountered infrequently (<25%) included green filamentous, sea colander, and coral weed.

3.3.1.5 T-5

Crustose algae was encountered consistently on hard substrates throughout the transect length in abundances of < 25%. Sour weed was observed consistently in abundances of < 25% to <50% from the shoreline to 170 m. Edible kelp was encountered from 10 to 170 m in abundances of < 25 to 100%. Kelp (*Laminaria sp.*), green filamentous, and black whip weed were encountered from the shoreline to 95 m (<25%).

Shoreline and intertidal species (<25%) consisted of dulse, callophyllis, coral weed, and red tubed weed. Rockweed was observed sporadically from the shoreline to 70 m (<25%).

3.3.1.6 T-6

Crustose algae was encountered consistently on hard substrates throughout the transect length in abundances of < 25%. Sour weed was observed consistently in abundances of < 25% to <75% from the shoreline to 200 m. Edible kelp was encountered from the shoreline to 175 m in abundances of <25 to <50%. Kelp (*Laminaria sp.*) was encountered intermittently < 25% to < 50% from 45 to 100 m.

Shoreline and intertidal species (<25%) include green filamentous, sea lettuce, *Halosaccion sp*., and red tubed weed. Species encountered infrequently (<25%) include dulse, black whip weed, sea colander, and smooth cord weed.

3.3.1.7 T-7

Crustose algae was encountered consistently on hard substrates throughout the transect length in abundances of < 25%. Sour weed was observed consistently in abundances of < 25% to <75% from the shoreline to 175 m. Edible kelp was encountered from the shoreline to 150 m in abundances of <25%. Kelp (*Laminaria sp.*) was encountered from the shoreline to 160 m in abundances ranging from < 25% to 100%. Knotted wrack was encountered in abundances up to 100% on the shoreline.

Shoreline and intertidal species (<25%) include rockweed, red tubed weed, and red tubed weed. Species encountered infrequently (<25%) include dulse, black whip weed, sea colander, green filamentous, sea lettuce, laver, and banded weed.

3.3.1.8 T-13

Crustose algae was encountered consistently on hard substrates throughout the transect length in abundances of <25 to <50%. Sour weed was observed consistently in abundances of < 25% to <50% from 0 to 585 m. Sea colander was encountered from 30 to 300 m in abundances of <25%. Edible kelp was encountered from the 30 to 125 m in abundances of <25%.

3.3.1.9 T-14

Edible kelp was the predominant (< 25 to 75%) inshore and intertidal species and was associated with large substrates within both headland and beach areas of the shoreline transect. Crustose algae and sour weed were encountered consistently on hard substrates associated with the headland areas throughout the transect length in abundances of <25%. Smooth chord weed and sea lettuce were associated with both beach and headland in abundances of < 25%. Knotted wrack (<25 to 50%) was only noted to occur along the margins of Beach #7 (Doughboy Cove) and Headland #9 (Come By Chance Point). Green filamentous (< 25%) was observed only at Headland #8.

3.3.2 Zone 2 – Marine Jetty

3.3.2.1 T-8

Crustose algae was observed sporadically (<25 to 50%) in association with intermittent cobble and small boulder habitat from 0 to 450 m. Storm toss of sour weed, sea colander, kelp (*Laminaria sp.*), and rockweed was observed sporadically from 400 to 700 m (sand and gravel).

3.3.2.2 T-9

Storm toss sea colander was observed sporadically from 0 to 700 m. Storm toss kelp (*Laminaria sp.*) was observed sporadically from 500 to 625 m.

3.3.2.3 T-10

Sour weed, crustose algae, kelp (*Laminaria sp.*), and edible kelp were noted upon isolated hard substrates in abundances of < 25% on hard substrates from 0 to 100 m.

3.3.3 Zone 3 – Marine Water Intake

3.3.3.1 T-11

Crustose algae was encountered consistently on hard substrates occurring from 200 to 960 m in abundances of < 25% to 100%. Sour weed was observed in abundances of < 25 to 50% from 10 m to 630 m.

Edible kelp and black whip weed were observed sporadically on large substrates in abundances of <25 to 75% from 10 to 310 m. Sea colander was observed in abundances of <25% from 260 to 910 m. Intermittent species (<25%) included red fern (30-440 m), banded weed (430-870 m), and storm toss leaf weed (430-960 m). Shoreline and intertidal species (<25%) included hollow green weed, smooth chord weed, coral weed, green filamentous, red tubed weed, and rockweed.

Kelp (*Laminaria sp.*) was observed (<25%) upon large substrates from 10 to 20 m and 150 to 200 m respectively. Tubed weed was observed (<25%) from 520 to 530 m.

3.3.4 Zone 3 – Marine Outfall

3.3.4.1 T-12

Crustose algae was encountered consistently on hard substrates occurring from the shoreline to 330 m in abundances of <25% to 50%%. Sour weed was observed in abundances of < 25% from 10 m to 310 m.

Edible kelp was noted in abundances of <25 to 75% from the shoreline to 60 m and in abundances of <25% from 100-120 m. Shoreline and intertidal species included rockweed (< 25 to 75%), knotted wrack (<25%), coral weed (<25%), red fern (<25%), sea lettuce (<25%), black whip weed (<25%), and green filamentous (<25%).

4.0 GENERAL SUMMARIES

Although lobsters were not observed in significant numbers within Zones 1, 2, 3, or 4 the nearshore areas are known to contain lobster habitat. This is evidenced by the large numbers of lobster pots observed during the surveys and the long timeline of the traditional lobster fishery in the area. Due to the primarily nocturnal nature of lobster movements it is common for them not to be observed during daylight video surveys.

Based upon conversations with local fisher people it has been ascertained that lumpfish, capelin, and scallop are not present in commercial quantities within the boundaries of the proposed marine facilities. There is currently no commercial fishery being prosecuted for either of these species within the marine boundaries of the project.

4.1 Zone 1 - Marine Terminal and Tug Berth

The marine habitat of Zone-1 Marine Terminal and Tug Berth was representative of a semi-exposed marine ecosystem. Shelter is provided to the west and north via the backshore land mass. The wave exposure fetches are approximately 3 km to the west (eastern shoreline of Come By Chance Harbour), 13 km to the south (Merasheen Islands Archipelago). It should be noted that the Merasheen Island Archipelago, due to its unconsolidated nature provides only partial shelter.

The shoreline consisted of small cobble/gravel beaches with scattered boulder and bedrock margins (50 to 100 m in width) rising to steep rock cliffs in the backshore interspersed with rocky headlands (10 to 40 m in width). Shoreline surveys quantified 5 beaches and 8 headlands within Zone-1.

Generalized substrate distributions within the entire zone consisted of cobble and small boulder (25 to 125 m; mean 70 m) from the shoreline. Following this, the southern portion of Zone 1 (T-1, T-2, T-3, T-4) transitioned into a region of coarse gravels interspersed with occasional bedrock outcrops (15 to 90 m; mean 55 m) followed by a region predominated by sand and fine gravel (75 to 165 m; mean 111 m). The northern section of Zone 1 (T-5, T-6, and T-7) transitioned from the nearshore cobble and small boulder to a region typified by sand and fine gravels (115 to 130 m; mean 115 m).

Sea urchins and starfish in low to moderate numbers were ubiquitous on both hard/coarse and soft/fine substrates from the shoreline to the outer limits of Zone 1. Slightly higher numbers of urchins were associated with sections consisting primarily of large boulder and bedrock. Blue mussels and horse mussels were encountered sporadically on large boulders and bedrock outcrops. Horse mussels were generally encountered in deeper water (10+ m) although blue mussels were also encountered further out on the transect lines on the tops of large boulders. Periwinkles were observed primarily on large substrates within 50 m of the shoreline in water depths < 10 m but were also observed on large shallow substrates at greater distances.

Species encountered more sporadically on large substrates (independent of depth) included frilled anemone in low to high numbers and low numbers of tube worms (1-2 per transect line). Eleven winter flounder observed within Zone 1 were usually

associated with gravel and sand substrates. Sand dollars were encountered in moderate to high numbers in association with fine gravel and sand substrates. Deep-sea scallop in abundances ranging from 0-6 individuals per 5 m section and three American plaice were encountered primarily on soft substrates along the furthest reaches of the transect lines (deeper water).

Species encountered infrequently included hermit crab, barnacles (large substrates), sponge, and northern lobster (one individual in a crevice).

Crustose algae was consistently encountered on hard substrates in densities ranging from <25 to 50%. Sour weed was also ubiquitous (< 25 to 75%) on all substrates except fine sand although the highest densities were usually observed on small boulder substrate. Edible kelp (*Alaria sp.*) was commonly observed (<25 to 100%) on large substrates with the highest densities generally associated with the shoreline and intertidal areas. Sea colander was occasionally observed in deeper water at distances greater than 100 m from the shoreline.

Shoreline algal species were dominated by rockweed and knotted wrack interspersed with lesser amounts of green filamentous, black whip weed, sea lettuce, coral weed, red tubed weed, and dulse.

Species observed infrequently included ribbed lace, *Halosaccion sp.*, laver, and ribbon weed.

4.2 Zone 2 - Marine Jetty

The marine habitat of Zone-2 Marine Jetty was representative of a semi-exposed, open water, marine ecosystem. Shelter is provided to the west and north via the backshore land mass. The wave exposure fetches are approximately 3 km to the east (eastern shoreline of Come By Chance Harbour), 13 km to the south (Merasheen Islands Archipelago). It should be noted that the Merasheen Island Archipelago, due to its unconsolidated nature provides only partial shelter. Approximately 250 m of the southwestern extent of T-8 is exposed to a 9 km wave fetch to the west (Sound Island).

Substrates were uniform throughout the entire zone consisting primarily of sand with small amounts of gravel and isolated small boulders.

Sea urchins, starfish and deep-sea scallop were consistently encountered in relatively low numbers on sand and gravel substrates throughout the entire transect length. Scallop densities averaged approximately one to three individuals per five meter transect section. Species observed infrequently included American plaice (five individuals), Atlantic cod (three individuals), skate (one individual), frilled anemone, and tube worms.

Crustose algae was encountered sporadically on T-8 and T-10 in association with intermittent cobble and boulder substrate. Sour weed and edible kelp were noted upon isolated hard substrates on the shoreward portion (100 m) of T-10. Storm tossed sour weed, sea colander, kelp (*Laminaria sp.*), and rockweed were noted sporadically throughout the entire section.

4.3 Zone 3 - Marine Water Intake

The marine habitat of Zone-3 Marine Water Intake was a combination of both a semi-sheltered (approximately the first 400 m from shore) and semi-exposed (the remaining 560 m) marine ecosystems. Shelter for the first 400 m is provided to the north, west, and east via the shoreline of Hollets Cove. The southern wave exposure fetch is approximately 13 km with partial shelter provided by the Merasheen Islands Archipelago. Shelter for the remaining 560 m is provided to the north via the backshore landmass and to the east via Come By Chance Point. The southern wave exposure fetch is approximately 12 km with partial shelter provided by the Merasheen Islands Archipelago. The western wave exposure fetch is approximately 8 km to Sound Island.

Substrates from the shoreline to 60 m were predominantly cobble with lesser amounts of sand and gravel with isolated small boulder and bedrock. From 60 m to 470 m substrates were primarily gravel and sand with lesser amounts of cobble and isolated boulder. From 470 m to 960 m substrates were larger, consisting of large bedrock outcrops interspersed with small boulder and gulches dominated by cobble.

Sea urchins and starfish were consistently encountered throughout the entire (960 m) transect length. Horse mussels, blue mussels, and frilled anemone were sporadically encountered on large boulder and bedrock substrates. Species encountered infrequently included hermit crab (one individual), eel pout (two individuals), deep-sea scallop (one individual), and polychaetes (one individual).

Crustose algae was consistently encountered on all hard substrates from 200 m to 960 m. Sour weed was fairly abundant on all substrates from 10 m to 630 m. The predominant shoreline and intertidal species were edible kelp, kelp (*Laminaria sp.*), black whip weed, hollow green weed, smooth chord weed, coral weed, green filamentous, red tubed weed, and rockweed, . Sea colander were noted to occur from over the outside transect portion from 260 to 910 m. Intermittent species included red fern and banded weed.

4.4 Zone 4 - Marine Outfall

The marine habitat of Zone-4 Marine Outfall was representative of a semi-exposed marine ecosystem. Shelter is provided to the north via the backshore land mass and to the west via Southern Head. The southern wave exposure fetch is approximately 13 km with partial shelter provided by the Merasheen Islands Archipelago. The western wave exposure fetch is approximately 6 km to Sound Island.

Substrates from the shoreline to 40 m were predominantly small boulder with lesser amounts of cobble and gravel and isolated small boulder. From 40 m to 200 m substrates were primarily bedrock and large boulder interspersed with cobble and gravel. From 200 to 330 m substrates were dominated by sand and gravels with occasional cobble patches.

Sea urchins and starfish were consistently encountered on all substrates throughout the transect length. Deep-sea scallop were encountered in densities ranging from one to two individuals per five meter transect section. Sand dollars were encountered on sections of fine substrate. Periwinkles were encountered on large substrate within the

shoreline/intertidal zone. Blue and horse mussels, frilled anemone, and barnacles were observed sporadically on large substrates. Species observed infrequently included hermit crab (one individual), winter flounder (two individuals), and skate (two individuals).

Crustose algae was encountered consistently on hard substrates and sour weed on all substrates throughout the transect length. Edible kelp was noted in the shoreline/intertidal area and in a narrow band from 100 to 120 m. Shoreline/intertidal species included rockweed, knotted wrack, coral weed, red fern, sea lettuce, black whip weed, and green filamentous.

Appendix-A

Newfoundland and Labrador Refinery Project

Marine Habitat Surveys

Qualitative and Quantitative Transect Observations

Zone 1 - Marine Terminal and Tug Berth

A = Abundant, C = Common, O = Occasional, U = Uncommon

Table A.1 - Transect T-1, Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay NL, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0	27:31	Cobble (65%) Gravel (20%) Sand (15%)	No Fauna Observed	No Flora Observed
0-5	0.9	26:57	Cobble (90%) Small Boulder (5%) Gravel (5%)	No Fauna Observed	No Flora Observed
5-10	1.2	26:14	Cobble (70%) Small Boulder (20%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Black Whip Weed (*Chordaria flagelliformis*) (80%) Edible Kelp (*Alaria sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%)
10-15	1.5	25:56	Small Boulder (65%) Cobble (30%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Black Whip Weed (*Chordaria flagelliformis*) (80%) Edible Kelp (*Alaria sp.)* (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Green Filamentous (*Chaetomorpha sp.*) (2%)
15-20	1.5	25:16	Cobble (50%) Small Boulder (40%) Large Boulder (5%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Black Whip Weed (*Chordaria flagelliformis*) (50%) Edible Kelp (*Alaria sp.*)(40%) Crustose Algae *(Lithothamnium sp.)* (5%)
20-25	2.4	22:59	Small Boulder (70%) Large Boulder (15%) Cobble (10%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Edible Kelp (*Alaria sp.*) (30%) Black Whip Weed *(Chordaria flagelliformis)* (15%)
25-30	3.1	22:42	Cobble (45%) Small Boulder (40%) Large Boulder (5%) Gravel (5%) Bedrock (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Edible Kelp (*Alaria sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
30-35	3.4	21:16	Small Boulder (50%) Cobble (30%) Large Boulder (10%) Gravel (5%) Bedrock (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
35-40	2.1	21:52	Cobble (55%) Small Boulder (30%) Gravel (10%) Bedrock (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
40-45	4.3	21:25	Cobble (60%) Small Boulder (30%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
45-50	4.3	20:58	Cobble (70%) Small Boulder (20%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%)
50-55	4.9	20:38	Cobble (75%) Small Boulder (15%) Gravel (10%)	Sea Urchins (Strongylocentrotus droebachiensis) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (2%)
55-60	5.2	19:52	Cobble (80%) Gravel (10%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (15%)
60-65	5.8	19:22	Cobble (80%) Gravel (10%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**U**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.*) (20%) Sour Weed (*Desmarestia sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
65-70	5.8	18:51	Cobble (85%) Gravel (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**U**) Hermit Crab (*Pagurus sp.*) (**U** - 1 individual)	Crustose Algae (*Lithothamnium sp*). (20%) Sour Weed (*Desmarestia sp.*) (2%)
70-75	6.1	18:20	Cobble (85%) Gravel (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**U**) Hermit Crab (*Pagurus sp.*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (20%)
75-80	6.4	17:58	Small Boulder (5%) Cobble (80%) Gravel (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (2%)
80-85	6.7	17:40	Cobble (80%) Gravel (10%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (2%)
85-90	7.6	17:15	Cobble (65%) Small Boulder (20%) Gravel (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (2%)
90-95	7.6	16:56	Cobble (70%) Small Boulder (10%) Gravel (10%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (5%)
95-100	7.9	16:40	Cobble (65%) Gravel (20%) Shells (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
100-105	7.9	16:14	Cobble (50%) Gravel (35%) Shells (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (2%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
105-110	7.9	15:47	Gravel (50%) Cobble (35%) Small Boulder (5%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (2%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
110-115	7.9	15:30	Gravel (45%) Cobble (40%) Shells (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (5%)
115-120	8.5	15:05	Bedrock (50%) Cobble (35%) Gravel (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (2%)
120-125	9.1	14:43	Bedrock (40%) Gravel (40%) Cobble (10%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)
125-130	9.1	14:00	Gravel (80%) Shells (10%) Small Boulder (5%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (10%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
130-135	9.1	13:47	Gravel (80%) Cobble (15%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
135-140	9.1	13:21	Gravel (75%) Cobble (20%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (2%)
140-145	9.1	12:41	Bedrock (40%) Small Boulder (20%) Cobble (20%) Gravel (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Tube Worm (**U**) (*Spirobis sp.*)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)
145-150	9.8	12:22	Bedrock (80%) Small Boulder (10%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
150-155	10.1	12:04	Cobble (35%) Gravel (30%) Bedrock (20%) Small Boulder (10%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (10%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
155-160	10.1	11:43	Gravel (50%) Cobble (30%) Small Boulder (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (20%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
160-165	10.4	11:28	Gravel (50%) Cobble (30%) Small Boulder (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (20%), Ribbed Lace Weed (*Membranoptera sp.*) (2%)
165-170	10.4	10:47	Gravel (50%) Cobble (30%) Small Boulder (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (10%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
170-175	10.4	10:34	Gravel (50%) Small Boulder (30%) Cobble (30%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
175-180	10.1	10:10	Gravel (50%) Small Boulder (30%) Cobble (30%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (20%) Ribbed Lace Weed (*Membranoptera sp.*) (2%) Sour Weed (*Desmarestia sp.*) (1%)
180-185	9.8	9:33	Large Boulder (60%) Bedrock (20%) Small Boulder (10%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Ribbed Lace Weed (*Membranoptera sp.*) (1%) Sour Weed (*Desmarestia sp.*) (1%)
185-190	10.1	9:16	Small Boulder (60%) Bedrock (20%) Large Boulder (10%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (30%) Ribbed Lace Weed (*Membranoptera sp.*) (2%) Sour Weed (*Desmarestia sp.*) (1%)
190-195	10.4	8:45	Small Boulder (70%) Cobble (20%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**C**)	Crustose Algae *(Lithothamnium sp.)* (30%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
195-200	10.4	8:12	Small Boulder (65%) Cobble (30%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**C**) Horse Mussel (*Modiolus modiolus)*(**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Ribbed Lace Weed (*Membranoptera sp.*) (2%) Sour Weed (*Desmarestia sp.*) (1%)
200-205	10.4	8:01	Small Boulder (40%) Cobble (35%) Bedrock (20%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%) Ribbed Lace Weed (*Membranoptera sp.*) (2%) Sour Weed (*Desmarestia sp.*) (1%)
205-210	10.4	7:45	Small Boulder (40%) Cobble (35%) Bedrock (20%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%) Ribbed Lace Weed (*Membranoptera sp.*) (2%) Sour Weed (*Desmarestia sp.*) (1%)
210-215	10.7	7:19	Bedrock (50%) Small Boulder (20%) Cobble (20%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (Modiolus modiolus) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%) Leaf Weeds (*Phyllophora sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
215-220	10.4	6:44	Bedrock (45%) Small Boulder (20%) Cobble (20%) Large Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%) Sour Weed (*Desmarestia sp.*) (1%) Leaf Weeds (*Phyllophora sp.*) (1%)
220-225	10.4	6:20	Bedrock (45%) Small Boulder (20%) Cobble (20%) Large Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (50%)
225-230	10.7	5:55	Bedrock (70%) Small Boulder (10%) Cobble (10%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%)
230-235	10.1	5:31	Bedrock (70%) Small Boulder (10%) Cobble (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (U – 1 individual)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (1%)
235-240	10.7	5:22	Bedrock (81%) Small Boulder (10%) Cobble (5%) Shells (3%) Sand (1%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%)
240-245	10.7	4:58	Bedrock (89%) Cobble (5%) Small Boulder (2%) Shells (2%) Sand (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
245-250	10.7	4:58	Bedrock (94%) Small Boulder (2%) Cobble (2%) Mussel and Urchin Shells (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%)
250-255	10.7	4:33	Bedrock (94%) Small Boulder (2%) Cobble (2%) Mussel and Urchin Shells (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%)
255-260	10.7	4:33	Bedrock (98%) Small Boulder (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (40%)
260-265	10.7	4:09	Bedrock (100%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%)
265-270	10.7	4:09	Bedrock (100%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%)
270-275	11.3	3:31	Bedrock (100%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%)
275-280	12.2	3:02	Bedrock (100%)	Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	No Flora Observed
280-285	13.7	2:18	Bedrock (99%) Small Boulder (1%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (1%) Leaf Weeds (*Phyllophora sp.*) (1%)
285-290	11.3	1:41	Bedrock (88%) Cobble (5%) Sand (5%) Gravel (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
290-295	12.2	1:14	Bedrock (98%) Small Boulder (1%) Cobble (1%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Sour Weed (*Desmarestia sp.*) (1%)
295-300	13.7	0:25	Bedrock (98%) Small Boulder (1%) Cobble (1%)	Sea Urchins (*Strongylocentrotus droebachiensis*) ((**U**) Blue Mussel (*Mytilus edulis)* (**O**)	Sour Weed (*Desmarestia sp.*) (1%) Leaf Weeds (*Phyllophora sp.*) (1%)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.2 - Transect T-2, Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0	28:56	Cobble (45%) Bedrock (Cliff) (40%) Small Boulder (10%) Large Boulder (5%)	No Fauna Observed	No Flora Observed
0-5	0.6	28:04	Cobble (80%) Bedrock (5%) Small Boulder (5%) Large Boulder (5%) Gravel (5%)	Blue Mussel (*Mytilus edulis)* (**U**)	Rockweed (*Fucus sp.*) (5%) Sour Weed (*Desmarestia sp.*) (2%) Knotted Wrack (*Ascophyllum nodosum*) (1%)
5-10	1.2	27:37	Cobble (90%) Bedrock (5%) Small Boulder (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (2%) Coral Weed (*Corallina officinalis*) (2%) Rockweed (*Fucus sp.*) (2%) Knotted Wrack (*Ascophyllum nodosum*) (1%)
10-15	1.8	26:53	Cobble (80%) Bedrock (10%) Small Boulder (10%)	Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (20%) Rockweed (*Fucus sp.*) (5%) Sour Weed (*Desmarestia sp.*) (2%) Coral Weed (*Corallina officinalis)* (2%) Green Filamentous (*Chaetomorpha sp.*) (2%)
15-20	2.1	25:19	Small Boulder (60%) Cobble (30%) Large Boulder (10%)	Periwinkle (*Littorina sp.*) (**O**) (On Rocks and Kelp)	Edible Kelp (*Alaria sp.*) (40%) Coral Weed (*Corallina officinalis*) (10%) Sea Lettuce (*Ulva lactuca*) (5%) Green filamentous (*Chaetomorpha sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
25-30	3.1	23:40	Small Boulder (60%) Cobble (35%) Gravel (5%)	No Fauna Observed	Edible Kelp (*Alaria sp.*) (60%) Green Filamentous (*Chaetomorpha sp.*) (5%) *Chordaria flagelliformis* (5%) Sour Weed (*Desmarestia sp.*) (2%) Crustose Algae *(Lithothamnium sp.)* (2%)
30-35	3.7	22:57	Small Boulder (50%) Cobble (45%) Gravel (5%)	Periwinkle (*Littorina sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (25%) Green Filamentous (*Chaetomorpha sp.*) (5%) *Chordaria flagelliformis* (5%) Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%)
35-40	4.0	22:27	Small Boulder (70%) Cobble (20%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**U**) Blue Mussel (*Mytilus edulis)* (**U**)	Edible Kelp (*Alaria sp.*) (25%) Crustose Algae *(Lithothamnium sp.)* (5%) Green Filamentous (*Chaetomorpha sp.*) (2%)
40-45	4.6	19:47	Small Boulder (50%) Cobble (40%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Periwinkle (*Littorina sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (20%) Crustose Algae *(Lithothamnium sp.)* (5%) Green Filamentous (*Chaetomorpha sp.*) (5%) Black Whip Weed (*Chordaria flagelliformis*) (2%)
45-50	5.5	20:09	Small Boulder (45%) Cobble (30%) Bedrock (10%) Gravel (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (20%) Crustose Algae *(Lithothamnium sp.)* (5%) Green Filamentous (*Chaetomorpha sp.*) (2%) Sour Weed (*Desmarestia sp.*) (2%) Black Whip Weed (*Chordaria flagelliformis*) (1%)
50-55	6.1	20:31	Small Boulder (40%) Cobble (30%) Bedrock (10%) Gravel (10%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
55-60	6.4	19:19	Small Boulder (50%) Cobble (20%) Bedrock (15%) Gravel (5%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
60-65	7.0	19:02	Small Boulder (50%) Cobble (30%) Gravel (10%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
65-70	7.3	18:38	Small Boulder (30%) Gravel (30%) Cobble (20%) Bedrock (10%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
70-75	7.6	18:17	Gravel (45%) Cobble (30%) Bedrock (10%) Small Boulder (5%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
75-80	7.9	17:11	Cobble (35%) Gravel (25%) Bedrock (20%) Small Boulder (10%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Hermit Crab (*Pagurus sp.*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
80-85	8.5	16:47	Bedrock (90%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
85-90	9.1	16:27	Bedrock (80%) Small Boulder (10%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
90-95	9.1	16:10	Bedrock (40%) Small Boulder (20%) Cobble (30%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
95-100	9.5	15:52	Cobble (40%) Bedrock (30%) Small Boulder (20%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Tube Worm (*Spirobis sp.*) (**U** – 2 individuals)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
100-105	9.5	15:29	Cobble (80%) Small Boulder (10%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
105-110	9.8	15:09	Cobble (50%) Bedrock (20%) Small Boulder (10%) Gravel (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.)* (15%) Ribbed Lace Weed (*Membranoptera sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
110-115	10.1	14:12	Cobble (60%) Small Boulder (20%) Gravel (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (15%) Ribbed Lace Weed (*Membranoptera sp.*) (5%)
115-120	10.1	13:50	Cobble (60%) Small Boulder (20%) Gravel (10%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
120-125	10.1	13:06	Cobble (50%) Small Boulder (40%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
125-130	10.4	12:45	Cobble (50%) Small Boulder (40%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (5%)
130-135	10.4	12:23	Cobble (50%) Small Boulder (40%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)
135-140	10.7	12:08	Cobble (50%) Small Boulder (30%) Gravel (10%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (2%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
140-145	10.7	10:57	Cobble (50%) Small Boulder (30%) Gravel (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (3%)
145-150	10.1	10:36	Cobble (45%) Small Boulder (20%) Bedrock (20%) Gravel (5%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (1%)
150-155	10.1	9:55	Cobble (30%) Bedrock (30%) Small Boulder (20%) Large Boulder (10%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus*) (**O**) Tube Worm (*Spirobis sp.*) (**U** – 1 individuals) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (2%)
155-160	10.1	9:27	Bedrock (80%) Small Boulder (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (1%)
160-165	10.1	9:01	Bedrock (80%) Small Boulder (10%) Cobble (5%) Gravel (3%) Shells (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus*) (**O**) Deep-Sea Scallop (Placopecten magellanicus) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (1%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
165-170	10.4	8:31	Bedrock (80%) Small Boulder (10%) Cobble (5%) Gravel (3%) Shells (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
170-175	10.4	8:05	Bedrock (80%) Small Boulder (10%) Cobble (5%) Gravel (3%) Shells (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (1%)
175-180	10.4	7:49	Bedrock (80%) Small Boulder (10%) Cobble (5%) Gravel (3%) Shells (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (1%)
180-185	11.0	6:42	Bedrock (80%) Small Boulder (10%) Cobble (5%) Gravel (3%) Shells (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel *(Modiolus modiolus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (1%)
185-190	12.5	6:04	Small Boulder (45%) Bedrock (30%) Large Boulder (10%) Cobble (5%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus*) (**C**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (1%)
190-195	12.8	5:25	Bedrock (50%) Small Boulder (30%) Gravel (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Blue Mussel (*Mytilus edulis)* (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (1%)
195-200	13.1	4:55	Small Boulder (55%) Cobble (15%) Bedrock (10%) Large Boulder (10%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
200-205	13.7	4:27	Small Boulder (50%) Large Boulder (20%) Cobble (15%) Gravel (5%) Bedrock (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
205-210	14.6	3:55	Small Boulder (50%) Cobble (25%) Gravel (10%) Large Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
210-215	15.2	3:27	Small Boulder (60%) Cobble (20%) Gravel (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (5%)
215-220	15.2	2:33	Small Boulder (50%) Cobble (28%) Gravel (10%) Large Boulder (5%) Shells (5%) Sand (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
220-225	15.5	2:08	Cobble (38%) Sand (30%) Small Boulder (15%) Gravel (10%) Large Boulder (5%) Shells (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)
225-230	15.9	1:50	Sand (85%) Small Boulder (5%) Cobble (5%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U –** 3 individuals) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
230-235	16.2	1:28	Sand (85%) Small Boulder (5%) Cobble (5%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U –** 2 individuals)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (1%)
235-240	16.5	1:06	Sand (80%) Cobble (10%) Small Boulder (5%) Gravel (5%)	Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (Placopecten magellanicus) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (1%)
240-245	16.8	0:15	Sand (60%) Small Boulder (15%) Cobble (10%) Large Boulder (10%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Tube Worm (*Spirobis sp.*) (**U** – 1 individual) Blue Mussel (*Mytilus edulis*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (1%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
245-250	16.8	0:00	Sand (78%) Cobble (15%) Small Boulder (5%) Gravel (2%)	Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U -** 1 individual)	Crustose Algae *(Lithothamnium sp.)* (5%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.3 - Transect T-3, Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0		Bedrock (90%) Large Boulder (10%)	No Fauna Observed	Rockweed (*Fucus sp.*) (50%) Knotted Wrack (*Ascophyllum nodosum*) (1%)
0-5	1.2	14:22	Bedrock (50%) Small Boulder (30%) Cobble (10%) Large Boulder (5%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (40%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Green Filamentous (*Chaetomorpha sp.*) (10%) Red Tubed Weed (*Rhodomela sp.*) (5%) Rockweed (*Fucus sp.*) (10%) Dulse (*Palmeria palmata*) (2%)
5-10	0.91	14:00	Bedrock (30%) Small Boulder (20%) Cobble (30%) Gravel (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (20%) Sour Weed (*Desmarestia sp.*) (10%)
10-15	2.4	13:34	Small Boulder (50%) Bedrock (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**O**)	Edible Kelp (*Alaria sp.*) (15%) Crustose Algae *(Lithothamnium sp.)* (5%) Black Whip Weed (*Chordaria flagelliformis*) (5%) Sour Weed (*Desmarestia sp.*) (2%) Red Tubed Weed (*Rhodomela sp.*) (1%)
15-20	3.7	12:42	Small Boulder (70%) Bedrock (20%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**C**) Frilled anemone (*Metridium senile*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (20%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Green Filamentous (*Chaetomorpha sp.*) (5%)
20-25	5.2	12:18	Small Boulder (60%) Cobble (35%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Coral Weed (*Corallina officinalis*) (1%)
25-30	6.1	12:01	Small Boulder (60%) Cobble (35%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) **Storm Toss:** Edible Kelp (*Alaria sp.*) Rockweed (*Fucus sp.*)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
30-35	6.7	11:45	Cobble (55%) Small Boulder (40%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) **Storm Toss:** Edible Kelp (*Alaria sp.*) Rockweed (*Fucus sp.*)
35-40	7.3	11:25	Cobble (50%) Small Boulder (30%) Gravel (10%) Large Boulder (5%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) **Storm Toss:** Rockweed (*Fucus sp.*)
40-45	7.9	11:11	Small Boulder (50%) Cobble (40%) Gravel (5%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (2%) **Storm Toss:** Rockweed (*Fucus sp.*)
45-50	8.5	10:53	Cobble (50%) Small Boulder (30%) Gravel (10%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Rockweed (*Fucus sp.*)
50-55	9.1	10:31	Bedrock (30%) Large Boulder (20%) Small Boulder (20%) Cobble (20%) Gravel (5%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Blue Mussel (*Mytilus edulis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U –** 1 Individual)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (10%)
55-60	9.7	10:12	Cobble (60%) Small Boulder (20%) Bedrock (5%) Gravel (5%) Shell (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)*(**U**) Deep-Sea Scallop (Placopecten magellanicus) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
60-65	10.1	9:52	Cobble (55%) Gravel (20%) Small Boulder (10%) Shell (10%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (Modiolus modiolus) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (5%)
65-70	10.4	9:30	Cobble (60%) Gravel (5%) Small Boulder (20%) Bedrock (5%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%)
70-75	10.7	9:07	Bedrock (30%) Small Boulder (20%) Cobble (20%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (2%)
75-80	11.9	8:49	Bedrock (50%) Small Boulder (20%) Cobble (10%) Gravel (10%) Shell (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)
80-85	11.9	8:23	Cobble (50%) Gravel (30%) Shell (20%) Sand (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (30%) Sour Weed (*Desmarestia sp.*) (5%) Rockweed (*Fucus sp.*) (1%)
85-90	12.2	8:03	Small Boulder (40%) Cobble (30%) Gravel (10%) Large Boulder (10%) Shell (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (45%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (2%) Sea Colander (*Agarum sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
90-95	13.1	7:43	Small Boulder (40%) Cobble (35%) Gravel (10%) Large Boulder (5%) Shell (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (2%)
95-100	13.1	7:33	Cobble (40%) Gravel (25%) Sand (20%) Small Boulder (10%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%) Ribbed Lace Weed (*Membranoptera sp.*) (1%)
100-105	13.4	7:12	Cobble (50%) Gravel (25%) Small Boulder (10%) Sand (10%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)
105-110	14.3	6:50	Cobble (50%) Gravel (20%) Small Boulder (20%) Large Boulder (5%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Horse Mussel (*Modiolus modiolus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%) Dulse (*Palmeria palmata*) (1%)
110-115	14.6	6:30	Cobble (60%) Sand (20%) Gravel (10%) Small Boulder (5%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (2%) Ribbed Lace Weed (*Membranoptera sp.*) (2%) Edible Kelp (*Alaria sp.*) (1%)
115-120	15.2	6:11	Cobble (65%) Sand (20%) Gravel (10%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
120-125	15.9	5:51	Cobble (50%) Sand (30%) Gravel (15%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
125-130	16.2	5:34	Sand (50%) Gravel (30%) Cobble (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%) Sour Weed (*Desmarestia sp.*) (1%)
130-135	16.5	5:15	Sand (50%) Gravel (30%) Cobble (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%) Sour Weed (*Desmarestia sp.*) (1%)
135-140	16.8	4:54	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%)
140-145	17.7	3:42 to 4:40	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%)
145-150	18.3	3:29	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
150-155	19.2	3:11	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O** – 6 individuals) Sand Dollar (*Echinarachnius parma*) (**O**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (2%)
155-160	19.5	2:53	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%)
160-165	20.1	2:26	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O** – 6 individuals) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%)
165-170	20.7	2:10	Sand (50%) Gravel (40%) Cobble (9%) Small Boulder (1%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O** – 1 individual) Sand Dollar (*Echinarachnius parma*) (**O**) Winter Flounder (*Pseudopleuronectes americanus*) (**O** – 2 individuals)	Crustose Algae *(Lithothamnium sp.)* (2%)
170-175	22.0	1:55	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis)* (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%) Sour Weed (*Desmarestia sp.*) (1%)
175-180	22.3	1:44	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
180-185	22.6	1:32	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%) Sour Weed (*Desmarestia sp.*) (1%)
185-190	23.2	1:14	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Sand Dollar (Echinarachnius parma) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%) Sour Weed (*Desmarestia sp.*) (1%)
190-195	23.8	0:53	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (2%)
195-200	23.8	0:00	Sand (50%) Gravel (40%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (2%)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.4 - Transect T-4, Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0		**Nearshore:** Cobble (70%) Small Boulder (30%) **Midshore:** Cobble (100%) **Backshore:** Bedrock (Cliff) (100%)	No Fauna Observed	No Flora Observed
0-5	0		Cobble (70%) Small Boulder (30%)	No Fauna Observed	No Flora Observed
5-10	0.6	21:29	Cobble (50%) Small Boulder (50%)	Periwinkle (*Littorina sp.*) (**U**)	Black Whip Weed (Chordaria flagelliformis) (5%)
10-15	0.9	20:48	Cobble (90%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (80%)
15-20	1.2	19:48	Cobble (85%) Small Boulder (10%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Periwinkle (*Littorina sp.*) (**O**) Frilled anemone (*Metridium senile*) (**U**)	Edible Kelp (*Alaria sp.*) (50%) Sour Weed (*Desmarestia sp.*) (5%) Red Tubed Weed (*Rhodomela sp.*) (2%)
20-25	1.5	19:21	Small Boulder (70%) Cobble (20%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (5%) Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%)
25-30	1.5	19:02	Bedrock (40%) Large Boulder (30%) Small Boulder (20%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Periwinkle (*Littorina sp.*) (**O**) Frilled anemone (*Metridium senile*) (**U**)	Edible Kelp (*Alaria sp.*) (30%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
30-35	1.5	18:30	Bedrock (65%) Large Boulder (20%) Cobble (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Periwinkle (*Littorina sp.*) (**O**) Frilled anemone (*Metridium senile*) (**U**)	Edible Kelp (*Alaria sp.*) (25%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Knotted Wrack (*Ascophyllum nodosum*) (2%)
35-40	1.2	18:09	Bedrock (95%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**) Frilled anemone (*Metridium senile*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%)
40-45	0.9	17:42	Bedrock (80%) Large Boulder (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**) Frilled anemone (*Metridium senile*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (25%) Sour Weed (*Desmarestia sp.*) (10%) Green Filamentous (*Chaetomorpha sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%)
45-50	2.7	17:03	Bedrock (90%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis)* (**O**) Periwinkle (*Littorina sp.*) (**O**) Frilled anemone (*Metridium senile*) (**O**) Starfish (*Asterias sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (20%) Sour Weed (*Desmarestia sp.*) (10%) Green Filamentous (*Chaetomorpha sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%)
50-55	3.4	16:31	Bedrock (100%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%)
55-60	4.0	16:06	Bedrock (100%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**O**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%)
60-65	4.0	15:23	Bedrock (90%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**C**) Horse Mussel (*Modiolus modiolus*) (**O**)	Sour Weed (*Desmarestia sp.*) (15%) Edible Kelp (*Alaria sp.*) (10%) Sea Colander (*Agarum sp.*) (1%)
65-70	5.2	14:11	Bedrock (90%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**A**) Horse Mussel (*Modiolus modiolus*) (**O**) Starfish (*Asterias sp.*) (**O**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Coral Weed (*Corallina officinalis*) (5%) Sea Colander (*Agarum sp.*) (2%) **Note:** Large Outcrops

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
70-75	6.7	13:42	Bedrock (70%) Large Boulder (30%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**O**) Periwinkle (*Littorina sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) **Note:** Large Outcrops
75-80	8.5	13:19	Bedrock (70%) Gravel (10%) Large Boulder (5%) Small Boulder (5%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**U**) Periwinkle (*Littorina sp.*) (**U**) Starfish (*Asterias sp.*) (**U**) Barnacle (*Balunus sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
80-85	7.9	10:06	Bedrock (60%) Gravel (10%) Large Boulder (10%) Small Boulder (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**U**) Periwinkle (*Littorina sp.*) (**U**) Horse Mussel (*Modiolus modiolus*) (**O**) Starfish (*Asterias sp.*) (**U**) Barnacle (*Balunus sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) Sea Colander (*Agarum sp.*) (2%)
85-90	8.2	9:40	Bedrock (40%) Cobble (30%) Gravel (20%) Small Boulder (10%)	Sea Urchins (Strongylocentrotus droebachiensis) (**O**) Frilled anemone (*Metridium senile*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)
90-95	9.1	9:12	Bedrock (80%) Cobble (10%) Gravel (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%)
95-100	11.0	8:53	Bedrock (100%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
100-105	11.3	8:22	Bedrock (80%) Large Boulder (10%) Small Boulder (5%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**U**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Horse Mussel (*Modiolus modiolus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (10%)
105-110	12.2	7:47	Small Boulder (50%) Cobble (20%) Gravel (20%) Sand (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%)
110-115	12.5	7:26	Cobble (60%) Gravel (20%) Sand (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Sour Weed (*Desmarestia sp.*) (10%) **Storm Toss:** Rockweed (*Fucus sp.*)
115-120	12.8	7:12	Sand (50%) Cobble (30%) Gravel (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**C**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Rockweed (*Fucus sp.*)
120-125	12.8	6:29	Sand (80%) Cobble (10%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Rockweed (*Fucus sp.*)
125-130	13.1	5:35	Sand (90%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Rockweed (*Fucus sp.*)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
130-135	13.7	5:03	Sand (90%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Rockweed (*Fucus sp.*)
135-140	14.3	4:48	Sand (90%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Rockweed (*Fucus sp.*)
140-145	14.9	4:28	Sand (90%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	No Flora Found **Storm Toss:** Rockweed (*Fucus sp.*)
145-150	15.9	3:53	Sand (90%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Starfish (*Asterias sp.*) (**O**) Sand Dollar (*Echinarachnius parma*) (**U**)	No Flora Found **Storm Toss:** Rockweed (*Fucus sp.*)
150-155	16.5	3:30	Sand (95%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	No Flora Found **Storm Toss:** Rockweed (*Fucus sp.*)
155-160	16.5	3:15	Sand (95%) Gravel (5%)	Sea Urchins (Strongylocentrotus droebachiensis) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (Echinarachnius parma) (**U**)	Sour Weed (*Desmarestia sp.*) (2%) **Storm Toss:** Rockweed (*Fucus sp.*)
160-165	18.0	2:53	Sand (95%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	No Flora Found **Storm Toss:** Rockweed (*Fucus sp.*)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
165-170	18.6	2:30	Sand (85%) Gravel (10%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (2%) **Storm Toss:** Rockweed (*Fucus sp.*)
170-175	19.5	2:16	Sand (70%) Gravel (20%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (2%) **Storm Toss:** Rockweed (*Fucus sp.*)
175-180	19.8	1:53	Sand (70%) Gravel (20%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Sour Weed (*Desmarestia sp.*) (2%) **Storm Toss:** Rockweed (*Fucus sp.*)
180-185	20.7	1:20	Sand (50%) Gravel (20%) Cobble (30%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Sour Weed (*Desmarestia sp.*) (2%) Crustose Algae *(Lithothamnium sp.)* (2%) **Storm Toss:** Rockweed (*Fucus sp.*)
185-190	21.3	0:55	Sand (50%) Gravel (20%) Cobble (30%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) **Storm Toss:** Rockweed (*Fucus sp.*)
190-195	22.0	0:33	Sand (50%) Gravel (20%) Cobble (30%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) **Storm Toss:** Rockweed (*Fucus sp.*)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
195-200	22.6	0:00	Sand (65%) Gravel (20%) Cobble (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (2%) Crustose Algae *(Lithothamnium sp.)* (2%) **Storm Toss:** Edible Kelp (*Alaria sp.*) Sea Colander (*Agarum sp.*) Rockweed (*Fucus sp.*)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.5 - Transect T-5, Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0		Bedrock (60%) Cobble (30%) Gravel (10%)	No Fauna Observed	Rockweed (*Fucus sp.*) (60%) Edible Kelp (*Alaria sp.*) (20%)
-5-0	3.4	17:31	Bedrock (70%) Small Boulder (10%) Cobble (10%) Gravel (5%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Edible Kelp (*Alaria sp.*) (80%) Rockweed (*Fucus sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Dulse (*Palmeria palmata*) (5%) *Callophyllis sp. (*2%) Coral Weed (*Corallina officinalis*) (2%) Laminaria (2%) Red Tubed Weed (*Rhodomela sp.*) (2%)
0-5	3.7	16:04	Bedrock (40%) Large Boulder (40%) Small Boulder (10%) Cobble (5%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Frilled anemone (*Metridium senile*) (**O**) Porifera (**U** – 2 individuals)	Edible Kelp (*Alaria sp.*) (50%) Sour Weed (*Desmarestia sp.*) (10%) Green Filamentous (*Chaetomorpha sp.*) (5%) Black Whip Weed (*Chordaria flagelliformis*) (5%)
5-10	5.2	15:14	Gravel (50%) Small Boulder (20%) Cobble (20%) Shells (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (60%) Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%) Green Filamentous (*Chaetomorpha sp.*) (2%)
10-15	6.1	14:52	Gravel (85%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Edible Kelp (*Alaria sp.*) (30%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Green Filamentous (*Chaetomorpha sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
15-20	7.0	14:22	Bedrock (55%) Gravel (30%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Edible Kelp (*Alaria sp.*) (10%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (10%)
20-25	8.5	13:45	Bedrock (70%) Gravel (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Edible Kelp (*Alaria sp.*) (5%) Sour Weed (*Desmarestia sp.*) (5%)
25-30	9.5	12:42	Bedrock (40%) Cobble (40%) Gravel (10%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Frilled anemone (*Metridium senile*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Edible Kelp (*Alaria sp.*) (5%) Green Filamentous (*Chaetomorpha sp.*) (2%)
30-35	9.6	12:24	Cobble (50%) Gravel (45%) Shells (10%) Sand (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.)* (10%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Kelp (*Laminaria sp.*) (5%) Edible Kelp (*Alaria sp.*) (5%) Green Filamentous (*Chaetomorpha sp.*) (2%) Sea Lettuce (*Ulva lactuca*) (2%)
35-40	10.7	12:01	Cobble (70%) Gravel (15%) Shells (10%) Sand (5%)	Horse Mussel (*Modiolus modiolus)* (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.)* (10%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Kelp (*Laminaria sp.*) (10%) Edible Kelp (*Alaria sp.*) (5%) Green Filamentous (*Chaetomorpha sp.*) (5%)
40-45	11.0	11:16	Gravel (55%) Cobble (30%) Shells (10%) Sand (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.)* (10%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Kelp (*Laminaria sp.*) (10%) Edible Kelp (*Alaria sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
45-50	11.3	11:00	Gravel (80%) Shells (10%) Cobble (5%) Sand (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.)* (10%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Kelp (*Laminaria sp.*) (10%) Edible Kelp (*Alaria sp.*) (5%)
50-55	11.9	10:34	Gravel (80%) Shells (10%) Cobble (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.)* (15%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Edible Kelp (*Alaria sp.*) (5%) Green Filamentous (*Chaetomorpha sp.*) (1%)
55-60	12.2	10:12	Gravel (80%) Shells (10%) Cobble (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** - 1 individual)	Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.)* (20%) Edible Kelp (*Alaria sp.*) (10%) Kelp (*Laminaria sp.*) (2%)
60-65	12.5	9:40	Gravel (70%) Cobble (10%) Sand (10%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (5%) Kelp (*Laminaria sp.*) (5%)
65-70	13.4	9:07	Gravel (70%) Cobble (10%) Sand (10%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (15%) Crustose Algae *(Lithothamnium sp.)* (10%) Black Whip Weed (*Chordaria flagelliformis*) (5%) Edible Kelp (*Alaria sp.*) (5%) Rockweed (*Fucus sp.*) (1%) Green Filamentous (*Chaetomorpha sp.*) (1%)
70-75	14.6	8:40	Gravel (70%) Cobble (10%) Sand (10%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (10%)
75-80	14.6	8:28	Gravel (60%) Sand (25%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (10%) Kelp (*Laminaria sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
80-85	14.3	7:48 and 8:13	Gravel (60%) Sand (25%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (15%) Sour Weed (*Desmarestia sp.*) (10%) Edible Kelp (*Alaria sp.*) (5%)
85-90	14.9	7:17	Gravel (40%) Sand (40%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (10%) Edible Kelp (*Alaria sp.*) (10%) Kelp (*Laminaria sp.*) (5%) Black Whip Weed (*Chordaria flagelliformis*) (5%) Green Filamentous (*Chaetomorpha sp.*) (1%) Knotted Wrack (*Ascophyllum nodosum*) (1%)
90-95	15.2	6:13	Sand (55%) Gravel (30%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Edible Kelp (*Alaria sp.*) (5%) Kelp (*Laminaria sp.*) (5%)
95-100	15.9	5:47	Sand (55%) Gravel (30%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%)
100-105	16.5	5:21	Sand (55%) Gravel (30%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*)
105-110	17.4	5:05	Sand (65%) Gravel (20%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
110-115	17.7	4:47	Sand (70%) Gravel (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual) Sand Dollar (*Echinarachnius parma*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)
115-120	18.0	4:32	Sand (70%) Gravel (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*)
120-125	18.3	4:05	Sand (70%) Gravel (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual) Sand Dollar (*Echinarachnius parma*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*) Sea Colander (*Agarum sp.*)
125-130	18.9	3:37	Sand (75%) Gravel (15%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**O**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)
130-135	18.9	3:14	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 individuals) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)
135-140	19.8	2:49	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
140-145	20.4	2:00	Sand (75%) Gravel (10%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual) Sand Dollar (*Echinarachnius parma*) (**O**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)
145-150	20.7	1:30	Sand (80%) Cobble (10%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Sea Colander (*Agarum sp.*)
150-155	22.3	1:10	Sand (80%) Cobble (10%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)
155-160	22.3	0:46	Sand (80%) Cobble (10%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*) Sea Colander (*Agarum sp.*)
160-165	22.6	0:21	Sand (80%) Cobble (10%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)
165-170	22.6	0:00	Sand (80%) Cobble (10%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.6 - Transect T-6, Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0		**Nearshore:** Bedrock (30%) Cobble (20%) Small Boulder (50%) **Midshore:** Cobble (50%) Bedrock (40%) Small Boulder (5%) Large Boulder (5%) **Backshore:** Bedrock (100%) (Cliff)	No Fauna Observed	Edible Kelp (*Alaria sp.*) (20%) Rockweed (*Fucus sp.*) (10%)
0-5	1.2	21:56	Small Boulder (50%) Cobble (40%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**) Rock Crab (*Cancer sp.*) (**U** – 1 individual)	Smooth Chord Weed (*Chorda filum*) (10%) Edible Kelp (*Alaria sp.*) (10%) Sour Weed (*Desmarestia sp.*) (2%) Green Filamentous (*Cladophora sp.*) (2%) Sea Lettuce (*Ulva lactuca*) (1%) *Halosaccion sp* (1%) Red Tubed Weed (*Rhodomela sp.*) (1%)
5-10	1.5	21:11	Small Boulder (90%) Cobble (5%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Frilled anemone (*Metridium senile*) (**U**) Barnacle (*Balunus sp.*) (**O**) Periwinkle (*Littorina sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**)	Edible Kelp (*Alaria sp.*) (10%) Smooth Chord Weed (*Chorda filum*) (10%) Sour Weed (*Desmarestia sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
10-15	1.5	20:20	Small Boulder (80%) Cobble (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Frilled anemone (*Metridium senile*) (**O**) Barnacle (*Balunus sp.*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Sour Weed (*Desmarestia sp.*) (1%)
15-20	3.4	19:44	Small Boulder (75%) Cobble (20%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Frilled anemone (*Metridium senile*) (**O**) Barnacle (*Balunus sp.*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%) Edible Kelp (*Alaria sp.*) (2%)
20-25	4.3	18:29	Small Boulder (60%) Cobble (40%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Frilled anemone (*Metridium senile*) (**U**) Barnacle (*Balunus sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (2%) Sour Weed (*Desmarestia sp.*) (2%)
25-30	4.9	17:55	Cobble (60%) Small Boulder (40%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (2%)
30-35	5.2	17:27	Cobble (60%) Small Boulder (40%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)
35-40	6.1	16:57	Cobble (90%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%) Edible Kelp (*Alaria sp.*) (5%) Rockweed (*Fucus sp.*) (1%)
40-45	6.1	16:22	Cobble (90%) Small Boulder (5%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%) Edible Kelp (*Alaria sp.*) (5%) Rockweed (*Fucus sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
45-50	6.1	15:57	Cobble (90%) Small Boulder (5%) Gravel (5%)	No Fauna Observed	Smooth Chord Weed (*Chorda filum*) (20%) Kelp (*Laminaria sp.*) (20%) Sour Weed (*Desmarestia sp.*) (15%) Edible Kelp (*Alaria sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%)
50-55	6.4	15:28	Cobble (90%) Small Boulder (10%)	No Fauna Observed	Smooth Chord Weed (*Chorda filum*) (30%) Sour Weed (*Desmarestia sp.*) (20%) Kelp (*Laminaria sp.*) (15%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%)
55-60	7.0	14:32	Cobble (90%) Gravel (10%)	Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Smooth Chord Weed (*Chorda filum*) (15%) Kelp (*Laminaria sp.*) (10%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Dulse (*Palmeria palmata*) (1%) Sea Lettuce (*Ulva lactuca*) (1%)
60-65	7.6	14:06	Cobble (70%) Gravel (30%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (10%) Kelp (*Laminaria sp.*) (5%) Smooth Chord Weed (*Chorda filum*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%)
65-70	7.6	13:25	Cobble (60%) Gravel (30%) Small Boulder (5%) Shells (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (10%) Kelp (*Laminaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (2%) Smooth Chord Weed (*Chorda filum*) (1%)
70-75	8.5	13:04	Cobble (50%) Gravel (35%) Small Boulder (5%) Shells (5%) Sand (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (40%) Kelp (*Laminaria sp.*) (30%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
75-80	9.1	12:51	Cobble (40%) Gravel (40%) Sand (15%) Shells (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (40%) Kelp (*Laminaria sp.*) (30%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (2%)
80-85	9.1	12:36	Cobble (45%) Gravel (30%) Sand (20%) Shells (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (40%) Kelp (*Laminaria sp.*) (20%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (2%)
85-90	9.1	12:21	Sand (45%) Gravel (40%) Cobble (10%) Shells (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (40%) Edible Kelp (*Alaria sp.*) (20%) Kelp (*Laminaria sp.*) (10%)
90-95	9.1	11:59	Sand (60%) Gravel (30%) Cobble (5%) Shells (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (40%) Edible Kelp (*Alaria sp.*) (20%) Kelp (*Laminaria sp.*) (10%)
95-100	9.5	11:23	Sand (60%) Gravel (30%) Cobble (5%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (40%) Edible Kelp (*Alaria sp.*) (30%) Kelp (*Laminaria sp.*) (2%) Black Whip Weed (*Chordaria flagelliformis*) (2%)
100-105	9.8	11:06	Sand (85%) Gravel (10%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (10%)
105-110	10.4	10:46	Sand (85%) Gravel (10%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (15%) Edible Kelp (*Alaria sp.*) (10%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
110-115	10.4	10:16	Sand (80%) Large Boulder (10%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%)
115-120	10.7	9:46	Sand (60%) Large Boulder (20%) Small Boulder (10%) Shells (5%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**C**)	Sour Weed (*Desmarestia sp.*) (20%) Kelp (*Laminaria sp.*) (10%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%)
120-125	11.0	8:36	Sand (80%) Small Boulder (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**C**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual) Sand Dollar (*Echinarachnius parma*) (**U**) Horse Mussel (*Modiolus modiolus)*(**U**) Frilled anemone (*Metridium senile*) (**U**)	Sour Weed (*Desmarestia sp.*) (30%) Edible Kelp (*Alaria sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea Colander (*Agarum sp.*) (2%)
125-130	11.8	8:14	Sand (80%) Small Boulder (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**C**)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%) Edible Kelp (*Alaria sp.*) (2%)
130-135	12.5	7:51	Sand (80%) Small Boulder (10%) Shells (5%) Cobble (5%)	Sand Dollar (*Echinarachnius parma*) (**C**)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%) Edible Kelp (*Alaria sp.*) (2%)
135-140	12.5	6:57	Small Boulder (50%) Sand (40%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (10%) Edible Kelp (*Alaria sp.*) (5%)
140-145	14.3	6:18	Small Boulder (60%) Sand (30%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (40%) Crustose Algae *(Lithothamnium sp.)* (10%) Edible Kelp (*Alaria sp.*) (10%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
			Shells (5%)	Horse Mussel (*Modiolus modiolus)*(**U**)	
145-150	13.7	5:22	Sand (50%) Small Boulder (40%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (30%) Edible Kelp (*Alaria sp.*) (10%) Sea Colander (*Agarum sp.*) (5%)
150-155	14.6	4:31	Small Boulder (60%) Sand (20%) Gravel (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea Colander (*Agarum sp.*) (5%)
155-160	15.2	3:59	Sand (50%) Gravel (30%) Cobble (10%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (70%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea Colander (*Agarum sp.*) (5%)
160-165	15.2	3:40	Sand (40%) Small Boulder (30%) Gravel (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea Colander (*Agarum sp.*) (5%)
165-170	15.9	2:46	Sand (40%) Gravel (20%) Cobble (20%) Shells (10%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea Colander (*Agarum sp.*) (5%)
170-175	16.8	2:32	Sand (30%) Gravel (30%) Cobble (20%) Shells (10%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea Colander (*Agarum sp.*) (5%) Edible Kelp (*Alaria sp.*)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
175-180	16.8	2:13	Sand (30%) Gravel (30%) Cobble (20%) Shells (10%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**) Sand Dollar (*Echinarachnius parma*) (**U**)	Sea Colander (*Agarum sp.*) (5%) Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%)
180-185	16.8	1:03	Sand (55%) Gravel (20%) Cobble (10%) Shells (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*) Sea Colander (*Agarum sp.*)
185-190	16.2	0.44	Sand (55%) Gravel (20%) Cobble (10%) Shells (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea Colander (*Agarum sp.*)
190-195	16.5	0.25	Sand (50%) Gravel (35%) Cobble (5%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*) Sea Colander (*Agarum sp.*)
195-200	16.5	0.00	Sand (50%) Gravel (40%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Edible Kelp (*Alaria sp.*) Sea Colander (*Agarum sp.*)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.7 - Transect T-7, Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0	44:09	**Nearshore:** Large Boulder (60%) Bedrock (40%) **Midshore:** Large Boulder (30%) Bedrock (30%) Small Boulder (20%) Cobble (20%) **Backshore:** Bedrock (100%) (Cliff)	No Fauna Observed	Knotted Wrack (*Ascophyllum nodosum*) (80%) Rockweed (*Fucus sp.*) (10%) Edible Kelp (*Alaria sp.*) (10%)
0-5	0.3	43:42	Small Boulder (60%) Cobble (30%) Gravel (5%) Shells (5%)	No Fauna Observed	Edible Kelp (*Alaria sp.*) (20%) Rockweed (*Fucus sp.*) (5%) Kelp (*Laminaria sp.*) (5%) Coral Weed (*Corallina officinalis*) (5%) Red Tubed Weed (*Rhodomela sp.*) (2%) Crustose Algae *(Lithothamnium sp.)* (2%) Sour Weed (*Desmarestia sp.*) (2%) Dulse (*Palmeria palmata*) (1%)
5-10	0.6	42:41	Small Boulder (50%) Cobble (40%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (20%) Rockweed (*Fucus sp.*) (10%) Knotted Wrack (*Ascophyllum nodosum*) (10%) Kelp (*Laminaria sp.*) (10%) Coral Weed (*Corallina officinalis*) (5%) Red Tubed Weed (*Rhodomela sp.*) (5%)
10-15	1.2	42:06	Cobble (50%) Small Boulder (40%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Frilled anemone (*Metridium senile*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (15%) Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
15-20	1.5	41:55	Small Boulder (40%) Cobble (35%) Gravel (25%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Frilled anemone (*Metridium senile*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) Green Filamentous (*Cladophora sp.*) (2%)
20-25	2.1	41:44	Small Boulder (40%) Cobble (30%) Gravel (20%) Shells (5%) Bedrock (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Frilled anemone (*Metridium senile*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (10%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%)
25-30	2.7	40:42	Small Boulder (40%) Cobble (30%) Gravel (20%) Shells (5%) Bedrock (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Frilled anemone (*Metridium senile*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (10%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (10%) Green Filamentous (*Chaetomorpha sp.*) (2%)
30-35	4.0	39:21	Small Boulder (40%) Cobble (30%) Gravel (20%) Shells (5%) Bedrock (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**) Lobster (*Homerus americanus*) (**U** – 1 Individual)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%)
35-40	4.6	38:55	Cobble (55%) Small Boulder (20%) Gravel (10%) Shells (10%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (2%)
40-45	5.5	37:32	Cobble (60%) Gravel (20%) Shells (10%) Small Boulder (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)*(**U**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%) Kelp (*Laminaria sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
45-50	6.4	35:28	Cobble (60%) Gravel (25%) Shells (10%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)*(**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Rock Crab (*Cancer sp.*) (**U** – 1 individual)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%) Kelp (*Laminaria sp.*) (5%) Edible Kelp (*Alaria sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (2%)
50-55	7.9	32:25	Cobble (60%) Gravel (30%) Sand (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)*(**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (10%) Kelp (*Laminaria sp.*) (10%) Edible Kelp (*Alaria sp.*) (5%)
55-60	8.5	31:32	Cobble (40%) Gravel (40%) Sand (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Kelp (*Laminaria sp.*) (70%) Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.)* (10%)
60-65	8.8	28:39	Gravel (40%) Cobble (30%) Sand (25%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Kelp (*Laminaria sp.*) (80%) Sour Weed (*Desmarestia sp.*) (20%) Dulse (*Palmeria palmata*) (5%) Crustose Algae *(Lithothamnium sp.)* (5%) Laver (*Porphyra sp*) (2%)
65-70	8.8	28:01	Gravel (35%) Sand (35%) Cobble (25%) Shells (5%)	No Fauna Observed	Kelp (*Laminaria sp.*) (80%) Sour Weed (*Desmarestia sp.*) (10%) Dulse (*Palmeria palmata*) (5%) Laver (*Porphyra sp*) (2%)
70-75	8.8	26:45	Sand (40%) Gravel (35%) Cobble (20%) Shells (5%)	No Fauna Observed	Kelp (*Laminaria sp.*) (80%) Sour Weed (*Desmarestia sp.*) (10%) Dulse (*Palmeria palmata*) (5%) Sea Lettuce (*Ulva lactuca*) (1%)
75-80	9.1	25:54	Sand (65%) Gravel (30%) Cobble (10%) Shells (5%)	No Fauna Observed	Kelp (*Laminaria sp.*) (60%) Sour Weed (*Desmarestia sp.*) (20%) Dulse (*Palmeria palmata*) (1%) Sea Lettuce (*Ulva lactuca*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
80-85	9.1	25:21	Sand (65%) Gravel (30%) Cobble (10%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**U**)	Kelp (*Laminaria sp.*) (30%) Sour Weed (*Desmarestia sp.*) (20%) Sea Lettuce (*Ulva lactuca*) (1%) Laver (*Porphyra sp*) (1%) Dulse (*Palmeria palmata*) (1%)
85-90	9.1	24:48	Sand (65%) Gravel (30%) Cobble (10%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**U**)	Kelp (*Laminaria sp.*) (30%) Sour Weed (*Desmarestia sp.*) (20%) Banded Weed (*Ceramium sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (1%) Laver (*Porphyra sp*) (1%)
90-95	9.1	24:08	Sand (70%) Gravel (20%) Cobble (5%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**U**)	Kelp (*Laminaria sp.*) (60%) Sour Weed (*Desmarestia sp.*) (20%) Sea Lettuce (*Ulva lactuca*) (1%) Banded Weed (*Ceramium sp.*) Laver (*Porphyra sp*) (2%)
95-100	9.5	23:49	Sand (70%) Gravel (20%) Cobble (5%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**C**)	Sour Weed (*Desmarestia sp.*) (10%) Kelp (*Laminaria sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (1%)
100-105	9.5	22:43	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**C**)	Sour Weed (*Desmarestia sp.*) (5%) Kelp (*Laminaria sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (1%)
105-110	10.1	22:10	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**C**)	Sour Weed (*Desmarestia sp.*) (5%) Kelp (*Laminaria sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (1%)
110-115	10.1	21:17	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sand Dollar (*Echinarachnius parma*) (**C**)	Sour Weed (*Desmarestia sp.*) (5%) Kelp (*Laminaria sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
115-120	10.4	19:16	Sand (60%) Gravel (20%) Cobble (10%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Kelp (*Laminaria sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Edible Kelp (*Alaria sp.*) (5%) Laver (*Porphyra sp*) (2%) Sea Lettuce (*Ulva lactuca*) (1%) Crustose Algae *(Lithothamnium sp.)* (1%)
120-125	10.4	17:00	Small Boulder (30%) Cobble (30%) Sand (20%) Gravel (10%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**) Horse Mussel (*Modiolus modiolus)*(**U**)	Kelp (*Laminaria sp.*) (20%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea Colander (*Agarum sp.*) (5%)
125-130	11.3	15:37	Sand (35%) Small Boulder (30%) Cobble (20%) Gravel (5%) Large Boulder (5%) Shell (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Ribbon Weed (*Petalonia sp.*) (20%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Kelp (*Laminaria sp.*) (5%) Sea Colander (*Agarum sp.*) (5%)
130-135	11.6	14:03	Small Boulder (40%) Sand (30%) Cobble (20%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Horse Mussel (*Modiolus modiolus)*(**U**)	Sour Weed (*Desmarestia sp.*) (15%) Ribbon Weed (*Petalonia sp.*) (10%) Kelp (*Laminaria sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%) Sea Colander (*Agarum sp.*) (2%) Black Whip Weed (*Chordaria flagelliformis*) (2%) Green Filamentous (C*ladophera sp.*)(1%)
135-140	12.2	12:47	Small Boulder (40%) Sand (30%) Cobble (20%) Gravel (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Horse Mussel (*Modiolus modiolus)*(**U**)	Sour Weed (*Desmarestia sp.*) (20%) Kelp (*Laminaria sp.*) (5%) Crustose Algae *(Lithothamnium sp.)* (2%) Sea Colander (*Agarum sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
140-145	13.1	11:41	Small Boulder (40%) Sand (20%) Cobble (20%) Gravel (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Horse Mussel (*Modiolus modiolus)*(**U**)	Sour Weed (*Desmarestia sp.*) (20%) Kelp (*Laminaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (2%) Sea Colander (*Agarum sp.*) (2%)
145-150	13.4	10:03	Sand (60%) Gravel (20%) Small Boulder (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Kelp (*Laminaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (2%) Sea Colander (*Agarum sp.*) (2%) Edible Kelp (*Alaria sp.*) (5%) Ribbon Weed (*Petalonia sp.*) (1%)
150-155	13.4	7:31	Sand (65%) Gravel (20%) Small Boulder (5%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.)* (10%) Kelp (*Laminaria sp.*) (5%) Banded Weed (*Ceramium sp*) (5%) Black Whip Weed (*Chordaria flagelliformis*) (2%)
155-160	14.0	5:22	Sand (65%) Gravel (20%) Small Boulder (5%) Cobble (5%) Shells (5%)	Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Horse Mussel (*Modiolus modiolus)*(**U**)	Sour Weed (*Desmarestia sp.*) (50%) Banded Weed (*Ceramium sp*) Crustose Algae *(Lithothamnium sp.)* (2%) Black Whip Weed (*Chordaria flagelliformis*) (2%) Kelp (*Laminaria sp.*) (1%)
160-165	14.3	3:40	Sand (70%) Gravel (20%) Cobble (5%) Shells (5%)	Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**C**)	Sour Weed (*Desmarestia sp.*) (20%) Banded Weed (*Ceramium sp.*) Crustose Algae *(Lithothamnium sp.)* (2%) Dulse (*Palmeria palmata*) (1%)
165-170	14.6	2:03	Sand (45%) Cobble (20%) Small Boulder (20%) Gravel (10%) Shells (5%)	Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**C**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.)* (2%)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
170-175	14.6	0:00	Sand (35%) Small Boulder (30%) Cobble (20%) Gravel (10%) Shells (5%)	Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.)* (2%) Sea Colander (*Agarum sp.*) (2%) Dulse (*Palmeria palmata*) (1%)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.13 - Transect T-13, Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
0-20	14.8	0:11	Sand (60%) Cobble (20%) Small Boulder (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.)* (5%) Black Whip Weed (*Chordaria flagelliformis*) (5%)
20-30	15.0	1:41	Sand (90%) Cobble (5%) Shells (5%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (30%)
30-125	14.3	2:31	Sand (50%) Cobble (30%) Small Boulder (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (**U**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 4 to 6 individuals every 5m) Horse Mussel (*Modiolus modiolus)* (**U**)	Sour Weed (*Desmarestia sp.*) (25%) Crustose Algae *(Lithothamnium sp.)* (20%) Sea colander (*Agarum sp.*) (10%) Edible Kelp (*Alaria sp*.) (2%)
125-260	19.0	8:27	Sand (90%) Shells (5%) Cobble (5%)	Sea Urchins (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 3 to 6 individuals every 5m) American plaice (*Hippoglossoides platessoides*) (**U** – 2 individuals)	Sour Weed (*Desmarestia sp.*) (25%) Sea colander (*Agarum sp.*) (10%)
260-300	19.2	16:58	Sand (50%) Cobble (30%) Gravel (10%) Small Boulder (5%) Shells (5%)	Sea Urchins (**O** – 5 to 10 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 1 to 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 3 to 6 individuals every 5m)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (10%) Sea colander (*Agarum sp.*) (2%)
300-365	19.1	18:00	Sand (85%) Cobble (5%) Gravel (5%) Shells (5%)	Sea Urchins (**O** – 5 to 10 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 1 to 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 to 2 individuals every 5m)	Crustose Algae *(Lithothamnium sp.)* (5%) Sour Weed (*Desmarestia sp.*) (5%)

Transect Distance (m)	Depth	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
365-400	17.6	21:52	Sand (65%) Cobble (20%) Gravel (10%) Shells (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 1 to 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 to 2 individuals every 5m)	Crustose Algae *(Lithothamnium sp.)* (5%)
400-450	17.0	28:42	Sand (85%) Cobble (5%) Gravel (5%) Shells (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 1 to 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 to 2 individuals every 5m) Horse Mussel (*Modiolus modiolus*) (**U** – 1 to 2 individuals every 5 m) American plaice (*Hippoglossoides platessoides*) (**U** – 1 individual)	Crustose Algae *(Lithothamnium sp.)* (5%)
450-490	14.7	31:26	Sand (45%) Small Boulder (20%) Large Boulder (10%) Cobble (10%) Gravel (10%) Shells (5%)	Sea Urchins (**O** – 5 to 10 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 4 to 6 individuals every 5m) Horse Mussel (*Modiolus modiolus*) (**O**) (On Boulders)	Crustose Algae *(Lithothamnium sp.)* (20%) Sour Weed (*Desmarestia sp.*) (5%)
490-545	13.9	34:03	Small Boulder (40%) Large Boulder (20%) Cobble (20%) Gravel (10%) Shells (5%) Sand (5%)	Sea Urchins (**O** – 5 to 10 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 4 to 6 individuals every 5m) Horse Mussel (*Modiolus modiolus)* (**O**) (On Boulders)	Crustose Algae *(Lithothamnium sp.)* (40%) Sour Weed (*Desmarestia sp.*) (10%)
545-560	13.2	37:48	Sand (65%) Gravel (20%) Cobble (10%) Shells (5%)	Sea Urchins (**O** – 5 to 10 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 to 2 individuals every 5m) Horse Mussel (*Modiolus modiolus)* (**U** 1 to 2 individuals every 5m)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%)
560-585	12.8	41:14	Small Boulder (65%) Cobble (25%) Sand (10%) Shells (5%)	Sea Urchins (**O** – 10 to 15 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 1 to 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual every 5m) Horse Mussel (*Modiolus modiolus)* (**O**) (On Boulders)	Crustose Algae *(Lithothamnium sp.)* (10%) Sour Weed (*Desmarestia sp.*) (5%)

Transect Distance (m)	Depth	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
585-600	10.8 9.5	41:55 43:52	Bedrock (85%) Small Boulder (10%) Cobble (5%)	Sea Urchins (**O** – 10 to 15 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 4 to 6 individuals every 5m) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.)* (10%)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.14 - Transect T-14 (Nearshore), Zone-1, Marine Terminal and Tug Berth, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Headland 1	2.5 2.6	4:00 4:35	Bedrock (85%) Large Boulder (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (30%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (10%)
Beach 1	3.1 2.2	4:35 5:28	Cobble (50%) Small Boulder (40%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Periwinkle (*Littorina sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (10%) Edible Kelp (*Alaria sp.*) (2%) Sour Weed (*Desmarestia sp.*) (1%)
Headland 2	2.2 0.5	5:28 6:06	Bedrock (90%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**)	Edible Kelp (*Alaria sp.*) (50%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (10%)
Headland 3	0.5 1.2	6:06 7:42	Small Boulder (70%) Cobble (20%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (70%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (2%) Cord Weed (*Chordaria filum*) (1%)
Beach 2	1.2 3.4	7:42 9:30	Small Boulder (50%) Cobble (30%) Gravel (10%) Bedrock (5%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.*) (10%) Cord Weed (*Chordaria filum*) (10%) Sour Weed (*Desmarestia sp.*) (5%)
Headland 4	2.2 0.9	9:30 10:25	Bedrock (70%) Large Boulder (20%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (10%) Cord Weed (*Chordaria filum*) (5%) Sour Weed (*Desmarestia sp.*) (5%) Edible Kelp (*Alaria sp.*) (2%)
Headland 5	3.3 6.9	10:25 11:17	Small Boulder (70%) Cobble (25%) Gravel (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Cord Weed (*Chordaria filum*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Beach 3	7.1 6.6	11:17 12:20	Cobble (60%) Small Boulder (30%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Periwinkle (*Littorina sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (30%) Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.*) (5%) Kelp (*Laminaria sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (1%)
Headland 6	3.6 4.3	12:22 13:13	Small Boulder (70%) Cobble (30%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (5%) Sour Weed (*Desmarestia sp.*) (5%)
Beach 4	4.0 5.3	13:13 21:11	Small Boulder (35%) Cobble (25%) Sand (20%) Gravel (20%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**U**) Starfish (*Asterias sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (30%) Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (5%) Smooth Cord Weed (*Chordaria filum*) (5%) Sea Lettuce (*Ulva lactuca*) (2%)
Headland 7	2.1 0.9	21:13 22:18	Bedrock (70%) Cobble (20%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (20%) Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (2%) Smooth Cord Weed (*Chordaria filum*) (2%)
Beach 5	1.0 4.2	22:18 34:45	Small Boulder (40%) Cobble (20%) Gravel (20%) Bedrock (10%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**) Frilled anemone (*Metridium senile*) (**O**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Edible Kelp (*Alaria sp.*) (10%)
Headland 8	7.3	34:45 40:40	Bedrock (60%) Large Boulder (20%) Gravel (10%) Cobble (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (20%) Edible Kelp (*Alaria sp.*) (20%) Sour Weed (*Desmarestia sp.*) (10%) Sea Lettuce (*Ulva lactuca*) (5%) Green Filamentous (*Chaetomorpha sp.*) (2%) Smooth Cord Weed (*Chordaria filum*) (1%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Beach 6	8.8 44:58	40:40	Bedrock (30%) Large Boulder (20%) Gravel (20%) Cobble (20%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**U**)	Edible Kelp (*Alaria sp.*) (30%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (10%) Sea Lettuce (*Ulva lactuca*) (5%)
Beach 7	3.7 0.2	44:58 52:00	Cobble (50%) Gravel (30%) Large Boulder (10%) Bedrock (5%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.*) (5%) Smooth Cord Weed (*Chordaria filum*) (5%) Green Filamentous (*Cladophora sp.*) (5%) Knotted Wrack (*Ascophyllum nodosum*) (5%) Rockweed (*Fucus sp.*) (2%) Sea Lettuce (*Ulva lactuca*) (2%)
Headland 9	0.2 0.2	52:00 59:17	Bedrock (65%) Large Boulder (10%) Cobble (10%) Gravel (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**)	Knotted Wrack (Ascophyllum nodosum) (30%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Smooth Cord Weed (*Chordaria filum*) (5%) Rockweed (*Fucus sp.*) (5%) Sea Lettuce (*Ulva lactuca*) (2%) Dulse (*Palmeria palmata*) (1%)

Appendix-B

Newfoundland and Labrador Refinery Project

Marine Habitat Surveys

Qualitative and Quantitative Transect Observations

Zone 2 - Marine Jetty Location

A = Abundant, C = Common, O = Occasional, U = Uncommon

Table B.1 - Transect T-8, Zone - 2, Marine Jetty, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
0-30	43.7	7:30	Cobble (60%) Sand (30%) Small Boulder (5%) Gravel (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual every 30m) American plaice (*Hippoglossoides platessoides*) (**U** – 2 individuals)	Crustose Algae *(Lithothamnium sp.)* (30%)
30-100	42.5	10:06	Sand (75%) Cobble (20%) Gravel (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.)* (20%)
100-130	38.0	21:52	Sand (45%) Cobble (40%) Small Boulder (10%) Gravel (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 1 to 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual every 30m) Anemone (**U** – 2 individuals every 30m)	Crustose Algae *(Lithothamnium sp.)* (40%)
130-180	35.0	25:55	Sand (75%) Cobble (20%) Gravel (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 1 to 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual every 5m)	Crustose Algae *(Lithothamnium sp.)* (40%)
180-360	32.0	29:06	Sand (50%) Cobble (30%) Small Boulder (15%) Gravel (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 to 4 individual every 5m) Tube Worm (*Spirobis sp.*) ((**U** – 2 individuals every 180m)	Crustose Algae *(Lithothamnium sp.)* (40%)
360-400	32.0 34.7	48:00 50:38	Sand (90%) Cobble (5%) Gravel (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 4 to 6 individuals every 5m) American plaice (*Hippoglossoides platessoides*) (**O** – 3 individuals) Atlantic Cod (*Gadus morhua*) (**U** – 2 individuals)	No Fauna Observed

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
400-450	32.5	51:23	Sand (85%) Cobble (10%) Gravel (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**O** – 3 to 6 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual every 5m) Atlantic Cod (*Gadus morhua*) (**O** – 1individual) Tube Worm (*Spirobis sp.*) (**U** – 2 individuals every 50m)	Crustose Algae *(Lithothamnium sp.)* (40%) **Storm Toss:** Sour Weed (*Desmarestia sp.*)
450-600	33.0	57:02	Sand (96%) Cobble (2%) Gravel (2%)	Sea Urchins (**O** – 5 to 15 individuals every 5m) Starfish (*Asterias sp.*) (**O** – 3 to 6 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 4 to 5 individual every 5m)	**Storm Toss:** Sour Weed (*Desmarestia sp.*) Sea Colander (*Agarum sp.*) Kelp (*Laminaria sp.*)
600-700	34.0 28.6	1:20:02 1:29:17	Sand (80%) Cobble (15%) Gravel (5%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**O** – 1 to 3 every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 1 to 2 individuals every 5m)	**Storm Toss:** Sea Colander (*Agarum sp.*) Kelp (*Laminaria sp.*) Rockweed (*Fucus sp.*)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table B.2 - Transect T-9, Zone - 2, Marine Jetty, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
0-60	30.6	0:00	Sand (96%) Cobble (2%) Gravel (2%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 2 to 4 individuals every 5m)	**Storm Toss**: Sea Colander (*Agarum sp.*)
60-230	29.3	11:00	Sand (90%) Cobble (5%) Gravel (5%)	Sea Urchins (**U** – 1 to 2 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 2 individuals every 5m) Starfish (*Solaster sp.*) (**U** - 1 individual) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 3 to 5 individuals every 5m) American plaice (*Hippoglossoides platessoides*) (**U** – 1 individual at 18:34)	**Storm Toss**: Sea Colander (*Agarum sp.*)
230-310	33.4	35:00	Sand (96%) Cobble (2%) Gravel (2%)	Sea Urchins (**U** – 1 to 2 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 2 to 3 individuals every 5m) American plaice (*Hippoglossoides platessoides*) (**U** – 1 individual at 38:25)	**Storm Toss**: Sea Colander (*Agarum sp.*)
310-400	32.9 32.4	39:58	Sand (80%) Cobble (10%) Gravel (10%)	Sea Urchins (**U** – 1 to 2 individuals every 5m) Starfish (*Asterias sp.*) (**U** – 2 to 3 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 1 to 2 individuals every 5m)	**Storm Toss**: Sea Colander (*Agarum sp.*)
400-500	35.0 35.5	26:20 36:08	Sand (83%) Cobble (10%) Gravel (5%) Small Boulder (2%)	Sea Urchins (**O** – 2 to 6 individuals every 5m) Starfish (*Asterias sp.*) (**O** – 4 to 6 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 1 to 3 individuals every 5m)	**Storm Toss**: Sea Colander (*Agarum sp.*)

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
500-615	35.0	10:07	Sand (83%) Cobble (10%) Gravel (5%) Small Boulder (2%)	Sea Urchins (**U** – 2 to 4 individuals every 5m) Starfish (*Asterias sp.*) (**O** – 3 to 5 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 1 to 3 individuals every 5m)	**Storm Toss**: Sea Colander (*Agarum sp.*) Kelp (*Laminaria sp.*)
615-700	36.0	0:00	Sand (93%) Cobble (5%) Gravel (5%)	Sea Urchins (**U** – 1 to 2 individuals every 5m) Starfish (*Asterias sp.*) (**O** – 3 to 5 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**O** – 1 to 3 individuals every 5m)	**Storm Toss**: Sea Colander (*Agarum sp.*)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table B.3 - Transect T-10, Zone - 2, Marine Jetty, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
0-30	19.6	4:04	Sand (65%) Cobble (20%) Gravel (10%) Shells (5%)	Sea Urchins (**U** – 1 to 5 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual every 30m)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%)
30-100	22.3	6:12	Sand (45%) Cobble (40%) Gravel (10%) Shells (5%)	Sea Urchins (**U** – 1 to 2 individuals every 5m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 individual every 30m) Shrimp (**U**) at 8:21	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.)* (5%) Kelp (*Laminaria sp.*) (2%) Edible Kelp (*Alaria sp.*) (2%)
100-200	33 38	16:01 24:05	Sand (85%) Cobble (10%) Gravel (5%)	Sea Urchins (**U** – 1 to 2 individuals every 10m) Deep Sea Scallop (*Placopecten magellanicus*) (**U** – 1 to 2 individuals every 5m) Skate (**U** – 1 individual at 17:59, buried)	No Flora Observed

Appendix-C

Newfoundland and Labrador Refinery Project

Marine Habitat Surveys

Qualitative and Quantitative Transect Observations

Zone 3 - Marine Water Intake Location

A = Abundant, C = Common, O = Occasional, U = Uncommon

Table C.1 - Transect T-11, Zone - 3, Marine Water Intake Location, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0		Cobble (68%) Gravel (20) Bedrock (10%) (Far Edges) Large Boulder (2%)	No Fauna Observed	No Flora Observed
0-10	1.5	1:10:44	Cobble (40%) Gravel (40%) Small Boulder (10%) Bedrock (5%) Sand (5%)	No Fauna Observed	No Flora Observed
10-20	3.1	1:09:00	Cobble (60%) Sand (30%) Gravel (10%)	No Fauna Observed	Edible Kelp (*Alaria sp.*) (20%) Hollow Green Weed (*Enteromorpha sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Kelp (*Laminaria sp.*) (5%) Smooth Cord Weed (*Chorda filum*) (2%) Coral Weed (*Corallina officinalis*) (2%) Green Filamentous (*Cladophora sp.*) (2%) Green Filamentous (*Chaetomorpha sp.*) (2%)
20-30	3.4	1:08:01	Cobble (60%) Sand (30%) Gravel (10%)	No Fauna Observed	Edible Kelp (*Alaria sp.*) (40%) Sour Weed (*Desmarestia sp.*) (10%) Red Tubed Weed (*Rhodomela sp.*) (10%) Hollow Green Weed (*Enteromorpha sp.*) (5%) Rockweed (*Fucus sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
30-40	4.3	1:05:55	Cobble (60%) Sand (30%) Gravel (10%)	No Fauna Observed	Edible Kelp (*Alaria sp.*) (70%) Sour Weed (*Desmarestia sp.*) (20%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Red Tubed Weed (*Rhodomela sp.*) (5%) Red fern (*Ptilota serrata*) (2%) Sea lettuce (*Ulva lactuca*) (2%) Green Filamentous (*Ulothrix sp.*) (1%) Green Filamentous (*Chaetomorpha sp.*) (1%) Hollow Green Weed *(Enteromorpha sp.)* (1%)
40-50	4.6	1:05:02	Cobble (60%) Sand (30%) Gravel (10%)	No Fauna Observed	Edible Kelp (*Alaria sp.*) (60%) Sour Weed (*Desmarestia sp.*) (30%) Red Tubed Weed (*Rhodomela sp.*) (5%)
50-60	4.9	1:03:39	Cobble (60%) Sand (20%) Gravel (20%)	No Fauna Observed	Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (10%) Black Whip Weed (*Chordaria flagelliformis*) (5%) Red fern (*Ptilota serrata*) (5%) Red Tubed Weed (*Rhodomela sp.*) (5%) Green Filamentous (*Chaetomorpha sp.*) (2%)
60-70	4.9	1:03:12	Gravel (95%) Sand (5%)	Sand Dollar (*Echinarachnius parma*) (**U**)	**Storm Toss:** Sour Weed (*Desmarestia sp.*)
70-80	5.5	1:02:41	Gravel (95%) Sand (5%)	Sand Dollar (*Echinarachnius parma*) (**U**)	No Flora Observed
80-90	5.8	1:01:18	Gravel (95%) Sand (5%)	Sand Dollar (*Echinarachnius parma*) (**U**)	**Storm Toss:** Sour Weed (*Desmarestia sp.*) Kelp (*Laminaria sp.*)
90-100	6.1	1:00:26	Gravel (95%) Sand (5%)	Sand Dollar (*Echinarachnius parma*) (**O**) Hermit Crab (*Pagurus sp.*) (**U** - 1 individual)	Sour Weed (*Desmarestia sp.*) (2%)
100-110	6.7	0:59:41	Gravel (95%) Sand (5%)	Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
110-120	7.0	0:58:59	Gravel (95%) Sand (5%)	Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (5%)
120-130	7.3	0:58:24	Gravel (95%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (5%)
130-140	7.6	0:57:34	Gravel (90%) Sand (10%)	Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (10%)
140-150	8.2	0:57:02	Gravel (90%) Sand (10%)	Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (10%)
150-160	8.8	0:56:27	Gravel (90%) Sand (10%)	Sand Dollar (*Echinarachnius parma*) (**O**)	Sour Weed (*Desmarestia sp.*) (20%) Kelp (*Laminaria sp.*) (5%)
160-170	8.8	0:54:14	Gravel (70%) Cobble (20%) Sand (10%)	Sand Dollar (*Echinarachnius parma*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (20%) Red fern (*Ptilota serrata*) (20%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Kelp (*Laminaria sp.*) (5%) Sea lettuce (*Ulva lactuca*) (2%) Green Filamentous (*Cladophora sp.*) (1%) Dulse (*Palmeria palmata*) (1%) Green Filamentous (*Chaetomorpha sp.*) (1%)
170-180	8.8	0:53:33	Sand (80%) Gravel (10%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (20%) Red fern (*Ptilota serrata*) (10%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Kelp (*Laminaria sp.*) (10%) Sea lettuce (*Ulva lactuca*) (2%) Green Filamentous (*Cladophora sp.*) (2%)
180-190	9.1	0:52:40	Sand (85%) Gravel (10%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Black Whip Weed (*Chordaria flagelliformis*) (60%) Sour Weed (*Desmarestia sp.*) (10%) Edible Kelp (*Alaria sp.*) (10%) Red fern (*Ptilota serrata*) (10%) Kelp (*Laminaria sp.*) (5%) Sea lettuce (*Ulva lactuca*) (2%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
190-200	9.1	0:51:56	Sand (50%) Gravel (45%) Cobble (15%)	Sand Dollar (*Echinarachnius parma*) (**U**)	Black Whip Weed (*Chordaria flagelliformis*) (60%) Sour Weed (*Desmarestia sp.*) (10%) Edible Kelp (*Alaria sp.*) (10%) Kelp (*Laminaria sp.*) (10%) Sea lettuce (*Ulva lactuca*) (2%) Red fern (*Ptilota serrata*) (2%)
200-210	9.1	0:51:06	Gravel (60%) Sand (30%) Shell (5%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Black Whip Weed (*Chordaria flagelliformis*) (50%) Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.)* (5%) Sea lettuce (*Ulva lactuca*) (3%) Red fern (*Ptilota serrata*) (2%) Edible Kelp (*Alaria sp.*) (2%)
210-220	7.6	0:50:29	Bedrock (40%) Gravel (20%) Sand (10%) Cobble (10%) Small Boulder (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Horse Mussel (*Modiolus modiolus)* (**U**)	Black Whip Weed (*Chordaria flagelliformis*) (40%) Sour Weed (*Desmarestia sp.*) (30%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.*) (5%)
220-230	9.5	0:49:54	Bedrock (60%) Small Boulder (10%) Large Boulder (10%) Gravel (5%) Sand (5%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Sand Dollar (*Echinarachnius parma*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%)
230-240	9.8	0:49:32	Gravel (70%) Sand (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Black Whip Weed (*Chordaria flagelliformis*) (40%) Sour Weed (*Desmarestia sp.*) (30%) Edible Kelp (*Alaria sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (5%) Red fern (*Ptilota serrata*) (5%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
240-250	9.8	0:49:10	Gravel (70%) Sand (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Sand Dollar (*Echinarachnius parma*) (**U**)	Black Whip Weed (*Chordaria flagelliformis*) (40%) Sour Weed (*Desmarestia sp.*) (30%) Edible Kelp (*Alaria sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (5%) Red fern (*Ptilota serrata*) (5%)
250-260	9.8	0:46:48	Gravel (80%) Sand (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (50%) Black Whip Weed (*Chordaria flagelliformis*) (40%) Crustose Algae *(Lithothamnium sp.*) (5%) Red fern (*Ptilota serrata*) (5%)
260-270	9.8	0:46:27	Gravel (80%) Sand (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Black Whip Weed (*Chordaria flagelliformis*) (20%) Sour Weed (*Desmarestia sp.*) (20%) Edible Kelp (*Alaria sp.*) (5%) Crustose Algae *(Lithothamnium sp.*) (5%) Red fern (*Ptilota serrata*) (2%) *Sea Colander (Agarum cribrosum)* (1%)
270-280	9.8	0:46:03	Gravel (80%) Shells (10%) Sand (5%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (40%) Crustose Algae *(Lithothamnium sp.*) (5%) Red fern (*Ptilota serrata*) (2%) Edible Kelp (*Alaria sp.*) (2%) Black Whip Weed (*Chordaria flagelliformis*) (2%)
280-290	9.8	0:45:43	Gravel (80%) Shells (10%) Sand (5%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (50%) Crustose Algae *(Lithothamnium sp.*) (5%) Red fern (*Ptilota serrata*) (2%) Black Whip Weed (*Chordaria flagelliformis*) (2%)
290-300	10.1	0:44:52	Gravel (65%) Cobble (20%) Shells (10%) Sand (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Black Whip Weed (*Chordaria flagelliformis*) (2%) Red fern (*Ptilota serrata*) (1%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
300-310	10.1	0:44:31	Gravel (60%) Cobble (20%) Sand (10%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Red fern (*Ptilota serrata*) (2%) Edible Kelp (*Alaria sp.*) (2%) Green Filamentous (*Cladophora sp.*) (1%)
310-320	10.7	0:43:35	Gravel (55%) Cobble (20%) Sand (10%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Black Whip Weed (*Chordaria flagelliformis*) (5%) Red fern (*Ptilota serrata*) (2%)
320-330	10.4	0:43:14	Gravel (55%) Small Boulder (20%) Cobble (20%) Sand (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Frilled anemone (*Metridium senile*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Red fern (*Ptilota serrata*) (1%)
330-340	10.7	0:42:57	Gravel (60%) Cobble (20%) Sand (10%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Red fern (*Ptilota serrata*) (1%)
340-350	10.7	0:42:36	Gravel (60%) Cobble (20%) Sand (10%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Red fern (*Ptilota serrata*) (1%)
350-360	10.7	0:42:12	Gravel (55%) Cobble (20%) Sand (10%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (30%) Crustose Algae *(Lithothamnium sp.*) (10%) Red fern (*Ptilota serrata*) (2%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
360-370	10.4	0:41:35	Gravel (60%) Sand (20%) Small Boulder (5%) Shells (5%) Large Boulder (5%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (40%) Crustose Algae *(Lithothamnium sp.*) (20%) Red fern (*Ptilota serrata*) (2%)
370-380	10.4	0:41:05	Gravel (55%) Small Boulder (20%) Cobble (10%) Sand (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Sour Weed (*Desmarestia sp.*) (60%) Crustose Algae *(Lithothamnium sp.*) (40%) Red fern (*Ptilota serrata*) (5%)
380-390	10.4	0:40:28	Gravel (55%) Small Boulder (20%) Cobble (10%) Sand (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**O**)	Sour Weed (*Desmarestia sp.*) (60%) Crustose Algae *(Lithothamnium sp.*) (40%) Red fern (*Ptilota serrata*) (2%)
390-400	10.7	0:39:46	Gravel (85%) Cobble (5%) Sand (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (60%) Crustose Algae *(Lithothamnium sp.*) (40%) Red fern (*Ptilota serrata*) (2%)
400-410	10.7	0:38:58	Gravel (85%) Cobble (5%) Sand (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**)	Sour Weed (*Desmarestia sp.*) (60%) Crustose Algae *(Lithothamnium sp.*) (40%) Red fern (*Ptilota serrata*) (2%)
410-420	10.7	0:38:36	Gravel (85%) Cobble (5%) Sand (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (60%) Crustose Algae *(Lithothamnium sp.*) (40%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
420-430	11.0	0:38:15	Gravel (70%) Small Boulder (10%) Sand (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (60%) Crustose Algae *(Lithothamnium sp.*) (40%) **Storm Toss:** Red fern (*Ptilota serrata*)
430-440	10.7	0:37:01	Gravel (55%) Small Boulder (20%) Sand (15%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (5%) Sea Colander *(Agarum cribrosum)* (1%) Banded Weed (*Banded Weed (Ceramium sp.)* (1%) **Storm Toss:** Red fern (*Ptilota serrata*) Leaf Weeds (*Phyllophora sp.*)
440-450	10.7	0:36:21	Gravel (70%) Small Boulder (10%) Sand (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.*) (5%)
450-460	11.0	0:34:58	Gravel (55%) Small Boulder (20%) Sand (10%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (10%) Crustose Algae *(Lithothamnium sp.*) (10%)
460-470	11.0	0:34:26	Gravel (30%) Small Boulder (30%) Cobble (30%) Sand (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (20%) Sour Weed (*Desmarestia sp.*) (15%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
470-480	9.1	0:32:27	Small Boulder (30%) Cobble (30%) Gravel (20%) Bedrock (10%) Sand (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Eel Pout (*Lycodes sp.)* (**U** – 1 Individual)	Crustose Algae *(Lithothamnium sp.*) (20%) Sour Weed (*Desmarestia sp.*) (2%) Sea Colander *(Agarum cribrosum)* (1%)
480-490	9.1	0:31:34	Bedrock (40%) Small Boulder (30%) Cobble (15%) Large Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (20%) Sour Weed (*Desmarestia sp.*) (2%) Sea Colander *(Agarum cribrosum)* (2%)
490-500	9.8	0:30:29	Bedrock (40%) Cobble (25%) Small Boulder (20%) Shells (10%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**C**) Horse Mussel (*Modiolus modiolus)* (**U**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (20%) Banded Weed (*Ceramium sp.*) (1%)
500-510	10.4	0:29:59	Small Boulder (40%) Cobble (30%) Bedrock (20%) Shells (5%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (2%)
510-520	10.4	0:29:26	Bedrock (40%) Small Boulder (30%) Cobble (25%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (1%) Sea Colander *(Agarum cribrosum)* (1%)
520-530	10.7	0:28:39	Cobble (65%) Bedrock (20%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (50%) Tubed Weed (*Polysiphonia sp.*) (1%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
530-540	10.7	0:28:13	Cobble (45%) Small Boulder (30%) Bedrock (20%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) Banded Weed (*Ceramium sp.*) (1%)
540-550	10.7	0:27:36	Cobble (40%) Small Boulder (30%) Bedrock (25%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**U**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (40%)
550-560	11.0	0:26:37	Bedrock (70%) Small Boulder (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (1%)
560-570	11.6	0:25:49	Bedrock (80%) Small Boulder (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (1%)
570-580	12.2	0:24:39	Bedrock (50%) Small Boulder (30%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) **Storm Toss:** Sour Weed (*Desmarestia sp.*)
580-590	12.8	0:23:51	Bedrock (60%) Small Boulder (20%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (5%)
590-600	13.7	0:23:17	Bedrock (50%) Small Boulder (20%) Cobble (20%) Shells (5%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (10%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
600-610	13.7	0:21:51	Bedrock (50%) Small Boulder (20%) Cobble (20%) Shells (5%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (5%)
610-620	13.4	0:21:20	Bedrock (65%) Small Boulder (20%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (40%) Sour Weed (*Desmarestia sp.*) (2%)
620-630	14.0	0:20:33	Bedrock (70%) Cobble (20%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (40%) Sour Weed (*Desmarestia sp.*) (2%) Sea Colander *(Agarum cribrosum)* (1%) Banded Weed (*Ceramium sp.*) (1%)
630-640	14.3	0:20:02	Bedrock (60%) Cobble (30%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (40%) Banded Weed (*Ceramium sp.*) (5%) Sea Colander *(Agarum cribrosum)* (2%)
640-650	14.3	0:18:40	Cobble (60%) Small Boulder (20%) Bedrock (10%) Shells (5%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 Individual) Polychaete (**U** – 1 Individual)	Crustose Algae *(Lithothamnium sp.*) (70%) Banded Weed (*Ceramium sp.*) (2%)
650-660	14.3	0:18:15	Cobble (95%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (80%) Banded Weed (*Ceramium sp.*) (2%)
660-670	14.3	0:17:31	Cobble (93%) Shells (5%) Large Boulder (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (80%) Banded Weed (*Ceramium sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
670-680	14.3	0:17:02	Cobble (95%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (90%) Banded Weed (*Ceramium sp.*) (2%) **Storm Toss:** Sour Weed (*Desmarestia sp.*)
680-690	14.6	0:16:24	Cobble (85%) Bedrock (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (80%) Banded Weed (*Ceramium sp.*) (2%) **Storm Toss:** Sour Weed (*Desmarestia sp.*)
690-700	14.6	0:15:49	Cobble (83%) Bedrock (5%) Shells (5%) Small Boulder (5%) Large Boulder (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (70%) Banded Weed (*Ceramium sp.*) (3%)
700-710	15.2	0:15:11	Cobble (88%) Shells (5%) Small Boulder (5%) Bedrock (2%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (80%) Banded Weed (*Ceramium sp.*) (2%)
710-720	14.9	0:14:37	Cobble (90%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (80%) Banded Weed (*Ceramium sp.*) (2%)
720-730	14.9	0:14:00	Cobble (95%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (80%) Banded Weed (*Ceramium sp.*) (2%)
730-740	14.9	0:13:31	Cobble (85%) Shells (5%) Small Boulder (5%) Bedrock (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (70%) Banded Weed (*Ceramium sp.*) (2%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
					Sour Weed (*Desmarestia sp.*)
740-750	14.6	0:13:03	Cobble (90%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (80%) Banded Weed (*Ceramium sp.*) (2%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*) Sour Weed (*Desmarestia sp.*)
750-760	14.3	0:12:30	Cobble (50%) Bedrock (40%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (80%) Sea Colander *(Agarum cribrosum)* (2%) Banded Weed (*Ceramium sp.*) (1%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*)
760-770	14.3	0:11:23	Cobble (90%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (60%) Sea Colander *(Agarum cribrosum)* (1%) Banded Weed (*Ceramium sp.*) (1%)
770-780	14.3	0:10:53	Bedrock (80%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (40%) Banded Weed (*Ceramium sp.*) (2%) Sea Colander *(Agarum cribrosum)* (1%)
780-790	14.3	0:10:20	Bedrock (70%) Cobble (20%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (50%) Banded Weed (*Ceramium sp.*) (2%) Sea Colander *(Agarum cribrosum)* (2%)
790-800	14.3	0:9:52	Bedrock (60%) Cobble (25%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (60%) Banded Weed (*Ceramium sp.*) (2%) Sea Colander *(Agarum cribrosum)* (2%)
800-810	14.6	0:9:22	Bedrock (60%) Cobble (25%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (60%) Banded Weed (*Ceramium sp.*) (2%) Sea Colander *(Agarum cribrosum)* (2%) **Storm Toss:**

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
					Leaf Weeds (*Phyllophora sp.*)
810-820	15.2	0:8:39	Cobble (45%) Bedrock (40%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (70%) Banded Weed (*Ceramium sp.*) (2%) Sea Colander *(Agarum cribrosum)* (2%)
820-830	15.2	0:8:11	Cobble (55%) Bedrock (30%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (80%) Banded Weed (*Ceramium sp.*) (2%) Sea Colander *(Agarum cribrosum)* (2%)
830-840	15.5	0:7:33	Cobble (45%) Bedrock (40%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (90%) Sea Colander *(Agarum cribrosum)* (2%)
840-850	15.5	0:6:26	Cobble (65%) Bedrock (20%) Small Boulder (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (90%) Banded Weed (*Ceramium sp.*) (2%)
850-860	15.9	0:5:48	Cobble (60%) Bedrock (30%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (90%) Banded Weed (*Ceramium sp.*) (2%)
860-870	16.2	0:5:13	Cobble (70%) Bedrock (20%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (90%) Banded Weed (*Ceramium sp.*) (2%)
870-880	16.2	0:4:34	Cobble (70%) Bedrock (20%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (90%) Sea Colander *(Agarum cribrosum)* (2%)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
880-890	17.1	0:3:54	Cobble (50%) Bedrock (40%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (90%)
890-900	17.4	0:3:16	Cobble (70%) Bedrock (20%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (90%) Sea Colander *(Agarum cribrosum)* (2%)
900-910	18.3	0:2:48	Cobble (90%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (90%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*) Sea Colander *(Agarum cribrosum)*
910-920	18.9	0:2:18	Cobble (90%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (90%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*)
920-930	19.8	0:1:48	Cobble (90%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (90%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*)
930-940	19.8	0:1:21	Cobble (90%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (90%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*) Sour Weed (*Desmarestia sp.*)
940-950	19.8	0:00:31	Cobble (90%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (90%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*)

Transect Distance (m)	Depth (m)	Video Time (hr:min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
950-960	20.4	0:00:00	Cobble (90%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Eel Pout (*Lycodes sp.*) 1 – Individual	Crustose Algae *(Lithothamnium sp.*) (90%) **Storm Toss:** Leaf Weeds (*Phyllophora sp.*)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Appendix-D

Newfoundland and Labrador Refinery Project

Marine Habitat Surveys

Qualitative and Quantitative Transect Observations

Zone 4 - Marine Outfall Location

A = Abundant, C = Common, O = Occasional, U = Uncommon

Table D.1 - Transect T-12, Zone - 4, Marine Outfall Location, Newfoundland and Labrador Refinery Project, South Head, Placentia Bay, May 18, 2007.

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
Shoreline	0		**Nearshore:** Cobble (65%) Gravel (20%) Bedrock (10%) Large Boulder (5%) **Midshore:** Cobble (90%) Gravel (10%) **Backshore:** Bedrock (90%) Large Boulder (10%)	No Fauna Observed	No Flora observed
0-10	1.2	30:01	Cobble (40%) Small Boulder (40%) Gravel (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**U**)	Rockweed (*Fucus sp.*) (40%) Knotted Wrack (*Ascophyllum nodosum*) (40%) Edible Kelp (*Alaria sp.*) (10%) Crustose Algae *(Lithothamnium sp.*) (5%) Coral Weed (*Corallina officinalis*) (5%)
10-20	1.5	28:18	Small Boulder (65%) Cobble (20%) Gravel (10%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Rockweed (*Fucus sp.*) (600%) Edible Kelp (*Alaria sp.*) (20%) Coral Weed (*Corallina officinalis*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Red fern (*Ptilota serrata*) (5%) Sea lettuce (*Ulva lactuca*) (2%) Black Whip Weed (*Chordaria flagelliformis*) (2%) Green Filamentous (*Cladophora sp.*) (1%)
20-30	2.1	27:27	Small Boulder (70%) Cobble (20%) Gravel (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Rockweed (*Fucus sp.*) (60%) Edible Kelp (*Alaria sp.*) (20%) Coral Weed (*Corallina officinalis*) (20%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
					Black Whip Weed (*Chordaria flagelliformis*) (10%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Sea lettuce (*Ulva lactuca*) (5%) Unidentified Brown (5%)
30-40	1.5	26:00	Small Boulder (50%) Cobble (30%) Gravel (10%) Bedrock (5%) Large Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Rockweed (*Fucus sp.*) (40%) Edible Kelp (*Alaria sp.*) (20%) Coral Weed (*Corallina officinalis*) (20%) Black Whip Weed (*Chordaria flagelliformis*) (10%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Sea lettuce (*Ulva lactuca*) (5%)
40-50	2.4	24:37	Bedrock (70%) Large Boulder (20%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Kelp (*Laminaria sp.*) (20%) Edible Kelp (*Alaria sp.*) (50%) Coral Weed (*Corallina officinalis*) (20%) Crustose Algae *(Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (5%) Sea lettuce (*Ulva lactuca*) (5%) Rockweed (*Fucus sp.*) (5%) Unidentified Brown (5%) Seen at 25:43
50-60	3.1	22:50	Small Boulder (40%) Large Boulder (30%) Bedrock (20%) Cobble (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**)	Edible Kelp (*Alaria sp.*) (30%) Crustose Algae *(Lithothamnium sp.*) (20%) Kelp (*Laminaria sp.*) (20%) Sour Weed (*Desmarestia sp.*) (10%) Sea lettuce (*Ulva lactuca*) (2%)
60-70	3.4	22:04	Bedrock (70%) Small Boulder (20%) Large Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (20%) Sour Weed (*Desmarestia sp.*) (5%)
70-80	4.3	20:47	Bedrock (100%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (20%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
80-90	4.4	19:56	Bedrock (95%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**) Hermit Crab (*Pagurus sp.*) (**U** - 1 individual)	Crustose Algae *(Lithothamnium sp.*) (30%)
90-100	3.7	19:18	Bedrock (85%) Small Boulder (5%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (40%) Sour Weed (*Desmarestia sp.*) (5%)
100-110	5.5	17:56	Bedrock (80%) Large Boulder (10%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**O**) Frilled anemone (*Metridium senile*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (40%) Sour Weed (*Desmarestia sp.*) (10%) Edible Kelp (*Alaria sp.*) (10%) **Note:** Large Cliffs and Gulches
110-120	7.3	17:11	Bedrock (80%) Large Boulder (10%) Small Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**O**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (40%) Sour Weed (*Desmarestia sp.*) (10%) Edible Kelp (*Alaria sp.*) (5%)
120-130	8.8	16:14	Large Boulder (50%) Bedrock (30%) Small Boulder (10%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Periwinkle (*Littorina sp.*) (**U**) Frilled anemone (*Metridium senile*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (40%)
130-140	9.1	15:40	Large Boulder (50%) Bedrock (30%) Small Boulder (10%) Shells (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (30%)
140-150	9.1	14:45	Bedrock (40%) Large Boulder (35%) Small Boulder (10%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**U**)	Crustose Algae *(Lithothamnium sp.*) (30%) **Note:**

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
			Cobble (5%) Gravel (5%) Shells (5%)		Large Cliffs and Gulches
150-160	9.8	13:48	Bedrock (80%) Small Boulder (10%) Large Boulder (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**O**) Blue Mussel (*Mytilus edulis*) (**O**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (30%) **Note:** Large Cliffs and Gulches
160-170	10.7	12:32	Bedrock (55%) Large Boulder (10%) Small Boulder (10%) Cobble (10%) Gravel (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Blue Mussel (*Mytilus edulis*) (**U**) Horse Mussel (*Modiolus modiolus)* (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 Individuals) Frilled anemone (*Metridium senile*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (30%) **Note:** Large Cliffs and Gulches
170-180	11.3	10:56	Bedrock (65%) Cobble (10%) Gravel (10%) Shells (10%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 Individuals)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (2%) **Note:** Large Cliffs and Gulches
180-190	14.3	9:48	Bedrock (85%) Cobble (5%) Shells (5%) Small Boulder (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**O**)	Crustose Algae *(Lithothamnium sp.*) (30%) **Note:** Large Cliffs and Gulches
190-200	15.9	8:20	Bedrock (50%) Small Boulder (35%) Cobble (10%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Horse Mussel (*Modiolus modiolus)* (**U**) Barnacle (*Balunus sp.*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (30%) Sour Weed (*Desmarestia sp.*) (10%)
200-210	16.8	6:38	Sand (50%) Cobble (20%) Gravel (20%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Barnacle (*Balunus sp.*) (**U**)	Sour Weed (*Desmarestia sp.*) (15%) Crustose Algae *(Lithothamnium sp.*) (5%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
			Shells (5%) Small Boulder (5%)	Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 Individual) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	
210-220	17.1	6:07	Sand (60%) Gravel (20%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 Individuals) Skate (*Raja sp.*) (**U** – 2 Individual)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (5%)
220-230	18.0	5:17	Sand (60%) Gravel (20%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 Individuals)	Sour Weed (*Desmarestia sp.*) (20%) Crustose Algae *(Lithothamnium sp.*) (5%)
230-240	18.6	4:39	Sand (60%) Gravel (20%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**O** – 4 Individuals) Winter Flounder (*Pseudopleuronectes americanus*) (**U** - 1 individual)	Sour Weed (*Desmarestia sp.*) (5%) Crustose Algae *(Lithothamnium sp.*) (5%) Green Filamentous (*Cladophora sp.*) (1%)
240-250	19.2	4:16	Sand (75%) Gravel (20%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 Individuals)	Crustose Algae *(Lithothamnium sp.*) (5%) Sour Weed (*Desmarestia sp.*) (2%)
250-260	19.8	3:58	Sand (75%) Gravel (20%) Cobble (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**)	Crustose Algae *(Lithothamnium sp.*) (5%) Sour Weed (*Desmarestia sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
			Shells (5%)	Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 Individuals)	
260-270	19.8	3:38	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 2 Individuals)	Crustose Algae *(Lithothamnium sp.*) (5%) Sour Weed (*Desmarestia sp.*) (5%) **Storm Toss:** Knotted Wrack (*Ascophyllum nodosum*) Rockweed (*Fucus sp.*)
270-280	19.8	3:23	Sand (80%) Gravel (10%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 Individual) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (5%) Sour Weed (*Desmarestia sp.*) (2%)
280-290	19.8	3:01	Sand (80%) Gravel (10%) Cobble (15%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (5%) Sour Weed (*Desmarestia sp.*) (2%)
290-300	19.8	2:33	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 Individual) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (5%) Sour Weed (*Desmarestia sp.*) (2%)
300-310	20.7	1:37	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 Individual) Horse Mussel (*Modiolus modiolus)* (**U**)	Crustose Algae *(Lithothamnium sp.*) (5%) Sour Weed (*Desmarestia sp.*) (2%)

Transect Distance (m)	Depth (m)	Video Time (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
310-320	20.7	1:07	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 Individual)	Crustose Algae *(Lithothamnium sp.*) (5%) **Storm Toss:** Rockweed (*Fucus sp.*)
320-330	21.0	0:21	Sand (80%) Gravel (10%) Cobble (5%) Shells (5%)	Sea Urchins (*Strongylocentrotus droebachiensis*) (**O**) Starfish (*Asterias sp.*) (**U**) Sand Dollar (*Echinarachnius parma*) (**O**) Deep-Sea Scallop (*Placopecten magellanicus*) (**U** – 1 Individual)	Crustose Algae *(Lithothamnium sp.*) (5%) **Storm Toss:** Knotted Wrack (*Ascophyllum nodosum*) Rockweed (*Fucus sp.*)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Appendix-E

Newfoundland and Labrador Refinery Project

Marine Water Quality Field Parameters

South Head Water Samples , June 2007
Site T12 (Marine Outfall) Inshore
47°48'01.1"N 54°03'48.77"W

Depth (m)	Temperature	Salinity	Conductivity	Turbidity	DO	pH
0	8.43		43445	0	105.3	7.75
1	8.31		43473	0	105.8	7.76
2	8.28		43482	0	105.4	7.75
3	8.25		43514	0	105.2	7.75
4	8.23		43501	0	105.2	7.75
5	8.19		43518	0	104.7	7.76
6	8.16		43526	0	104.8	7.76
7	8.11		43530	0	104.5	7.74
8	8.05		43538	0	104.7	7.76
8.5	8.03		48537	0	105.0	7.76

South Head Water Samples , June 2007
Site T12 (Marine Outfall) Offshore
47°48'00.0"N 54°04'00.0"W

Depth (m)	Temperature	Salinity	Conductivity	Turbidity	DO	pH
0	8.77		43427	0.1	105.3	7.78
1	8.53		43449	0	105.1	7.79
2	8.44		43470	0	105.1	7.78
3	8.31		43472	0	105.2	7.78
4	8.31		43488	0	105.3	7.78
5	8.23		43507	0	104.8	7.78
6	8.16		43531	0	104.6	7.78
7	7.85		43533	0	104.3	7.77
8	7.72		43555	0	104.7	7.77
9	7.47		43587	0	104.4	7.77
10	7.35		43597	0	104.3	7.77
11	7.21		43614	0	104.2	7.77
12	7.02		43645	0	103.9	7.77
13	6.94		43660	0	103.6	7.76
14	6.76		43680	0	103.3	7.76
15	6.67		43695	0	104.1	7.77
16	6.58		43713	0	103.8	7.77
17	6.44		43704	0	103.6	7.77
18	6.35		43706	0	103.6	7.77
19	6.14		43700	0	103.9	7.77
20	5.72		43714	0	103.5	7.77
21	5.63		43721	0	103.8	7.76
21.5	5.31		43650	0	104.6	7.77

South Head Water Samples , June 2007
Site T11 (Marine Water Intake) Inshore
47°47'57.7"N 54°03'14.7"W

Depth (m)	Temperature	Salinity	Conductivity	Turbidity	DO	pH
0	8.60		43428	0	107.2	7.75
1	8.60		43436	0	108.0	7.78
2	8.38		43455	0	106.9	7.77
3	8.14		43466	0	106.2	7.77
4	8.12		43507	0	105.5	7.76
5	8.10		43506	0	105.4	7.76
6	8.07		43517	0	105.2	7.77
7	7.93		43515	0	105.8	7.77
7.25	7.92		43512	0	104.0	7.76

South Head Water Samples , June 2007
Site T11 (Marine Water Intake) Offshore
47°47'35.0"N 54°03'07.0"W

Depth (m)	Temperature	Salinity	Conductivity	Turbidity	DO	pH
0	9.30		43180	60.3	106.7	7.64
1	8.40		43279	49.5	106.0	7.65
2	8.30		43350	0.1	105.5	7.66
3	8.30		43372	0	105.2	7.67
4	8.25		43395	0	105.1	7.67
5	8.16		43425	0	105.4	7.67
6	8.16		43425	0	105.4	7.67
7	8.16		43425	0	105.4	7.67
8	7.86		43507	0	104.3	7.68
9	7.87		43500	0	104.5	7.69
10	7.76		43498	0	104.2	7.70
11	7.65		43491	0	103.8	7.69
12	7.46		43529	0	103.7	7.70
13	7.12		43560	0	103.9	7.70
14	7.08		43554	0	103.9	7.70
15	6.99		43581	0	104.0	7.68
16	6.81		43588	0	103.8	7.70
17	6.36		43740	0	103.9	7.70
18	6.28		43814	0	103.7	7.74

Appendix-F

Newfoundland and Labrador Refinery Project

Marine Sediment Analytical Results

Appendix F1

Newfoundland and Labrador Refinery Project

Marine Sediment Analytical Results

Metals - Hydrides

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 11, 2007 May 30, 2007 1 of 7
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

ICP Metals + Hydrides

Lab Number		**S2007-06554**	**S2007-06556**	**S2007-06559**	**S2007-06561**	**S2007-06561**	**S2007-06565**
Sample ID		**T3-1 (1-4)**	**T3-2 (1-2-4)**	**T11-2 (1-4)**	**T9-5 (1-4)**	**T9-5 (1-4)**	**T6-2 (1-4)**
Date Collected		**18-May-07**	**18-May-07**	**23-May-07**	**17-May-07**	**17-May-07**	**17-May-07**
Unit		**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**
Parameters	**MDL (µg/g)**					**(Replicate)**	
Aluminum	5	13300	13200	12900	11000	11100	17800
Antimony	0.5	0.7	0.6	<0.5	<0.5	<0.5	0.7
Arsenic	0.5	6.4	2.7	2.3	2.5	2.6	2.6
Barium	0.5	29.4	7.3	16.9	40.7	40.9	11.0
Beryllium	0.2	0.3	0.2	0.2	0.3	0.3	0.3
Bismuth	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	25	9490	88900	99500	3830	3690	28700
Chromium	1	19	18	16	14	14	27
Cobalt	1	10	11	10	8	8	14
Copper	1	15	16	12	9	9	15
Iron	5	25100	23100	22300	18100	18100	30800
Lead	5	10	<5	<5	8	8	<5
Magnesium	10	10600	13400	12500	7600	7630	16100
Manganese	1	487	583	491	390	392	787
Mercury	0.01	0.04	0.01	0.01	0.02	0.02	0.01
Molybdenum	2	2	<2	2	<2	<2	2
Nickel	5	18	19	15	14	14	25
Phosphorus	5	871	708	756	638	636	793
Potassium	10	1530	1010	1010	1230	1250	926
Selenium	0.1	0.4	0.1	0.2	0.2	0.2	0.1
Silver	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Sodium	25	8060	8360	6330	4460	4580	4210
Vanadium	5	52	35	45	37	37	44
Zinc	2	48	46	38	37	38	54

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 11, 2007 May 30, 2007 2 of 7
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

ICP Metals + Hydrides

Lab Number **Sample ID** **Date Collected** **Unit**		**S2007-06569** **T7-1 (1-4)** **17-May-07** **(µg/g)**	**S2007-06573** **T7-2 (1-4)** **17-May-07** **(µg/g)**	**S2007-06577** **T4-2 (1-4)** **18-May-07** **(µg/g)**	**S2007-06581** **T5-1 (1-4)** **18-May-07** **(µg/g)**	**S2007-06585** **T6-1 (1-4)** **17-May-07** **(µg/g)**	**S2007-06589** **T11-3R (1-4)** **23-May-07** **(µg/g)**
Parameters	**MDL (µg/g)**						
Aluminum	5	15000	15500	18100	14300	16600	16500
Antimony	0.5	0.5	0.5	0.7	0.6	0.7	0.7
Arsenic	0.5	2.0	4.0	3.0	4.9	2.8	1.2
Barium	0.5	22.7	11.5	9.8	24.2	29.0	19.7
Beryllium	0.2	0.3	0.2	0.2	0.3	0.3	0.3
Bismuth	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	25	4280	89600	21300	6590	7920	7330
Chromium	1	21	22	26	19	24	23
Cobalt	1	13	12	15	10	15	15
Copper	1	10	14	15	16	12	14
Iron	5	25400	25900	31800	26100	29700	30900
Lead	5	<5	<5	<5	10	<5	<5
Magnesium	10	12400	15200	16300	11700	14200	13800
Manganese	1	616	681	792	524	695	604
Mercury	0.01	0.01	0.01	0.01	0.03	0.01	0.01
Molybdenum	2	<2	<2	<2	5	<2	<2
Nickel	5	21	20	25	19	23	21
Phosphorus	5	668	809	856	859	783	739
Potassium	10	866	1190	725	1730	958	755
Selenium	0.1	<0.1	0.2	<0.1	0.4	<0.1	<0.1
Silver	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Sodium	25	2230	9090	2960	11200	3010	2560
Vanadium	5	47	36	48	50	55	69
Zinc	2	49	48	56	49	54	49

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 11, 2007 May 30, 2007 3 of 7
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

ICP Metals + Hydrides

Lab Number **Sample ID** **Date Collected** **Unit**		**S2007-06594** **T11-2R (1-4)** **23-May-07** **(µg/g)**	**S2007-06597** **T9-4 (1-4)** **22-May-07** **(µg/g)**	**S2007-06597** **T9-4 (1-4)** **22-May-07** **(µg/g)**	**S2007-06601** **T8-1 (1-4)** **17-May-07** **(µg/g)**	**S2007-06605** **T8-2 (1-4)** **22-May-07** **(µg/g)**	**S2007-06609** **T11-3 (1-4)** **23-May-07** **(µg/g)**
Parameters	**MDL (µg/g)**			**(Replicate)**			
Aluminum	5	13400	12800	12400	12200	12300	17000
Antimony	0.5	0.5	0.6	<0.5	<0.5	<0.5	0.9
Arsenic	0.5	3.0	7.8	7.8	6.2	3.1	1.4
Barium	0.5	17.3	26.7	26.1	29.6	37.8	37.4
Beryllium	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Bismuth	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	25	94700	5630	5500	30800	7300	8020
Chromium	1	18	17	17	16	16	25
Cobalt	1	11	9	8	8	9	16
Copper	1	13	13	13	12	9	15
Iron	5	24300	24000	23200	22600	21100	32300
Lead	5	<5	11	11	10	9	<5
Magnesium	10	13100	9300	8990	9200	8910	14200
Manganese	1	545	451	436	466	456	625
Mercury	0.01	0.02	0.03	0.03	0.05	0.02	0.01
Molybdenum	2	2	3	3	2	<2	<2
Nickel	5	16	17	16	15	15	21
Phosphorus	5	821	781	758	765	704	727
Potassium	10	1140	1690	1670	1670	1390	767
Selenium	0.1	0.2	0.3	0.3	0.3	0.2	<0.1
Silver	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Sodium	25	8310	9720	9460	9320	7300	2460
Vanadium	5	50	44	44	42	42	74
Zinc	2	41	42	42	41	40	50

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 11, 2007 May 30, 2007 4 of 7
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

ICP Metals + Hydrides

Lab Number **Sample ID** **Date Collected** **Unit**		**S2007-06613** **T4-1 (1-4)** **18-May-07** **(µg/g)**	**S2007-06617** **T5-2 (1-4)** **18-May-07** **(µg/g)**	**S2007-06620** **T12-1 (1-3-4)** **22-May-07** **(µg/g)**	**S2007-06622** **T1-1 (1-4)** **17-May-07** **(µg/g)**	**S2007-06625** **T2-1 (1-3)** **17-May-07** **(µg/g)**	**S2007-06627** **T2-2 (1-3-4)** **17-May-07** **(µg/g)**
Parameters	**MDL (µg/g)**						
Aluminum	5	15500	17400	11200	13900	19500	19200
Antimony	0.5	0.7	0.5	0.5	0.6	0.9	0.8
Arsenic	0.5	4.1	4.0	12.6	5.4	5.3	2.5
Barium	0.5	28.4	12.2	26.4	17.5	10.4	13.2
Beryllium	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Bismuth	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5
Calcium	25	32600	52100	102000	72800	34400	20600
Chromium	1	21	26	17	20	27	30
Cobalt	1	12	14	6	10	16	16
Copper	1	13	19	19	18	18	27
Iron	5	28000	31900	22800	26900	36200	34600
Lead	5	6	<5	26	7	5	<5
Magnesium	10	13100	16200	11600	12900	18700	16200
Manganese	1	635	763	229	519	879	878
Mercury	0.01	0.02	0.01	0.03	0.02	0.01	<0.01
Molybdenum	2	<2	3	7	7	<2	<2
Nickel	5	20	24	16	20	27	27
Phosphorus	5	804	940	1190	976	1080	745
Potassium	10	1150	1080	2620	1480	1300	1060
Selenium	0.1	0.1	0.1	0.7	0.3	<0.1	<0.1
Silver	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Sodium	25	4380	6620	21200	9630	8800	2000
Vanadium	5	48	48	51	52	52	48
Zinc	2	50	55	44	47	64	57

Appendix F2

Newfoundland and Labrador Refinery Project

Marine Sediment Analytical Results

BTEX/TPH (RBCA)

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 1 of 7
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

BTEX, TPH (RBCA Method)

Lab Number		**S2007-06554**	**S2007-06554**	**S2007-06556**	**S2007-06559**	**S2007-06561**	**S2007-06565**
Sample ID		**T3-1 (1-4)**	**T3-1 (1-4)**	**T3-2 (1-2-4)**	**T11-2 (1-4)**	**T9-5 (1-4)**	**T6-2 (1-4)**
Date Collected		**18-May-07**	**18-May-07**	**18-May-07**	**23-May-07**	**17-May-07**	**17-May-07**
Unit		**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**
Parameters	**MDL (µg/g)**		**(Replicate)**				
Benzene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m+p-Xylene	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
o-Xylene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TPH (C6-C10)	10	<10	<10	<10	<10	<10	<10
TPH (C6-C10) less BTEX	10	<10	<10	<10	<10	<10	<10
TPH (>C10-C21)	10	<10	<10	<10	<10	<10	<10
TPH (>C21-<C32)	50	<50	<50	<50	<50	<50	<50
Modified TPH (Tier 1)		<70	<70	<70	<70	<70	<70
Hydrocarbon Identification		-	-	-	-	-	-
BTEX, TPH Purgeable							
Surrogate Recovery							
Difluorobenzene (%)		109	113	118	117	116	107
4-Bromofluorobenzene (%)		104	115	101	102	102	98
Trifluorotoluene (%)		96	93	113	108	72	79
TPH Extractable Surrogate Recovery							
O-Terphenyl (%)		78	92	96	76	96	94
% Moisture		30.6	NR	16.1	37.1	37.7	45.4

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 3 of 7
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

BTEX, TPH (RBCA Method)

Lab Number		**S2007-06589**	**S2007-06594**	**S2007-06597**	**S2007-06601**	**S2007-06605**	**S2007-06609**
Sample ID		**T11-3R (1-4)**	**T11-2R (1-4)**	**T9-4 (1-4)**	**T8-1 (1-4)**	**T8-2 (1-4)**	**T11-3 (1-4)**
Date Collected		**23-May-07**	**23-May-07**	**22-May-07**	**17-May-07**	**22-May-07**	**23-May-07**
Unit		**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**
Parameters	**MDL (µg/g)**	**(Replicate)**					
Benzene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m+p-Xylene	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
o-Xylene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TPH (C6-C10)	10	<10	<10	<10	<10	<10	<10
TPH (C6-C10) less BTEX	10	<10	<10	<10	<10	<10	<10
TPH (>C10-C21)	10	<10	<10	<10	<10	<10	<10
TPH (>C21-<C32)	50	<50	<50	<50	<50	<50	<50
Modified TPH (Tier 1)		<70	<70	<70	<70	<70	<70
Hydrocarbon Identification		-	-	-	-	-	-
BTEX, TPH Purgeable							
Surrogate Recovery							
Difluorobenzene (%)		118	112	104	115	105	112
4-Bromofluorobenzene (%)		114	105	104	105	108	116
Trifluorotoluene (%)		102	115	111	121	116	102
TPH Extractable Surrogate Recovery							
O-Terphenyl (%)		95	101	89	87	91	93
% Moisture		NR	22.7	47.7	51.3	41.4	29.1

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 4 of 7
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

BTEX, TPH (RBCA Method)

Lab Number **Sample ID** **Date Collected** **Unit**		**S2007-06613** **T4-1 (1-4)** **18-May-07** **(µg/g)**	**S2007-06617** **T5-2 (1-4)** **18-May-07** **(µg/g)**	**S2007-06620** **T12-1 (1-3-4)** **22-May-07** **(µg/g)**	**S2007-06622** **T1-1 (1-4)** **17-May-07** **(µg/g)**	**S2007-06625** **T2-1 (1-3)** **17-May-07** **(µg/g)**	**S2007-06627** **T2-2 (1-3-4)** **17-May-07** **(µg/g)**
Parameters	**MDL (µg/g)**						
Benzene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m+p-Xylene	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
o-Xylene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TPH (C6-C10)	10	<10	<10	<10	<10	<10	<10
TPH (C6-C10) less BTEX	10	<10	<10	<10	<10	<10	<10
TPH (>C10-C21)	10	<10	<10	<10	<10	<10	<10
TPH (>C21-<C32)	50	<50	<50	<50	<50	<50	<50
Modified TPH (Tier 1)		<70	<70	<70	<70	<70	<70
Hydrocarbon Identification		-	-	-	-	-	-
BTEX, TPH Purgeable							
Surrogate Recovery							
Difluorobenzene (%)		113	104	111	111	112	112
4-Bromofluorobenzene (%)		110	103	111	111	109	107
Trifluorotoluene (%)		107	103	108	93	110	106
TPH Extractable Surrogate Recovery							
O-Terphenyl (%)		94	101	90	83	103	90
% Moisture		45.7	41.2	42.7	23.4	32.4	20.7

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 5 of 7
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

BTEX, TPH (RBCA Method)

Lab Number		**S2007-06630**
Sample ID		**T11-1 (1-4)**
Date Collected		**23-May-07**
Unit		**(µg/g)**
Parameters	**MDL (µg/g)**	
Benzene	0.01	<0.01
Toluene	0.01	<0.01
Ethylbenzene	0.01	<0.01
m+p-Xylene	0.02	<0.02
o-Xylene	0.01	<0.01
TPH (C6-C10)	10	<10
TPH (C6-C10) less BTEX	10	<10
TPH (>C10-C21)	10	<10
TPH (>C21-<C32)	50	<50
Modified TPH (Tier 1)		<70
Hydrocarbon Identification		-
BTEX, TPH Purgeable		
Surrogate Recovery		
Difluorobenzene (%)		104
4-Bromofluorobenzene (%)		103
Trifluorotoluene (%)		95
TPH Extractable Surrogate Recovery		
O-Terphenyl (%)		96
% Moisture		41.8

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Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

BTEX, TPH (RBCA Method)

		Lab Blank (µg/g)	Blank Spike (ug/g)	Blank Spike Recovery (%)	Date of Analysis
Parameters	**MDL (µg/g)**				
Benzene	0.01	<0.01	2.29	92	31-May-07 / 01-Jun-07
Toluene	0.01	<0.01	2.48	99	
Ethylbenzene	0.01	<0.01	2.24	90	
m+p-Xylene	0.02	<0.02	2.30	92	
o-Xylene	0.01	<0.01	2.17	87	
TPH (C6-C10)	10	<10	82.3	82	
TPH (C6-C10) less BTEX	10	<10	70.8	124	
TPH (>C10-C21)	10	<10	773	77	01/04-Jun-07
TPH (>C21-<C32)	50	<50			
Modified TPH (Tier 1)		<70	-	-	-
BTEX, TPH Purgeable					
Surrogate Recovery					
Difluorobenzene (%)		119	112	112	31-May-07 / 01-Jun-07
4-Bromofluorobenzene (%)		118	103	103	
Trifluorotoluene (%)		111	87	87	
TPH Extractable Surrogate Recovery					
O-Terphenyl (%)		84	119	119	01/04-Jun-07
Method Reference		Atlantic RBCA Tier 1			

Modified TPH is the total of TPH Purgeable (less BTEX) value and TPH Extractable value.
Total hydrocarbons quantified as Toluene/Diesel.
All values in ppm (ug/g) unless otherwise stated.
Results reported on dry weight basis.

Cynthia Ridge, C. Chem.
Q.A./Q.C. Officer

Suman Punani, C. Chem.
Laboratory Manager

Appendix F3

Newfoundland and Labrador Refinery Project

Marine Sediment Analytical Results

PAH

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 1 of 6
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

Polynuclear Aromatic Hydrocarbons

Lab Number		**S2007-06554**	**S2007-06556**	**S2007-06559**	**S2007-06561**	**S2007-06565**	**S2007-06569**
Sample ID		**T3-1 (1-4)**	**T3-2 (1-2-4)**	**T11-2 (1-4)**	**T9-5 (1-4)**	**T6-2 (1-4)**	**T7-1 (1-4)**
Date Collected		**18-May-07**	**18-May-07**	**23-May-07**	**17-May-07**	**17-May-07**	**17-May-07**
Unit		**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**
Parameters	**MDL (µg/g)**						
Naphthalene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Acenaphthylene	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Acenaphthene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene	0.001	0.003	<0.001	<0.001	0.007	<0.001	<0.001
Anthracene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoranthene	0.001	0.013	<0.001	<0.001	0.018	<0.001	0.001
Pyrene	0.003	0.008	<0.003	<0.003	0.013	<0.003	<0.003
Benzo(a)anthracene	0.001	<0.001	<0.001	<0.001	0.013	<0.001	<0.001
Chrysene	0.001	0.003	<0.001	<0.001	0.006	<0.001	<0.001
Benzo(b)fluoranthene	0.004	0.005	<0.004	<0.004	0.008	<0.004	<0.004
Benzo(k)fluoranthene	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(a)pyrene	0.003	0.003	<0.003	<0.003	0.006	<0.003	<0.003
Indeno(123 cd.)pyrene	0.003	<0.003	<0.003	<0.003	0.004	<0.003	<0.003
Dibenzo(ah)anthracene	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(ghi)perylene	0.002	0.007	<0.002	<0.002	0.003	<0.002	<0.002
Dilution Factor		1	1	1	1	1	1
Surrogate Recovery							
Naphthalene-d8 (%)		72	61	72	68	77	80
Antracene-d10 (%)		84	81	89	82	90	92
Perylene-d12 (%)		90	88	97	89	91	93

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Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

Polynuclear Aromatic Hydrocarbons

Lab Number		**S2007-06573**	**S2007-06577**	**S2007-06581**	**S2007-06585**	**S2007-06585**	**S2007-06589**
Sample ID		**T7-2 (1-4)**	**T4-2 (1-4)**	**T5-1 (1-4)**	**T6-1 (1-4)**	**T6-1 (1-4)**	**T11-3R (1-4)**
Date Collected		**17-May-07**	**18-May-07**	**18-May-07**	**17-May-07**	**17-May-07**	**23-May-07**
Unit		**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**
Parameters	**MDL (µg/g)**					**(Replicate)**	
Naphthalene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Acenaphthylene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Anthracene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoranthene	0.001	<0.001	<0.001	0.003	0.003	0.006	<0.001
Pyrene	0.003	<0.003	<0.003	<0.003	<0.003	0.004	<0.003
Benzo(a)anthracene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chrysene	0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001
Benzo(b)fluoranthene	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(k)fluoranthene	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(a)pyrene	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Indeno(123 cd.)pyrene	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Dibenzo(ah)anthracene	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(ghi)perylene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dilution Factor		1	1	1	1	1	1
Surrogate Recovery							
Naphthalene-d8 (%)		83	66	79	66	63	66
Antracene-d10 (%)		92	75	94	70	77	73
Perylene-d12 (%)		95	86	100	79	81	81

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Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

Polynuclear Aromatic Hydrocarbons

Lab Number		**S2007-06594**	**S2007-06597**	**S2007-06601**	**S2007-06605**	**S2007-06609**	**S2007-06613**
Sample ID		**T11-2R (1-4)**	**T9-4 (1-4)**	**T8-1 (1-4)**	**T8-2 (1-4)**	**T11-3 (1-4)**	**T4-1 (1-4)**
Date Collected		**23-May-07**	**22-May-07**	**17-May-07**	**22-May-07**	**23-May-07**	**18-May-07**
Unit		**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**
Parameters	**MDL (µg/g)**						
Naphthalene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Acenaphthylene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene	0.001	<0.001	0.002	<0.001	0.001	<0.001	0.008
Anthracene	0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Fluoranthene	0.001	<0.001	0.013	0.009	0.011	<0.001	0.013
Pyrene	0.003	<0.003	0.009	0.006	0.007	<0.003	0.009
Benzo(a)anthracene	0.001	<0.001	<0.001	<0.001	0.012	<0.001	<0.001
Chrysene	0.001	<0.001	0.004	0.003	0.004	<0.001	0.004
Benzo(b)fluoranthene	0.004	<0.004	0.006	0.004	0.004	<0.004	0.004
Benzo(k)fluoranthene	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.006
Benzo(a)pyrene	0.003	<0.003	0.004	0.003	0.003	<0.003	0.013
Indeno(123 cd.)pyrene	0.003	<0.003	0.003	<0.003	<0.003	<0.003	0.015
Dibenzo(ah)anthracene	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(ghi)perylene	0.002	<0.002	0.003	0.002	<0.002	<0.002	0.011
Dilution Factor		1	1	1	1	1	1
Surrogate Recovery							
Naphthalene-d8 (%)		66	66	66	66	66	66
Antracene-d10 (%)		74	74	81	75	74	72
Perylene-d12 (%)		80	79	85	86	74	79

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 4 of 6
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Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

Polynuclear Aromatic Hydrocarbons

Lab Number		**S2007-06617**	**S2007-06620**	**S2007-06620**	**S2007-06622**	**S2007-06625**	**S2007-06627**
Sample ID		**T5-2 (1-4)**	**T12-1 (1-3-4)**	**T12-1 (1-3-4)**	**T1-1 (1-4)**	**T2-1 (1-3)**	**T2-2 (1-3-4)**
Date Collected		**18-May-07**	**22-May-07**	**22-May-07**	**17-May-07**	**17-May-07**	**17-May-07**
Unit		**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**	**(µg/g)**
Parameters	**MDL (µg/g)**			**(Replicate)**			
Naphthalene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Acenaphthylene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene	0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001
Anthracene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoranthene	0.001	<0.001	0.011	0.008	0.009	<0.001	<0.001
Pyrene	0.003	<0.003	0.008	0.005	0.007	<0.003	<0.003
Benzo(a)anthracene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chrysene	0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Benzo(b)fluoranthene	0.004	<0.004	0.004	<0.004	0.004	<0.004	<0.004
Benzo(k)fluoranthene	0.004	0.004	<0.004	<0.004	0.004	<0.004	<0.004
Benzo(a)pyrene	0.003	0.009	0.003	<0.003	0.009	<0.003	<0.003
Indeno(123 cd.)pyrene	0.003	<0.003	0.015	0.016	0.011	<0.003	<0.003
Dibenzo(ah)anthracene	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(ghi)perylene	0.002	<0.002	0.011	0.010	0.008	<0.002	<0.002
Dilution Factor		1	1	1	1	1	1
Surrogate Recovery							
Naphthalene-d8 (%)		60	63	63	63	75	72
Antracene-d10 (%)		77	72	73	84	93	89
Perylene-d12 (%)		79	72	74	91	93	89

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 5 of 6
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

Polynuclear Aromatic Hydrocarbons

Lab Number **Sample ID** **Date Collected** **Unit**		**S2007-06630** **T11-1 (1-4)** **23-May-07** **(µg/g)**	**S2007-06630** **T11-1 (1-4)** **23-May-07** **(µg/g)**	**Lab** **Blank** **(µg/g)**	**Blank** **Spike** **(µg/g)**	**Blank** **Spike** **Recovery** **(%)**
Parameters	**MDL** **(µg/g)**		**(Replicate)**			
Naphthalene	0.002	<0.002	<0.002	<0.002	0.139	69
Acenaphthylene	0.001	0.002	0.002	<0.001	0.140	70
Acenaphthene	0.002	<0.002	<0.002	<0.002	0.137	69
Fluorene	0.001	<0.001	<0.001	<0.001	0.142	71
Phenanthrene	0.001	0.005	0.013	<0.001	0.158	79
Anthracene	0.001	<0.001	<0.001	<0.001	0.163	82
Fluoranthene	0.001	0.033	0.035	<0.001	0.160	80
Pyrene	0.003	0.025	0.027	<0.003	0.164	82
Benzo(a)anthracene	0.001	0.018	0.018	<0.001	0.152	76
Chrysene	0.001	0.011	0.012	<0.001	0.162	81
Benzo(b)fluoranthene	0.004	0.014	0.016	<0.004	0.158	79
Benzo(k)fluoranthene	0.004	0.011	0.011	<0.004	0.166	83
Benzo(a)pyrene	0.003	0.020	0.021	<0.003	0.153	76
Indeno(123 cd.)pyrene	0.003	0.021	0.023	<0.003	0.146	73
Dibenzo(ah)anthracene	0.004	0.014	0.013	<0.004	0.150	75
Benzo(ghi)perylene	0.002	0.016	0.016	<0.002	0.159	79
Dilution Factor		1	1	1	1	1
Surrogate Recovery						
Naphthalene-d8 (%)		66	66	65	71	71
Antracene-d10 (%)		86	79	94	85	85
Perylene-d12 (%)		92	88	100	94	94
Date of Analysis		01/05-Jun-07				
Method References		SW 846, 3550, 3630, 8270 D				

Appendix F4

Newfoundland and Labrador Refinery Project

Marine Sediment Analytical Results

PCB

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 1 of 3
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

Polychlorinated Biphenyls

Parameter **Method Detection Limit** **Unit**			**Total PCB** **0.005** **(µg/g)**	**Surrogate Recovery (Decachloro-biphenyl)** **(%)**
Lab Number	**Sample ID**	**Date Collected**		
S2007-06554	T3-1 (1-4)	18-May-07	<0.005	105
S2007-06556	T3-2 (1-2-4)	18-May-07	<0.005	106
S2007-06559	T11-2 (1-4)	23-May-07	<0.005	104
S2007-06561	T9-5 (1-4)	17-May-07	<0.005	103
S2007-06565	T6-2 (1-4)	17-May-07	<0.005	96
S2007-06569	T7-1 (1-4)	17-May-07	<0.005	102
S2007-06573	T7-2 (1-4)	17-May-07	<0.005	105
S2007-06577	T4-2 (1-4)	18-May-07	<0.005	62
S2007-06581	T5-1 (1-4)	18-May-08	<0.005	107
S2007-06585	T6-1 (1-4)	17-May-07	<0.005 (<0.005)	89 (88)
S2007-06589	T11-3R (1-4)	23-May-07	<0.005	101
S2007-06594	T11-2R (1-4)	23-May-07	<0.005	100
S2007-06597	T9-4 (1-4)	22-May-07	<0.005	96
S2007-06601	T8-1 (1-4)	17-May-07	<0.005	102
S2007-06605	T8-2 (1-4)	22-May-07	<0.005	93
S2007-06609	T11-3 (1-4)	23-May-07	<0.005	103
S2007-06613	T4-1 (1-4)	18-May-07	<0.005	102
S2007-06617	T5-2 (1-4)	18-May-07	<0.005	88
S2007-06620	T12-1 (1-3-4)	22-May-07	<0.005	108
S2007-06622	T1-1 (1-4)	17-May-07	<0.005	99
S2007-06625	T2-1 (1-3)	17-May-07	<0.005	112

Client:	AMEC Earth & Environmental, A Division of AMEC Americas Limited 133 Crosbie Road, Suite 202, P.O. Box 13216 St. John's, Newfoundland A1B 4A5	Report Date: Received Date: Page:	June 06, 2007 May 30, 2007 2 of 3
Project Name:	NLRC	Sample Type:	Soil
Project Number:	TF 6116547	Lab Ref.:	F2007-0863
Contact:	Eugene Lee		Final

CERTIFICATE OF ANALYSIS

Polychlorinated Biphenyls

Parameter **Method Detection Limit** **Unit**			**Total PCB** **0.005** **(µg/g)**	**Surrogate Recovery (Decachloro-biphenyl)** **(%)**
Lab Number	**Sample ID**	**Date Collected**		
S2007-06627	T2-2 (1-3-4)	17-May-07	<0.005	103
S2007-06630	T11-1 (1-4)	23-May-07	<0.005 (<0.005)	97 (93)
Lab Blank			<0.005	113
Blank Spike			0.069	109
Blank Spike Recovery (%)			86	109
Date of Analysis			01/04-Jun-07	
Method References			SW 846, 3550, 3620C, 8082A	

Total PCB quantified as Aroclor 1254/60.
Results reported on dry weight basis.
All values in ppm (ug/g) unless otherwise stated.

Appendix F5

Newfoundland and Labrador Refinery Project

Marine Sediment Analytical Results

TOC

Sampler Initials:

RESULTS OF ANALYSES OF SOIL

Maxxam ID		S70312	S70313	S70314	S70315	S70316	S70317	S70318	S70319
Sampling Date									
COC Number		520258	520258	520258	520258	520258	520258	520258	520258
	Units	**S2007-6554 / T3-1**	**S2007-6556 / T3-2**	**S2007-6559 / T11-2**	**S2007-6561 / T9-5**	**S2007-6565 / T6-2**	**S2007-6569 / T7-1**	**S2007-6573 / T7-2**	**S2007-6577 / T4-2**
INORGANICS									
Total Organic Carbon	mg/kg	25000	7800	8500	13000	6300	4800	5200	4200

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
QC Batch = Quality Control Batch

S70320	S70321	S70322	S70323	S70324	S70325	S70325	S70326	S70327
520258	520258	520258	520258	520258	520258	520258	520258	520258
S2007-6581 / T5-1	**S2007-6585 / T6-1**	**S2007-6589 / T11-3R**	**S2007-6594 / T11-2R**	**S2007-6597 / T9-4**	**S2007-6601 / T8-1**	**S2007-6601 / T8-1 Lab-Dup**	**S2007-6605 / T8-2**	**S2007-6609 / T11-3**
29000	5600	1500	9200	25000	18000	17000	13000	1300

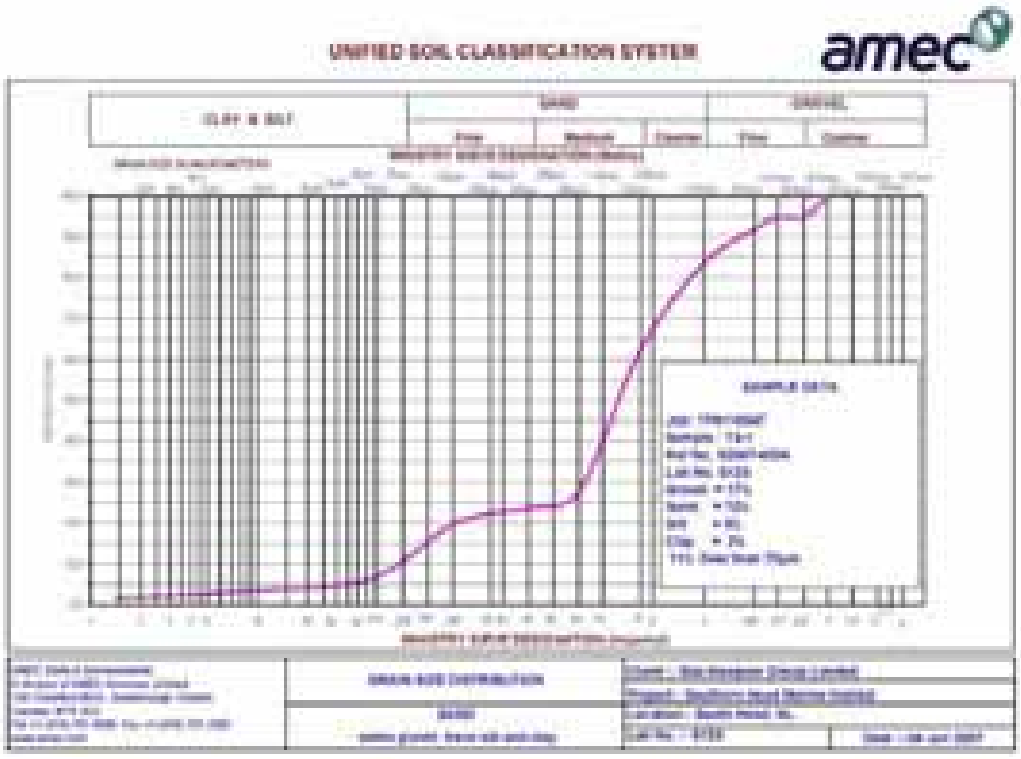
S70328	S70329	S70330	S70331	S70332	S70332	S70333	S70334		
520258	520258	520258	520258	520258	520258	520258	520258		
S2007-6613 / T4-1	**S2007-6617 / T5-2**	**S2007-6620 / T12-1**	**S2007-6622 / T1-1**	**S2007-6625 / T2-1**	**S2007-6625 / T2-1 Lab-Dup**	**S2007-6627 / T2-2**	**S2007-6630 / T11-1**	**RDL**	**QC Batch**
9600	13000	49000	25000	9400	8000	2600	35000	500	1260302

Appendix F6

Newfoundland and Labrador Refinery Project

Marine Sediment Analytical Results

Particle Size Analysis



amec

Grain Size Analysis

Project :- Southern Head Marine Habitat
Client :- Rae Newington Group Limited
Job# :- 71610047

Location :- South Head, NL
Date :- 6-Jun-07
Tested By :- RC/RB/KB

Ref No. :- 50/01-0054
Lab No. :- 5125

Sample # :- 73-1
Checked By :- MH

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing	Total Wt (g)	606.67
26.5	0.00	100.0	Wt used for Hydrometer (g)	
19.0	23.70	96.1	50.11	
13.2	51.70	91.5	Fines (sieve Reference # 200mm)	
9.5	90.60	85.1	0.034	11.20	0.023
4.75	131.8	78.3	0.025	10.80	0.018
2.00	174.80	71.2	0.018	10.47	0.013
0.83		67.5	0.134	10.34	0.010
0.425		65.4	0.106	10.13	0.008
0.250		62.3	0.075	9.93	0.005
0.150		59.1	75µm	9.80	0.004
0.106		55.3			
0.075		53.7			
0.0554		51.0			
0.0399		49.3			
0.0286		47.5			
0.0162		45.6			
0.0133		44.7			
0.0096		43.8			
0.0069		43.1			
0.0054		42.7			
0.0047		42.4			
0.0033		42.0			
0.0014		41.6			

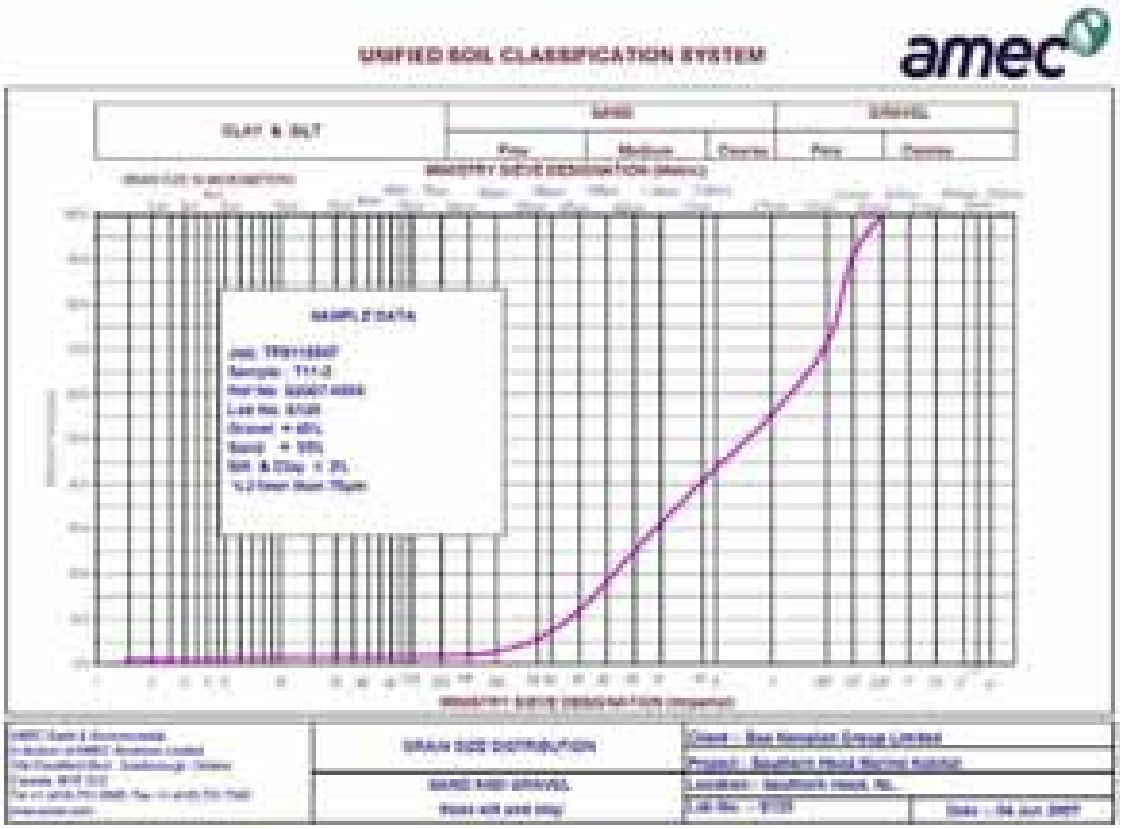
Grain Size Analysis

Project :-	Southern Head Marine Habitat	**Location:-**	South Head, NL
Client :-	Bae Newplan Group Limited	**Date :-**	4-Jun-07
Job# :-	TF6118647	**Tested By :-**	DC/RS/AS
Ref No.:-	02007-6056	**Sample # :-**	T3-2
Lab No. :-	5124	**Checked By :-**	DB

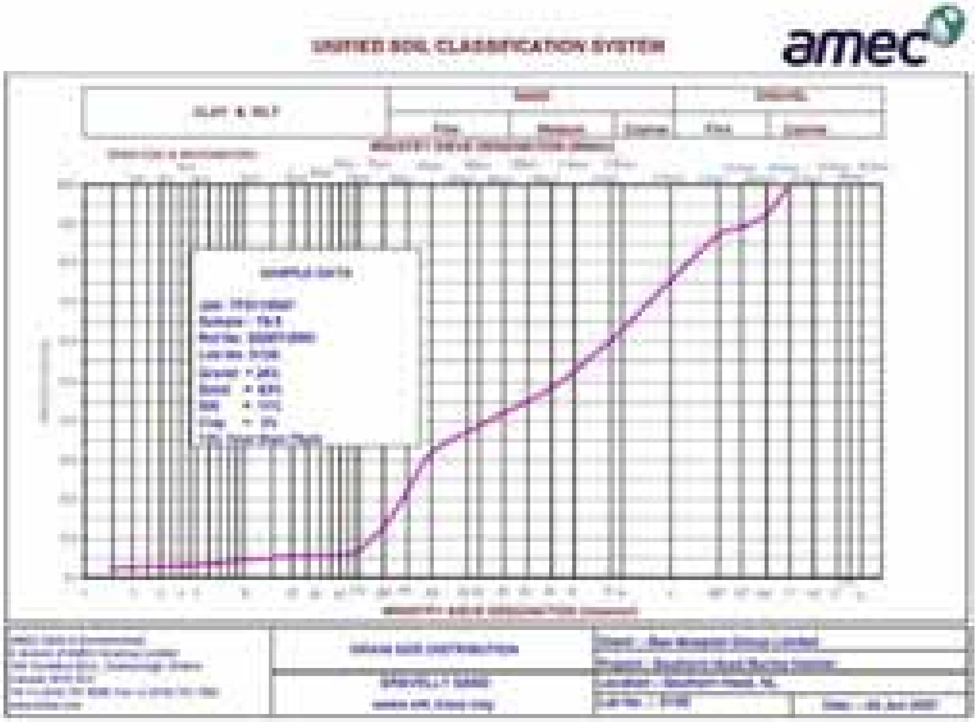
Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
19.0	[illegible]	100.0
13.2	[illegible]	95.4
9.5	[illegible]	91.7
4.75	[illegible]	86.1
2.00	[illegible]	56.2
0.85		15.2
0.425		6.1
0.250		1.9
0.150		1.4
0.106		1.3
0.075		1.2
0.0032		1.1
0.0014		0.9

Total Wt (g): 293.81

Wt used for Hydrometer (g)		
84.77		
Pass (mm) Retained (r) W%mm		
0.850	[illegible]	0.460
0.425	84.44	0.159
0.250	[illegible]	0.050
0.150	[illegible]	0.036
0.106	[illegible]	0.033
0.075	[illegible]	0.002
Pan	[illegible]	0.001


UNIFIED SOIL CLASSIFICATION SYSTEM
amec
CLAY & SILT
SAND
GRAVEL
Fine
Medium
Coarse
Fine
Coarse
SAMPLE DATA
Sample : TP11-2
Gravel : + 45%
Sand : + 55%
Silt & Clay : < 3%
GRAIN SIZE DISTRIBUTION
SAND AND GRAVEL
trace silt and clay
Client :- Bas Hewplan Group Limited
Project :- Southern Head Marine Habitat
Location :- Southern Head, NL
Date :- 04 Jun 2007


amec
Grain Size Analysis
Project :-
Southern Head Marine Habitat
Client :-
Bas Hewplan Group Limited
Location :-
Southern Head, NL
Date :- 4-Jun-07
Tested By :- SC/RS/AS
Sample # :- TP11-2
Checked By :-
Sieve size (mm)
Cumm. Wt. Retained (g)
%passing
Total Wt (g)
217.17



Grain Size Analysis

amec

Project:- Southern Head Marine Habitat
Client:- Bee Newplan Group Limited
Job#:- TF6118047

Location:- Southern Head, NL
Date:- 4-Jun-07
Tested By:- SC/RS/KS

Ref No.:- 22007-5001
Lab No.:- 5126

Sample #:- TS-3
Checked By:- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
26.5	[illegible]	100.0
19.0	[illegible]	95.8
13.2	[illegible]	89.2
9.5	[illegible]	87.2
4.75	[illegible]	75.5
2.00	[illegible]	60.3
0.85		46.8
0.425		42.1
0.250		37.1
0.150		32.0
0.106		22.3
0.075		13.0
[illegible]		6.6
[illegible]		5.8
[illegible]		5.6
[illegible]		5.1
[illegible]		4.7
[illegible]		4.4
[illegible]		3.8
[illegible]		3.4
[illegible]		3.2
[illegible]		3.0
[illegible]		2.4

Total Wt (g): [illegible]

0.850	[illegible]	[illegible]
0.425	[illegible]	[illegible]
0.250	[illegible]	[illegible]
0.150	[illegible]	[illegible]
0.106	[illegible]	[illegible]
0.075	[illegible]	[illegible]
Pan	[illegible]	[illegible]

UNIFIED SOIL CLASSIFICATION SYSTEM

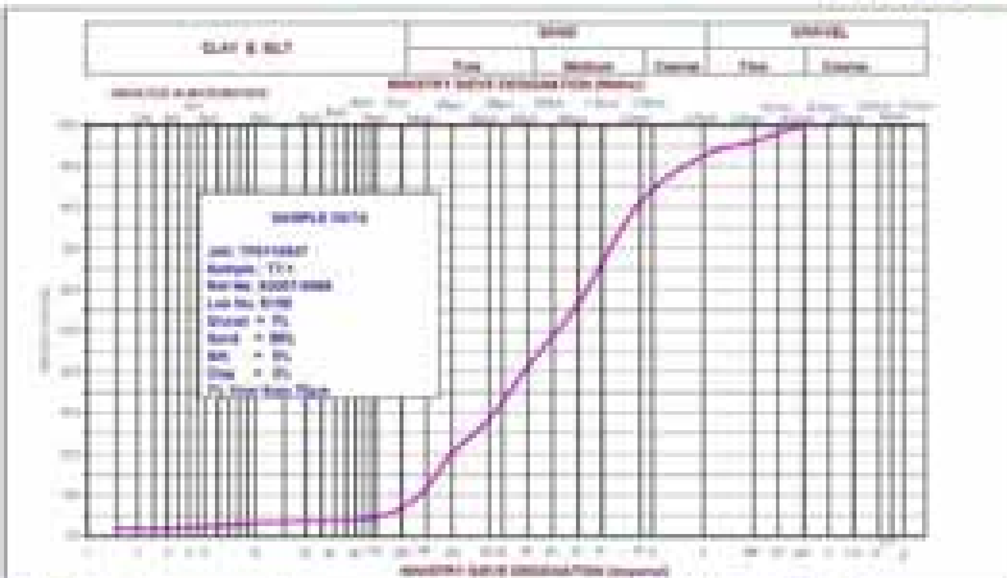
Grain Size Analysis

Project :-	Southern Head Marine Habitat	Location :-	Southern Head, NL
Client :-	[illegible]	Date :-	4-Jun-07
Job# :-	[illegible]	Tested By :-	[illegible]
Ref No. :-	[illegible]	Sample # :-	[illegible]
Lab No. :-	[illegible]	Checked By :-	[illegible]

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing	Total Wt (g)	[illegible]
26.5	[illegible]	100.0		
19.0	[illegible]	[illegible]		
13.2	[illegible]	[illegible]		
9.5	[illegible]	[illegible]		
4.75	[illegible]	[illegible]		
2.00	[illegible]	[illegible]		
0.85		[illegible]		
0.425		[illegible]		
0.250		[illegible]		
0.150		[illegible]		
0.106		[illegible]		
0.075		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		

Wt used for hydrometer (g)		
[illegible]		
Fines Sieve Retained		
0.850	[illegible]	[illegible]
0.425	[illegible]	[illegible]
0.250	[illegible]	[illegible]
0.150	[illegible]	[illegible]
0.106	[illegible]	[illegible]
0.075	[illegible]	[illegible]
Pan	[illegible]	[illegible]

UNIFIED SOIL CLASSIFICATION SYSTEM



[illegible]	GRAIN SIZE DISTRIBUTION	[illegible]
	SAND	[illegible]
	[illegible]	Lab No. :- [illegible] / Date :- [illegible]

Grain Size Analysis

Project :- Southern Head Marine Habitat
Client :- [illegible]
Job# :- [illegible]

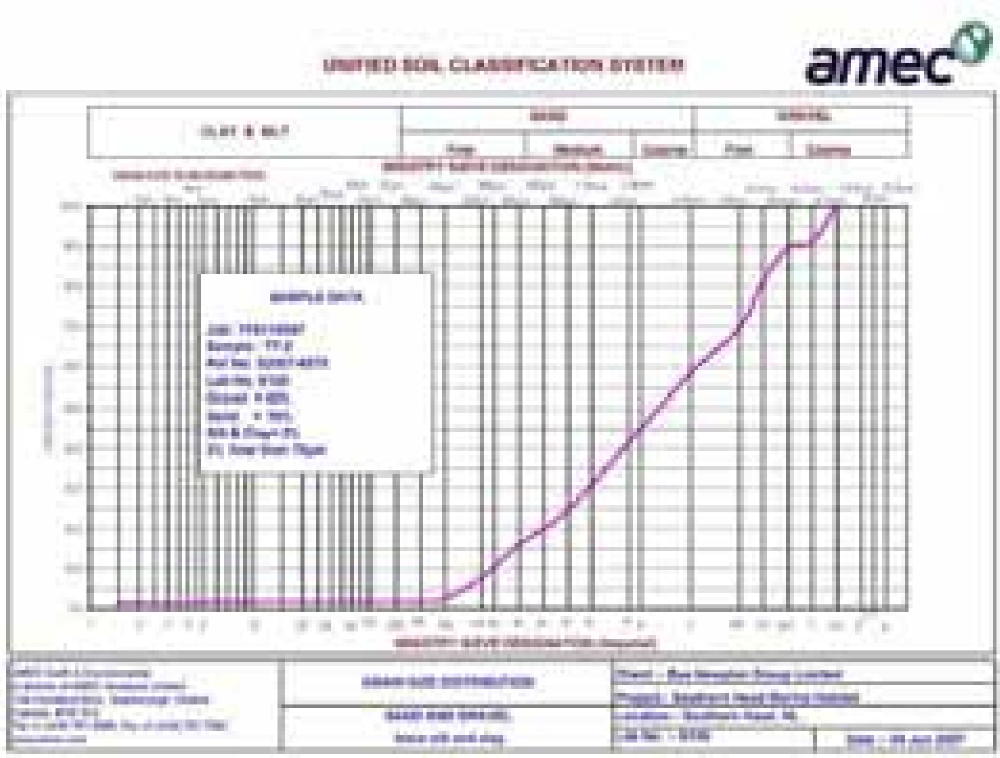
Location :- Southern Head, NL
Date :- 4-Jun-07
Tested By :- [illegible]

Ref No. :- [illegible]
Lab No. :- [illegible]

Sample # :- T7-1
Checked By :- [illegible]

Sieve size (mm)	Cumm. Wt Retained (g)	%passing	Total Wt (g)	[illegible]
19.0	[illegible]	100.0		
13.2	[illegible]	[illegible]		
9.5	[illegible]	[illegible]		
4.75	[illegible]	[illegible]		
2.00	[illegible]	[illegible]		
0.85		[illegible]		
0.425		[illegible]		
0.250		[illegible]		
0.150		[illegible]		
0.106		[illegible]		
0.075		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		
[illegible]		[illegible]		

Wt used for Hydrometer (g)		
[illegible]		
[illegible]		
0.850	[illegible]	[illegible]
0.425	[illegible]	[illegible]
0.250	[illegible]	[illegible]
0.150	[illegible]	[illegible]
0.106	[illegible]	[illegible]
0.075	[illegible]	[illegible]
Pan	[illegible]	[illegible]



Grain Size Analysis

Project:-	Southern Head Marine Habitat	**Location:-**	Southern Head, NL
Client :-	Bae Newplan Group Limited	**Date :-**	4-Jun-07
Job# :-	TF6116047	**Tested By :-**	SC/RS/AS
Ref No.:-	02007-4573	**Sample # :-**	T7-2
Lab No. :-	8129	**Checked By :-**	SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
37.0	0.00	100.0
26.5	24.89	91.2
19.0	28.89	89.8
13.2	52.34	81.5
9.5	85.75	69.7
4.75	117.83	58.4
2.00	165.05	41.7
0.85		24.7
0.425		16.1
0.250		7.7
0.150		2.6
0.106		2.1
0.075		1.9
0.0051		1.8
0.0046		1.5
0.0042		1.4
0.0015		1.4

Total Wt (g): 283.43

Wt used for Hydrometer (g): 65.22

Pass 2mm Retained [illegible]

Size	Retained	
0.850	[illegible]	0.561
0.425	40.74	0.385
0.250	53.04	0.189
0.150	62.11	0.082
0.106	62.94	0.050
0.075	63.14	0.047
Pan	63.39	0.045

amec

Grain Size Analysis

Project:- Southern Head Marine Habitat
Client :- Sea-Neuplan Group Limited
Job# :- TF8110047

Location:- Southern Head, NL
Date :- 4-Jun-07
Tested By :- SC/RG/AS

Ref No.:- 52007-8677
Lab No. :- S130

Sample # :- T4-2
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
26.5	0.00	100.0
16.0	13.05	98.8
13.2	14.00	95.3
9.5	28.74	92.0
4.75	67.85	78.1
2.00	119.43	61.8
0.85		54.8
0.425		38.4
0.250		8.3
0.150		3.8
0.106		2.8
0.075		2.8
0.0xxx		2.1
0.0xxx		1.8
0.0xxx		1.8
0.0xxx		1.8
0.0xxx		1.7

Total Wt (g): 309.15

Wt used for Hydrometer (g): 71.47

Pass Cum. Retained & D(mm)		
0.850	5.87	5.877
0.425	25.41	0.850
0.250	61.65	0.130
0.150	67.35	0.269
0.106	66.14	0.047
0.075	69.43	0.043
Pan	69.56	0.041

amec

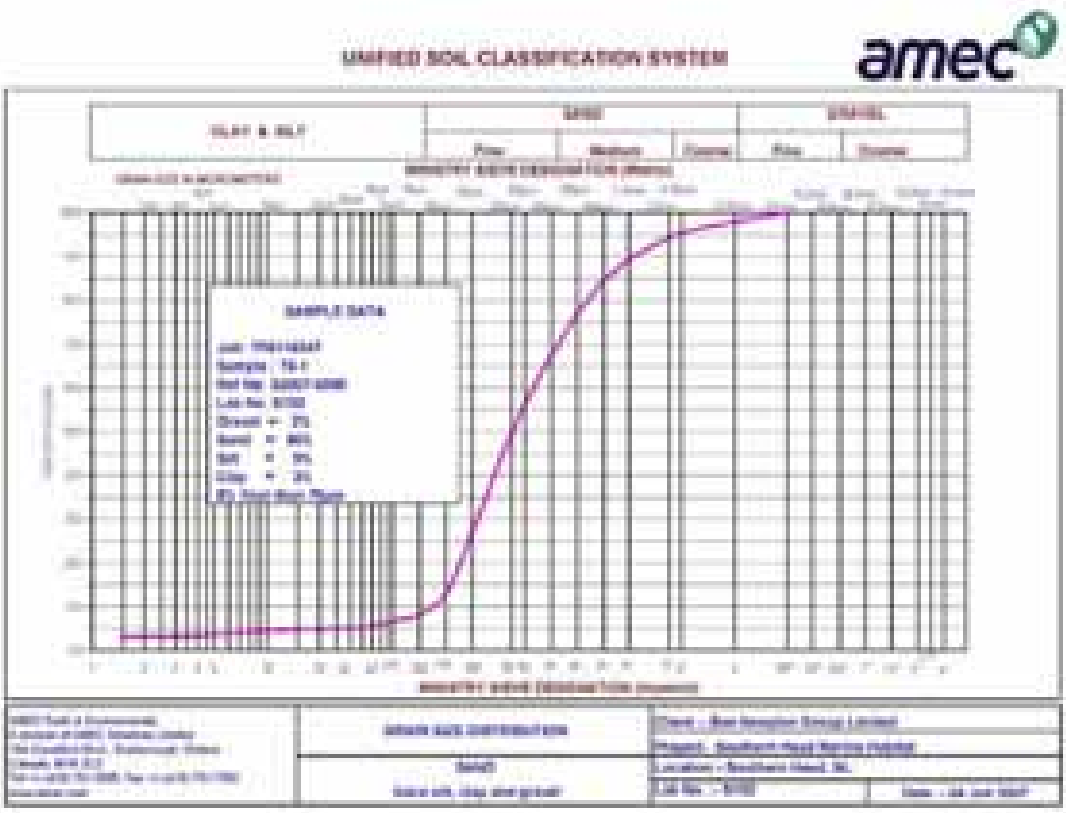
Grain Size Analysis

Project:-	[illegible]	Location:-	[illegible]
Client:-	[illegible]	Date:-	[illegible]
Job# :-	[illegible]	Tested By:-	[illegible]
Ref No.:-	[illegible]	Sample #:-	[illegible]
Lab No.:-	[illegible]	Checked By:-	[illegible]

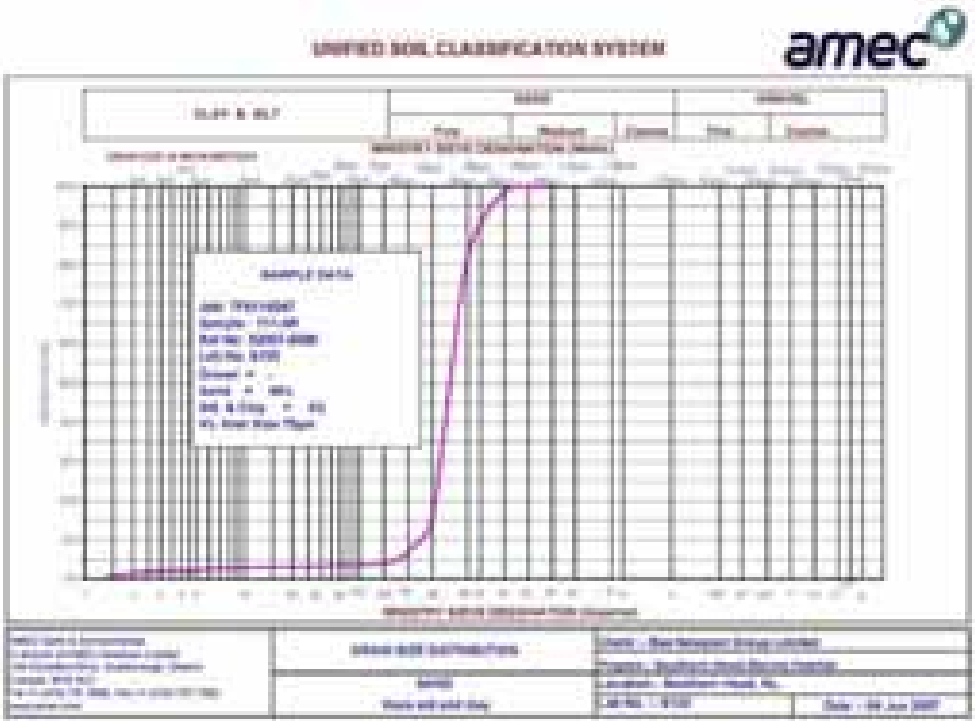
Sieve size (mm)	Cumm. Wt Retained (g)	%passing
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]

Total Wt (g)	[illegible]

[illegible]		
[illegible]		
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]


UNIFIED SOIL CLASSIFICATION SYSTEM
amec
CLAY & SILT
SAND
GRAVEL
Fine
Medium
Coarse
Fine
Coarse
SAMPLE DATA
Sample : Tb1
Lab No. 5132
Gravel = 3%
Sand = 96%
Silt = 0%
Clay = 0%


amec
Grain Size Analysis
Project:- Southern Head Marine Habitat
Client :- Ibas Navigation Group Limited
Job# :- TP811954T
Location:- Southern Head, NL
Date :- 4-Jun-07
Tested By :- SC/RS/AS
Ref No.:- 52007-4949
Lab No. :- 5132
Sample # :- Tb1
Checked By :- SB
Sieve size (mm)
Cumm. Wt. Retained (g)
%passing
Total Wt (g)
204.35
47.20



amec

Grain Size Analysis

Project:- Southern Head Marine Habitat
Client :- Bae Newplan Group Limited
Job# :- TF0118547

Location:- Southern Head, NL
Date :- 4-Jun-07
Tested By :- BC/RS/AS

Ref No.:- S2007-8589
Lab No. :- S133

Sample # :- T11-3R
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
4.75	0.00	100.0
2.00	0.07	100.0
0.85		99.8
0.425		98.3
0.250		81.8
0.150		10.5
0.106		6.9
0.075		4.1
0.0357		3.3
0.0276		3.1
0.0160		2.9
0.0108		2.8
0.0083		2.7
0.0060		2.5
0.0053		2.3
0.0046		2.0
0.0032		2.0
0.0014		0.7

Total Wt (g)	377.76

Wt used for hydrometer (g)	
73.07	

Pass 2mm, Retained 0.075mm

0.850	0.10	0.060
0.425	1.05	0.046
0.250	13.32	0.019
0.150	61.71	0.155
0.106	69.00	0.069
0.075	70.10	0.041
Pan	71.74	0.018

Grain Size Analysis

Project:-	Southern Head Marine Habitat	**Location:-**	Southern Head, NL
Client :-	Bae Newplan Group Limited	**Date :-**	4-Jun-07
Job# :-	TF6116047	**Tested By :-**	SC/RS/AS
Ref No.:-	S2007-6584	**Sample # :-**	T11-29
Lab No. :-	5134	**Checked By :-**	SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
37.5	0.00	100.0
26.5	24.45	92.0
19.0	50.47	83.4
13.2	77.80	74.5
9.5	109.84	64.0
4.75	158.11	48.1
2.00	197.24	35.3
0.85		21.8
0.425		10.0
0.250		4.9
0.150		2.5
0.106		1.8
0.075		1.6
0.0066		1.4
0.0054		1.3
0.0042		1.2
0.0031		1.1
0.0014		0.9

Total Wt (g)	304.91

Wt used for Hydrometer (g)		
73.22		
Pass Iron Retained 0.075mm		
0.850	[illegible]	0.613
0.425	52.50	0.283
0.250	65.00	0.138
0.150	[illegible]	0.071
0.106	[illegible]	0.050
0.075	[illegible]	0.045
Pan	[illegible]	0.044

Grain Size Analysis

Project :-	Southern Head Marine Habitat	**Location:-**	Southern Head, NL
Client :-	Bae-Newplan Group Limited	**Date :-**	4-Jun-07
Job# :-	[illegible]	**Tested By :-**	[illegible]
Ref No.:-	[illegible]	**Sample # :-**	TN-4
Lab No. :-	[illegible]	**Checked By :-**	[illegible]

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
26.5	0.00	100.0
19.0	[illegible]	79.4
13.2	[illegible]	79.4
9.5	[illegible]	74.7
4.75	[illegible]	[illegible]
2.00	[illegible]	[illegible]
0.85		46.7
0.425		[illegible]
0.250		41.6
0.150		37.7
0.106		[illegible]
0.075		[illegible]
[illegible]		[illegible]
[illegible]		12.4
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		4.2
[illegible]		[illegible]
[illegible]		[illegible]

Total Wt (g)	[illegible]

Wt used for hydrometer (g)		
[illegible]		
Pass. Sieve Retained 0.075mm		
0.850	[illegible]	[illegible]
0.425	[illegible]	[illegible]
0.250	[illegible]	[illegible]
0.150	[illegible]	[illegible]
0.106	[illegible]	[illegible]
0.075	[illegible]	[illegible]
Pan	[illegible]	[illegible]

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Grain Size Analysis

Project :-	Southern Head Marine Habitat	Location :-	Southern Head, NL
Client :-	Bee Newplan Group Limited	Date :-	4-Jun-07
Job# :-	TF6118647	Tested By :-	[illegible]
Ref No.:-	22207-0601	Sample # :-	TS-1
Lab No. :-	5738	Checked By :-	[illegible]

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
26.5	0.00	100.0
19.0	10.14	89.9
13.2	[illegible]	87.8
9.5	[illegible]	80.8
4.75	[illegible]	73.1
2.00	[illegible]	66.2
0.85		[illegible]
0.425		46.7
0.250		42.5
0.150		[illegible]
0.106		[illegible]
0.075		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]

Total Wt (g)	180.79

Wt used for hydrometer (g)		
89.23		
Fines sieve: Retained & %Passing		
0.850	[illegible]	[illegible]
0.425	[illegible]	[illegible]
0.250	[illegible]	[illegible]
0.150	[illegible]	[illegible]
0.106	[illegible]	[illegible]
0.075	[illegible]	[illegible]
Pan	[illegible]	[illegible]

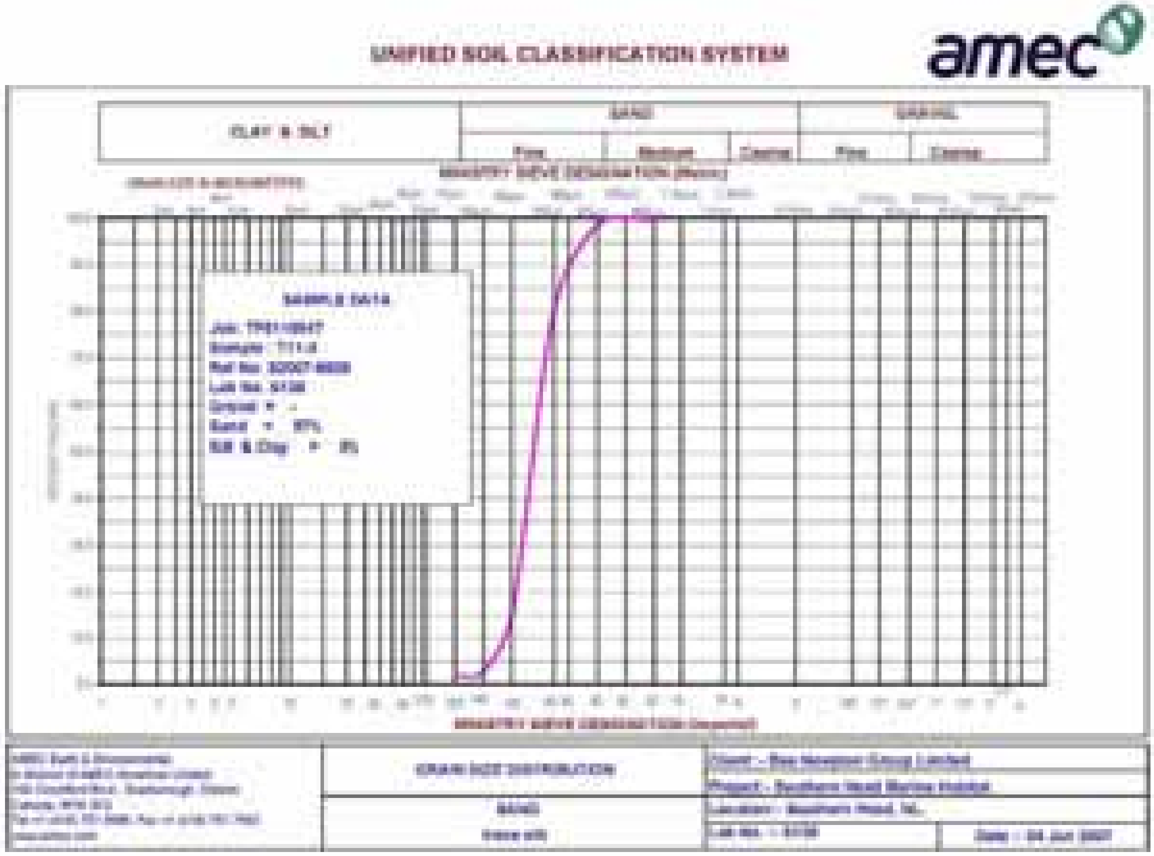
Grain Size Analysis

Project :-	Southern Head Marine Habitat	Location:-	Southern Head, NL
Client :-	[illegible] Group Limited	Date :-	4-Jun-07
Job# :-	TF6118947	Tested By :-	[illegible]
Ref No.:-	[illegible]	Sample # :-	TS-2
Lab No. :-	0137	Checked By :-	SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
19.0	[illegible]	100.0
13.2	[illegible]	97.7
9.5	[illegible]	[illegible]
4.75	[illegible]	[illegible]
2.00	[illegible]	71.3
0.85		[illegible]
0.425		46.7
0.250		40.0
0.150		[illegible]
0.106		21.1
0.075		[illegible]
[illegible]		7.7
[illegible]		[illegible]
[illegible]		5.4
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		4.9
[illegible]		4.4
[illegible]		3.7
[illegible]		3.2
[illegible]		2.8
[illegible]		2.0

Total Wt (g)	[illegible]
Wt used for Hydrometer (g)	
71.43	

Pass from Retained [illegible]		
0.850	[illegible]	[illegible]
0.425	[illegible]	[illegible]
0.250	[illegible]	[illegible]
0.150	[illegible]	[illegible]
0.106	[illegible]	[illegible]
0.075	[illegible]	[illegible]
Pan	[illegible]	[illegible]



Grain Size Analysis

Project:- Southern Head Marine Habitat
Client :- Bae Newplan Group Limited
Job# :- TF6110047

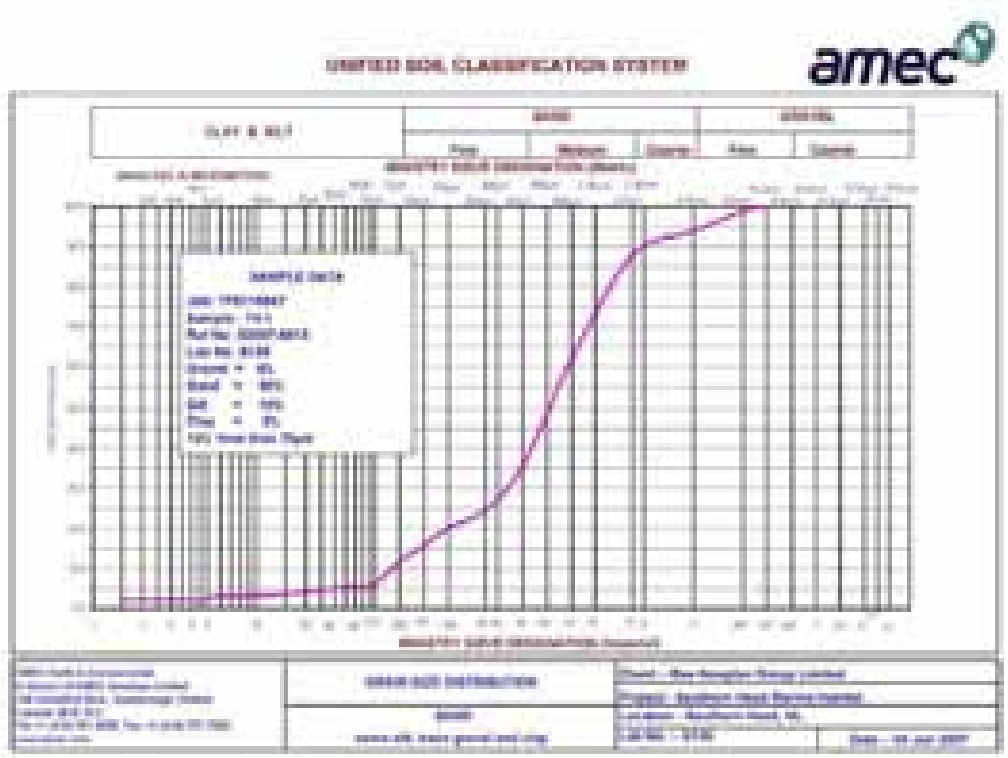
Location:- Southern Head, NL
Date :- 4-Jun-07
Tested By :- SC/RS/AS

Ref No.:- 52007-9509
Lab No. :- 5138

Sample # :- T11-3
Checked By :- SB

Sieve size (mm)	Cumm. Wt Retained (g)	%passing
4.75	0.00	100.0
2.00	0.01	100.0
0.85		99.8
0.425		98.4
0.250		80.1
0.150		14.9
0.106		3.8
0.075		1.9

Total Wt (g)	236.77	
Wt used for Hydrometer (g)		
68.76		
Pass 2mm Retained 0.075mm		
0.850	0.15	0.066
0.425	1.07	0.384
0.250	13.86	0.801
0.150	58.49	0.149
0.106	66.82	0.028
0.075	67.45	0.019
Pan	67.51	0.019



Grain Size Analysis

Project:-	Southern Head Marine Habitat	Location:-	Southern Head, NL
Client:-	Bae Newplan Group Limited	Date:-	4-Jun-07
Job#:-	TF6111847	Tested By:-	SC/RS/AS
Ref No.:-	52007-8613	Sample #:-	T4-1
Lab No.:-	0139	Checked By:-	SB

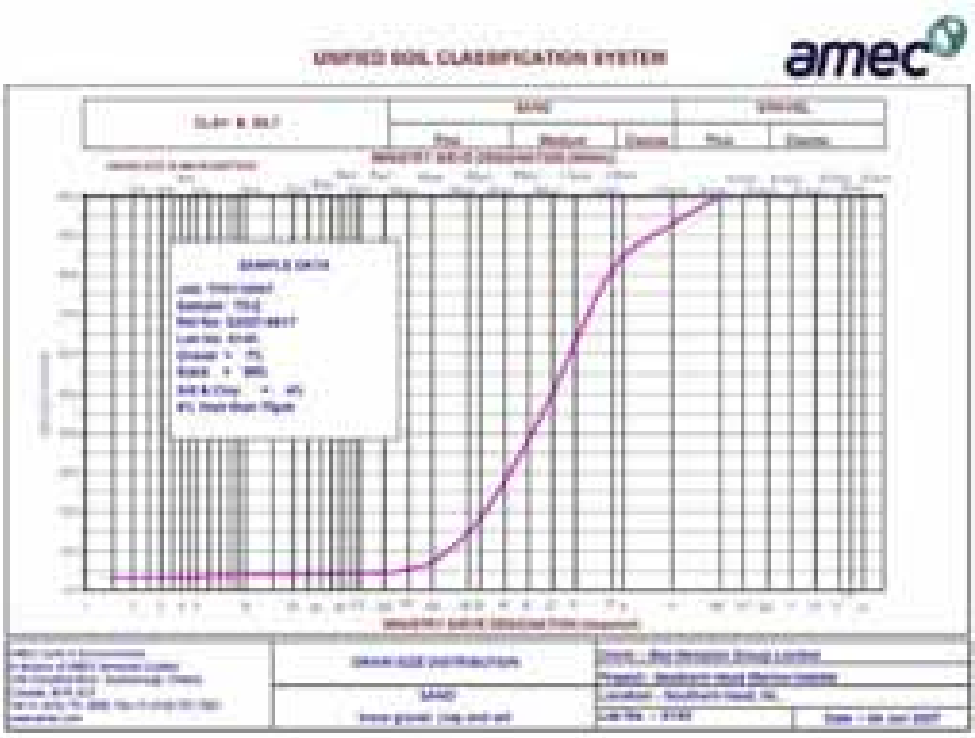
Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
13.2	[illegible]	100.0
9.5	[illegible]	98.8
4.75	[illegible]	93.9
2.00	[illegible]	87.4
0.85		61.8
0.425		30.8
0.250		24.8
0.150		20.2
0.106		15.7
0.075		11.8
0.0508		5.7
0.0358		5.4
0.0227		4.4
0.0161		3.6
0.0132		3.5
0.0093		3.1
0.0066		3.0
0.0054		2.8
0.0047		2.5
0.0029		2.3
0.0015		2.3

Total Wt (g): 295.87

Wt used for Hydrometer (g): 69.58

Pass 2mm Retained 0.075mm

0.850	[illegible]	0.706
0.425	[illegible]	2.406
0.250	[illegible]	0.279
0.150	[illegible]	0.230
0.106	[illegible]	0.179
0.075	[illegible]	0.133
Pan	[illegible]	0.120



amec

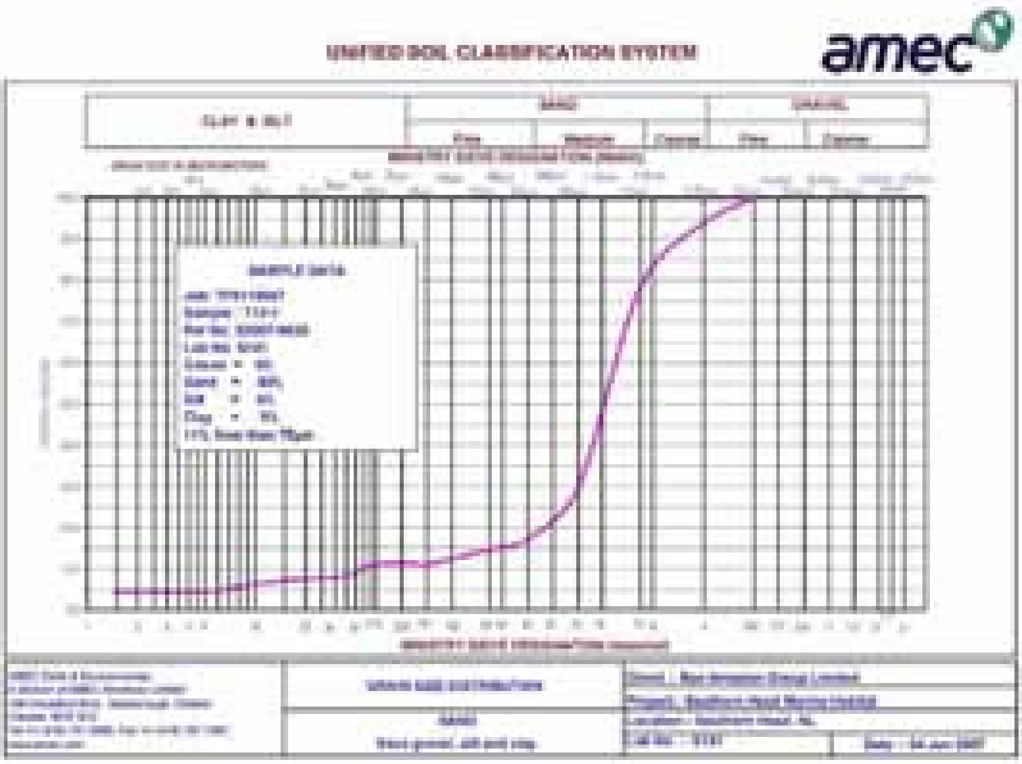
Grain Size Analysis

Project:-	Southern Head Marine Habitat	**Location:-**	Southern Head, NL
Client :-	Bae Newplan Group Limited	**Date :-**	4-Jun-07
Job# :-	TF0110547	**Tested By :-**	SC/RG/AS
Ref No.:-	82007-8817	**Sample # :-**	TS-2
Lab No. :-	5140	**Checked By :-**	SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
9.5	0.00	100.0
4.75	17.20	92.9
2.00	49.62	81.1
0.85		80.3
0.425		27.8
0.250		14.7
0.150		7.4
0.106		5.6
0.075		4.5
0.0065		3.8
0.0053		3.5
0.0040		3.3
0.0030		3.5
0.0014		3.2

Total Wt (g)	243.98
Wt used for Hydrometer (g)	40.94

Pass (mm)	Retained (g)	%Pass
0.850	33.19	0.819
0.425	40.08	0.342
0.250	48.80	0.181
0.150	52.38	0.091
0.106	50.77	0.059
0.075	57.55	0.024



Grain Size Analysis

Project:- Southern Head Marine Habitat
Client:- [illegible]
Job# :- TF6110947
Location:- Southern Head, NL
Date :- 4-Jun-07
Tested By :- DC/RS/AS

Ref No.:- 82007-9620
Lab No. :- 0141
Sample # :- T12-1
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	% passing
9.5	0.00	100.0
4.75	8.83	93.9
2.00	30.83	78.5
0.85		78.6
0.425		17.2
0.250		14.8
0.150		12.5
0.106		11.2
0.075		11.4
0.0[illegible]		10.8
0.0[illegible]		8.3
0.0[illegible]		7.7
0.0[illegible]		7.3
0.0[illegible]		5.5
0.0[illegible]		5.2
0.0[illegible]		4.8
0.0[illegible]		4.8
0.0[illegible]		4.8
0.0[illegible]		4.8
0.0[illegible]		4.5

Total Wt (g)	144.01

Wt used for hydrometer (g): 60.34

Pass (mm)	Retained (g)	
0.850	37.41	0.380
0.425	47.74	0.220
0.250	49.10	0.188
0.150	50.75	0.150
0.106	51.74	0.143
0.075	51.88	0.143
Pan	[illegible]	0.118

amec

Grain Size Analysis

Project:-	Southern Head Marine Habitat	**Location:-**	Southern Head, NL
Client :-	Sea Neasden Group Limited	**Date :-**	4-Jun-07
Job# :-	TF6116847	**Tested By :-**	SC/RS/AS
Ref No.:-	02007-6622	**Sample # :-**	T1-1
Lab No. :-	8142	**Checked By :-**	SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
12.7	0.00	100.0
9.5	14.22	92.0
4.75	44.21	75.1
2.00	98.40	44.8
0.85		33.4
0.425		24.8
0.250		21.2
0.150		18.0
0.106		15.4
0.075		8.5
0.0348		7.1
0.0272		6.1
0.0158		5.0
0.0130		4.8
0.0092		4.8
0.0065		4.3
0.0053		4.1
0.0040		3.8
0.0032		2.8
0.0016		2.7

Total Wt (g)	175.16
Wt used for Hydrometer (g)	61.62

Pass 2mm Retained 0.075mm

0.850	15.56	0.748
0.425	27.40	0.558
0.250	32.40	0.475
0.150	41.05	0.337
0.106	47.40	0.234
0.075	50.56	0.181
Pan	50.66	0.182

UNIFIED SOIL CLASSIFICATION SYSTEM

Grain Size Analysis

Project:-	Southern Head Marine Habitat	**Location:-**	Southern Head, NL
Client :-	Bas Keuplan Group Limited	**Date :-**	4-Jun-07
Job# :-	TF8116547	**Tested By :-**	SDR/SAS
Ref No.:-	S2007-0025	**Sample # :-**	T2-1
Lab No. :-	5143	**Checked By :-**	BB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
9.5	0.00	100.0
4.75	4.02	97.2
2.00	29.93	79.3
0.85		16.6
0.425		2.2
0.250		1.0
0.150		1.0
0.106		1.5
0.075		1.0

Total Wt (g)	145.28
Wt used for Hydrometer (g)	
59.41	

Pass 2mm Retained 0.075mm		
0.850	55.14	0.234
0.425	57.40	0.029
0.250	57.77	0.024
0.150	57.99	0.020
0.106	58.09	0.019
0.075	58.14	0.018
Pan	58.17	0.018

UNIFIED SOIL CLASSIFICATION SYSTEM

Grain Size Analysis

Project :- Southern Head Marine Habitat
Client :- Rae Keeplan Group Limited
Job# :- TF8110547

Location :- Southern Head, NL
Date :- 4-Jun-07
Tested By :- SC/RS/AS

Ref No.:- S2007-0027
Lab No. :- S144

Sample # :- T3-2
Checked By :- SB

Sieve size (mm)	Comm. Wt. Retained (g)	%passing
19.0	0.00	100.0
13.2	8.77	97.3
8.5	11.40	94.7
4.75	56.69	73.0
2.00	134.70	38.0
0.85		14.3
0.425		4.2
0.250		1.2
0.150		0.6
0.106		0.6
0.075		0.6

Total Wt (g)	217.43
Wt used for Hydrometer (g)	
87.73	

Pass (mm)	Retained (g)	%Pass
0.850	42.30	0.375
0.425	60.33	0.109
0.250	65.65	0.031
0.150	66.24	0.022
0.106	66.31	0.021
0.075	66.34	0.020
Pan	66.38	0.000

UNIFIED SOIL CLASSIFICATION SYSTEM

[illegible]	GRAIN SIZE DISTRIBUTION	Client :- [illegible]
	GRAVEL AND SAND	Project :- [illegible]
	some silt, trace clay	Location :- [illegible]
		Lab No :- [illegible] / Date :- [illegible]

Grain Size Analysis

Project:-	Southern Head Marine Habitat	Location:-	Southern Head, NL
Client :-	Bae-Newplan Group Limited	Date :-	[illegible]
Job# :-	TF6110547	Tested By :-	[illegible]
Ref No.:-	[illegible]	Sample # :-	[illegible]
Lab No. :-	[illegible]	Checked By :-	[illegible]

Total Wt (g): 135.71

Sieve size (mm)	Cum. Wt. Retained (g)	%passing
13.2	0.00	100.0
9.5	[illegible]	78.9
4.75	[illegible]	58.2
2.00	[illegible]	48.9
0.85		47.8
0.425		46.7
0.250		44.4
0.150		36.0
0.106		25.8
0.075		21.3
[illegible]		17.2
[illegible]		14.7
[illegible]		13.0
[illegible]		11.5
[illegible]		10.3
[illegible]		8.8
[illegible]		8.1
[illegible]		7.1
[illegible]		7.0
[illegible]		5.8
[illegible]		5.0

Wt used for hydrometer (g): [illegible]

Pass Coarse Retained [illegible]

0.850	[illegible]	[illegible]
0.425	[illegible]	[illegible]
0.250	[illegible]	[illegible]
0.150	[illegible]	[illegible]
0.106	[illegible]	[illegible]
0.075	[illegible]	[illegible]
Pan	[illegible]	[illegible]

Appendix G

Newfoundland and Labrador Refinery Project

Seawater Analytical Results

Appendix G1

Newfoundland and Labrador Refinery Project

Seawater Analytical Results

General Chemistry

					Marine Water Intake					
				Site Name:	T11-1-Top	T11-1-Mid	T11-1-Bot	T11-2-Top	T11-2-Mid	T11-2-Bot
				Sample ID:	Outside	Outside	Outside	Inside	Inside	Inside
				Sample Area:	47°47'35.0"N	47°47'35.0"N	47°47'35.0"N	47°47'57.7"N	47°47'57.7"N	47°47'57.7"N
				Sample Location:	54°03'07.0"W	54°03'07.0"W	54°03'07.0"W	54°03'14.7"W	54°03'14.7"W	54°03'14.7"W
				Depth (m):						
				Depth relative:	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
				Project Number:	S2007-08402	S2007-08403	S2007-08404	S2007-08405	S2007-08406	S2007-08407
				Lab ID:	MWS	MWS	MWS	MWS	MWS	MWS
				Sample Class:						
				Sample Number:	P	P	P	P	P	P
				Sample Type:	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07
				Date Sampled:						
				Client Description:						
Parameters	**CCME**	**Method**	**MDL**	**Units**						
Ammonia as N	ng		0.01	**(mg/L)**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride	ng		0.1	**(mg/L)**	17600	18400	18600	18100	19100	18300
Conductivity	ng		5	**(µS/cm)**	59000	58900	59200	59800	60600	60400 (57700)
Fluoride	ng		0.5 *	**(mg/L)**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
NaCl	ng			**(mg/L)**	30300	30800	32000	33600	32300	32600
Nitrate as N			0.5 *	**(mg/L)**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
pH	ng				7.82	7.82	7.83	7.82	7.84	7.85 (7.85)
Phenols	ng		0.001	**(mg/L)**	0.002	0.002	0.002	0.002 (0.002)	0.002	0.003
Phosphate	ng		0.5 *	**(mg/L)**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphate	ng		0.1	**(mg/L)**	2770	2810	2800	2830	2830	2840
Total Dissolved Solids	ng		10	**(mg/L)**	26800	25800	26100	26900	25700	29300
Total Organic Carbon	ng		0.5	**(mg/L)**	0.7	1.3	1.7	1.6	1.3	1.3
Total Suspended Solids	ng		2	**(mg/L)**	5	6	7	9	11	15
Turbidity	ng		0.1	**(NTU)**	0.2	0.4	<0.1	<0.1	0.1	<0.1 (0.1)
Cations										
Calcium	ng		0.5	**(mg/L)**	341	344	351	354	352	337
Magnesium	ng		0.02	**(mg/L)**	1460	1490	1490	1540	1510	1420
Potassium	ng		0.02	**(mg/L)**	499	507	517	509	492	475
Sodium	ng		0.5	**(mg/L)**	11900	12100	12600	13200	12700	12800

MWS - Marine Water Sample P - Primary
N/A - Not Applicable D - Duplicate
NS - Not Sampled ng - not given
* - Higher MDL reported due to interferences.
Result in (brackets) represents lab replicate.

					Marine Water Outfall					
				Site Name:	T12-1-Top	T12-1-Mid	T12-1-Bot	T12-2-Top	T12-2-Mid	T12-2-Bot
				Sample ID:	Outside	Outside	Outside	Inside	Inside	Inside
				Sample Area:	47°48'00.0"N	47°48'00.0"N	47°48'00.0"N	47°48'01.1"N	47°48'01.1"N	47°48'01.1"N
				Sample Location:	54°04'00.0"W	54°04'00.0"W	54°04'00.0"W	54°03'48.7"W	54°03'48.7"W	54°03'48.7"W
				Depth (m):						
				Depth relative:						
				Project Number:	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
				Lab ID:	S2007-08395	S2007-08396	S2007-08397	S2007-08398	S2007-08399	S2007-08400
				Sample Class:	MWS	MWS	MWS	MWS	MWS	MWS
				Sample Number:						
				Sample Type:	P	P	P	P	P	P
				Date Sampled:	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07
				Client Description:						
Parameters	**CCME**	**Method**	**MDL**	**Units**						
Ammonia as N	ng		0.01	**(mg/L)**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride	ng		0.1	**(mg/L)**	18900	18800	18300	18500	18600 (18600)	16600
Conductivity	ng		5	**(µS/cm)**	62400	60900	61500	60700	60600	61500 (65300)
Fluoride	ng		0.5 *	**(mg/L)**	<0.5	<0.5	<0.5	<0.5	<0.5 (<0.5)	<0.5
NaCl	ng			**(mg/L)**	32600	33800	33300	32800	32800	29800
Nitrate as N	16		0.5 *	**(mg/L)**	<0.5	<0.5	<0.5	<0.5	<0.5 (<0.5)	<0.5
pH	ng				7.71	7.78	7.78	7.79	7.82	7.83 (7.83)
Phenols	ng		0.001	**(mg/L)**	0.003	0.003	0.003	0.003	0.003	0.003
Phosphate	ng		0.5 *	**(mg/L)**	<0.5	<0.5	<0.5	<0.5	<0.5 (<0.5)	<0.5
Sulphate	ng		0.1	**(mg/L)**	2650	2680	2700	2680	2690 (2690)	2690
Total Dissolved Solids	ng		10	**(mg/L)**	21000	26000	26000	26000	26000	26000
Total Organic Carbon	ng		0.5	**(mg/L)**	<0.5	0.7	<0.5	<0.5	<0.5	<0.5
Total Suspended Solids	ng		2	**(mg/L)**	20	9	<2	6	11	7
Turbidity	ng		0.1	**(NTU)**	0.2	<0.1	0.1	<0.1	<0.1	<0.1 (<0.1)
Cations										
Calcium	ng		0.5	**(mg/L)**	365	371	361	358	349	346
Magnesium	ng		0.02	**(mg/L)**	1530	1580	1570	1530	1530	1460
Potassium	ng		0.02	**(mg/L)**	549	559	532	546	527	512
Sodium	ng		0.5	**(mg/L)**	12800	13300	13100	12900	12900	11700

MWS - Marine Water Sample P - Primary
N/A - Not Applicable D - Duplicate
NS - Not Sampled ng - not given
* - Higher MDL reported due to interferences.
Results in (brackets) represents a lab replicate.

Appendix G2

Newfoundland and Labrador Refinery Project

Seawater Analytical Results

Metals - Hydrides

			Site Name:	Marine Water Intake					
			Sample ID:	T11-1-Top	T11-1-Mid	T11-1-Bot	T11-2-Top	T11-2-Mid	T11-2-Bot
			Sample Area:	Outside	Outside	Outside	Inside	Inside	Inside
			Sample Location:	47°47'35.0"N 54°03'07.0"W	47°47'35.0"N 54°03'07.0"W	47°47'35.0"N 54°03'07.0"W	47°47'57.7"N 54°03'14.7"W	47°47'57.7"N 54°03'14.7"W	47°47'57.7"N 54°03'14.7"W
			Depth (m):						
			Depth relative:						
			Project Number:	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
			Lab ID:	S2007-08402	S2007-08403	S2007-08404	S2007-08405	S2007-08406	S2007-08407
			Sample Class:	MWS	MWS	MWS	MWS	MWS	MWS
			Sample Number:						
			Sample Type:	P	P	P	P	P	P
			Date Sampled:	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07
			Client Description:						
Parameters	**CCME**	**Method**	**MDL**	**Units**					
Aluminum	ng		0.001	**mg/L**	<0.001	<0.001	<0.001	0.001	0.005	0.010
Arsenic	0.0125		0.001	**mg/L**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	ng		0.0005	**mg/L**	0.0046	0.0045	0.0047	0.0046	0.0045	0.0044
Beryllium	ng		0.0001	**mg/L**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth	ng		0.0005	**mg/L**	0.0012	0.0007	<0.0005	<0.0005	<0.0005	0.0015
Cadmium	0.00012		0.000015	**mg/L**	0.000287	0.000170	0.000206	0.000528	0.000316	0.000383
Calcium	ng		0.5	**mg/L**	341	344	351	354	352	337
Chromium	ng		0.001	**mg/L**	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Cobalt	ng		0.001	**mg/L**	0.001	0.001	0.001	0.001	0.001	0.001
Copper	ng		0.001	**mg/L**	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Iron	ng		0.001	**mg/L**	0.036	0.033	0.043	0.033	0.032	0.034
Lead	ng		0.001	**mg/L**	0.019	0.022	0.024	0.025	0.027	0.026
Magnesium	ng		0.02	**mg/L**	1460	1490	1490	1540	1510	1420
Manganese	ng		0.001	**mg/L**	0.001	0.001	0.001	0.001	0.001	0.001
Molybdenum	ng		0.002	**mg/L**	0.008	0.007	0.007	0.007	0.007	0.007
Nickel	ng		0.001	**mg/L**	0.005	0.006	0.004	0.003	0.003	0.004
Phosphorous	ng		0.002	**mg/L**	0.095	0.101	0.098	0.098	0.104	0.105
Potassium	ng		0.02	**mg/L**	499	507	517	509	492	475
Selenium	ng		0.001	**mg/L**	<0.001	<0.001	<0.001 (<0.001)	<0.001	<0.001	<0.001
Silver	ng		0.0001	**mg/L**	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001
Sodium	ng		0.5	**mg/L**	11900	12100	12600	13200	12700	12800
Vanadium	ng		0.002	**mg/L**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	ng		0.001	**mg/L**	0.002	0.002	0.002	0.006	0.005	0.004

MSS - Marine Sedime P - Primary Exceeds Metals (CCME ISQG 2006)
N/A - Not Applicable D - Duplicate
NS - Not Sampled
Results in (brackets) represents lab replicate
ng - No Guideline

			Site Name:		Marine Water Outfall					
			Sample ID:		T12-1-Top	T12-1-Mid	T12-1-Bot	T12-2-Top	T12-2-Mid	T12-2-Bot
			Sample Area:		Outside	Outside	Outside	Inside	Inside	Inside
			Sample Location:		47°48'00.0"N 54°04'00.0"W	47°48'00.0"N 54°04'00.0"W	47°48'00.0"N 54°04'00.0"W	47°48'01.1"N 54°03'48.7"W	47°48'01.1"N 54°03'48.7"W	47°48'01.1"N 54°03'48.7"W
			Depth (m):							
			Depth relative:							
			Project Number:		TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
			Lab ID:		S2007-08395	S2007-08396	S2007-08397	S2007-08398	S2007-08399	S2007-08400
			Sample Class:		MWS	MWS	MWS	MWS	MWS	MWS
			Sample Number:							
			Sample Type:		P	P	P	P	P	P
			Date Sampled:		18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07
			Client Description:							
Parameters	**CCME**	**Method**	**MDL**	**Units**						
Aluminum	ng		0.001	**mg/L**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	0.0125		0.001	**mg/L**	<0.001	<0.001	<0.001	<0.001	<0.001 (<0.001)	<0.001
Barium	ng		0.0005	**mg/L**	0.0046	0.0047	0.0046	0.0047	0.0047	0.0046
Beryllium	ng		0.0001	**mg/L**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth	ng		0.0005	**mg/L**	0.0027	<0.0005	0.0021	0.0012	0.0013	<0.0005
Cadmium	0.00012		0.000015	**mg/L**	0.000419	0.000626	0.000533	0.000563	0.000529	0.000247
Calcium	ng		0.5	**mg/L**	365	371	361	358	349	346
Chromium	ng		0.001	**mg/L**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	ng		0.001	**mg/L**	0.002	0.002	0.001	0.001	0.001	0.001
Copper	ng		0.001	**mg/L**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	ng		0.001	**mg/L**	0.036	0.030	0.030	0.035	0.038	0.033
Lead	ng		0.001	**mg/L**	0.023	0.023	0.021	0.023	0.022	0.019
Magnesium	ng		0.02	**mg/L**	1530	1580	1570	1530	1530	1460
Manganese	ng		0.001	**mg/L**	0.001	0.001	0.001	0.001	0.001	0.001
Molybdenum	ng		0.002	**mg/L**	0.008	0.008	0.007	0.007	0.007	0.007
Nickel	ng		0.001	**mg/L**	0.005	0.004	0.004	0.004	0.004	0.004
Phosphorous	ng		0.002	**mg/L**	0.105	0.098	0.102	0.105	0.098	0.106
Potassium	ng		0.02	**mg/L**	549	559	532	546	527	512
Selenium	ng		0.001	**mg/L**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	ng		0.0001	**mg/L**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	ng		0.5	**mg/L**	12800	13300	13100	12900	12900	11700
Vanadium	ng		0.002	**mg/L**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	ng		0.001	**mg/L**	0.013	0.008	0.011	0.006	0.006	0.002

MSS - Marine Sediment Sample
N/A - Not Applicable
NS - Not Sampled
ng - no guideline
Results in (brackets) represents a lab replicate
P - Primary
D - Duplicate

Exceeds Metals (CCME ISQG 2006)

Appendix G3

Newfoundland and Labrador Refinery Project

Seawater Analytical Results

BTEX/TPH (RBCA)

					Marine Water Intake						
				Sample ID:	T11-1-Top	T11-1-Mid	T11-1-Bot	T11-2-Top	T11-2-Top	T11-2-Mid	T11-2-Bot
				Sample Area:	Outside	Outside	Outside	Inside	Inside	Inside	Inside
				Sample Location:	47°47'35.0"N	47°47'35.0"N	47°47'35.0"N	47°47'57.7"N	47°47'57.7"N	47°47'57.7"N	47°47'57.7"N
					54°03'07.0"W	54°03'07.0"W	54°03'07.0"W	54°03'14.7"W	54°03'14.7"W	54°03'14.7"W	54°03'14.7"W
				Depth (m):							
				Depth relative:							
				Project Number:	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
				Lab ID:	S2007-08402	S2007-08403	S2007-08404	S2007-08405	S2007-08405	S2007-08406	S2007-08407
				Sample Class:	MWS	MWS	MWS	MWS	MWS	MWS	MWS
				Sample Number:							
				Sample Type:	P	P	P	P	D	P	P
				Date Sampled:	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07
				Client Description:							
Parameters	**CCME**	**Method**	**MDL**	**Units**							
Benzene	110		0.2	µg/L	<0.2	<0.2	<0.2	<0.2	NR	<0.2	<0.2
Toluene	215		0.2	µg/L	<0.2	<0.2	<0.2	<0.2	NR	<0.2	<0.2
Ethylbenzene	25		0.2	µg/L	<0.2	<0.2	<0.2	<0.2	NR	<0.2	<0.2
m+p-Xylene	ng		0.4	µg/L	<0.4	<0.4	<0.4	<0.4	NR	<0.4	<0.4
o-Xylene	ng		0.2	µg/L	<0.2	<0.2	<0.2	<0.2	NR	<0.2	<0.2
TPH (C6-C10)	ng		50	µg/L	<50	<50	<50	<50	NR	<50	<50
TPH (C6-C10) less BTEX	ng		50	µg/L	<50	<50	<50	<50	NR	<50	<50
TPH (>C10-C21)	ng		50	µg/L	<50	<50	<50	<50	<50	<50	<50
TPH (>C21-<C32)	ng		50	µg/L	<50	<50	<50	<50	<50	<50	<50
Modified TPH (Tier 1)	ng		150	µg/L	<150	<150	<150	<150	<50	<150	<150
Hydrocarbon Identification	ng				-	-	-	-	-	-	-
BTEX, TPH Purgeable Surrogate Recovery											
1,4 Difluorobenzene (%)	ng			%	98	100	99	95	NR	100	100
4-Bromofluorobenzene (%)	ng			%	101	99	96	100	NR	97	96
TPH Extractable Surrogate Recovery											
O-Terphenyl (%)	ng			%	90	78	85	87	67	84	83

MWS - Marine Water Sample
N/A - Not Applicable
NS - Not Sampled
NR - No Lab Replicate

P - Primary
D - Duplicate
ng - not given

					Marine Water Outfall						
				Sample ID:	T12-1-Top	T12-1-Top	T12-1-Mid	T12-1-Bot	T12-2-Top	T12-2-Mid	T12-2-Bot
				Sample Area:	Outside	Outside	Outside	Outside	Inside	Inside	Inside
				Sample Location:	47°48'00.0"N	47°48'00.0"N	47°48'00.0"N	47°48'00.0"N	47°48'01.1"N	47°48'01.1"N	47°48'01.1"N
					54°04'00.0"W	54°04'00.0"W	54°04'00.0"W	54°04'00.0"W	54°03'48.7"W	54°03'48.7"W	54°03'48.7"W
				Depth (m):							
				Depth relative:							
				Project Number:	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
				Lab ID:	S2007-08395	S2007-08395	S2007-08396	S2007-08397	S2007-08398	S2007-08399	S2007-08400
				Sample Class:	MWS	MWS	MWS	MWS	MWS	MWS	MWS
				Sample Number:							
				Sample Type:	P	D	P	P	P	P	P
				Date Sampled:	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07
				Client Description:							
Parameters	**CCME**	**Method**	**MDL**	**Units**							
Benzene	110		0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	215		0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	25		0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
m+p-Xylene	ng		0.4	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
o-Xylene	ng		0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
TPH (C6-C10)	ng		50	µg/L	<50	<50	<50	51	<50	<50	<50
TPH (C6-C10) less BTEX	ng		50	µg/L	<50	<50	<50	51	<50	<50	<50
TPH (>C10-C21)	ng		50	µg/L	<50	NR	<50	<50	<50	<50	<50
TPH (>C21-<C32)	ng		50	µg/L	<50	NR	<50	<50	<50	<50	<50
Modified TPH (Tier 1)	ng		150	µg/L	<150	-	<150	<150	<150	<150	<150
Hydrocarbon Identification	ng			µg/L	-	-	-	-	-	-	-
BTEX, TPH Purgeable Surrogate Recovery											
1,4 Difluorobenzene (%)	ng			%	104	97	98	95	104	98	100
4-Bromofluorobenzene (%)	ng			%	100	99	100	98	103	97	105
TPH Extractable Surrogate Recovery											
O-Terphenyl (%)	ng			%	80	NR	88	90	80	82	112

MWS - Marine Water Sample
N/A - Not Applicable
NS - Not Sampled
NR - No Lab Replicate

P - Primary
D - Duplicate
ng - not given

Appendix G4

Newfoundland and Labrador Refinery Project

Seawater Analytical Results

PAH

			Site Name:	Marine Water Intake					
			Sample ID:	T11-1-Top	T11-1-Mid	T11-1-Bot	T11-2-Top	T11-2-Mid	T11-2-Bot
			Sample Area:	Outside	Outside	Outside	Inside	Inside	Inside
			Sample Location:	47°47'35.0"N	47°47'35.0"N	47°47'35.0"N	47°47'57.7"N	47°47'57.7"N	47°47'57.7"N
				54°03'07.0"W	54°03'07.0"W	54°03'07.0"W	54°03'14.7"W	54°03'14.7"W	54°03'14.7"W
			Depth (m):						
			Depth relative:						
			Project Number:	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
			Lab ID:	S2007-08402	S2007-08403	S2007-08404	S2007-08405	S2007-08406	S2007-08407
			Sample Class:	MWS	MWS	MWS	MWS	MWS	MWS
			Sample Number:						
			Sample Type:	P	P	P	P	P	P
			Date Sampled:	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07
			Client Description:						
Parameters	**CCME**	**Method**	**MDL**	**Units**					
Naphthalene	1.4		0.03	**µg/L**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Acenaphthylene	a		0.03	**µg/L**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Acenaphthene	a		0.04	**µg/L**	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Fluorene	a		0.03	**µg/L**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	a		0.04	**µg/L**	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Anthracene	a		0.01	**µg/L**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	a		0.03	**µg/L**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Pyrene	a		0.01	**µg/L**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	a		0.01	**µg/L**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	a		0.04	**µg/L**	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(b)fluoranthene	ng		0.05	**µg/L**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	ng		0.05	**µg/L**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	a		0.005	**µg/L**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Indeno(123 cd.)pyrene	ng		0.05	**µg/L**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzo(ah)anthracene	ng		0.05	**µg/L**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	ng		0.03	**µg/L**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Surrogate Recovery										
Naphthalene-d8 (%)	ng			**%**	73	73	73	73	73	73
Antracene-d10 (%)	ng			**%**	89	104	128	114	114	119
Perylene-d12 (%)	ng			**%**	104	122	117	117	117	129

MWS - Marine Water Sample
N/A - Not Applicable
NS - Not Sampled
a - Insufficient Data

P - Primary
D - Duplicate
ng - not given

			Site Name:	Marine Water Outfall					
			Sample ID:	T12-1-Top	T12-1-Mid	T12-1-Bot	T12-2-Top	T12-2-Mid	T12-2-Bot
			Sample Area:	Outside	Outside	Outside	Inside	Inside	Inside
			Sample Location:	47°48'00.0"N	47°48'00.0"N	47°48'00.0"N	47°48'01.1"N	47°48'01.1"N	47°48'01.1"N
				54°04'00.0"W	54°04'00.0"W	54°04'00.0"W	54°03'48.7"W	54°03'48.7"W	54°03'48.7"W
			Depth (m):						
			Depth relative:						
			Project Number:	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
			Lab ID:	S2007-08395	S2007-08396	S2007-08397	S2007-08398	S2007-08399	S2007-08400
			Sample Class:	MWS	MWS	MWS	MWS	MWS	MWS
			Sample Number:						
			Sample Type:	P	P	P	P	P	P
			Date Sampled:	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07	18-Jun-07
			Client Description:						
Parameters	**CCME**	**Method**	**MDL**	**Units**					
Naphthalene	1.4		0.03	µg/L	<0.03	<0.03	<0.03	<0.03	0.04	0.03
Acenaphthylene	a		0.03	µg/L	<0.03	0.03	<0.03	0.04	<0.03	<0.03
Acenaphthene	a		0.04	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Fluorene	a		0.03	µg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	a		0.04	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	0.04
Anthracene	a		0.01	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	a		0.03	µg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Pyrene	a		0.01	µg/L	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	a		0.01	µg/L	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	a		0.04	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(b)fluoranthene	ng		0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	ng		0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	a		0.005	µg/L	0.018	0.020	<0.005	0.005	<0.005	<0.005
Indeno(123 cd.)pyrene	ng		0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzo(ah)anthracene	ng		0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	ng		0.03	µg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Surrogate Recovery										
Naphthalene-d8 (%)	ng			%	78	73	96	73	72	73
Antracene-d10 (%)	ng			%	113	119	128	110	130	120
Perylene-d12 (%)	ng			%	122	124	119	106	114	120

MWS - Marine Water Sample
N/A - Not Applicable
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D - Duplicate
ng - not given

Appendix G5

Newfoundland and Labrador Refinery Project

Seawater Analytical Results

VOC

			Site Name:		Marine Water Intake						
			Sample ID:		T11-1-Top	T11-1-Mid	T11-1-Bot	T11-2-Top	T11-2-Mid	T11-2-Bot	T11-2-Bot
			Sample Area:		Outside	Outside	Outside	Inside	Inside	Inside	Inside
			Sample Location:		47°47'35.0"N 54°03'07.0"W	47°47'35.0"N 54°03'07.0"W	47°47'35.0"N 54°03'07.0"W	47°47'57.7"N 54°03'14.7"W	47°47'57.7"N 54°03'14.7"W	47°47'57.7"N 54°03'14.7"W	47°47'57.7"N 54°03'14.7"W
			Depth (m):								
			Depth relative:								
			Project Number:		TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
			Lab ID:		S2007-08402	S2007-08403	S2007-08404	S2007-08405	S2007-08406	S2007-08407	S2007-08407
			Sample Class:		MWS	MWS	MWS	MWS	MWS	MWS	MWS
			Sample Number:								
			Sample Type:		P	P	P	P	P	P	D
			Date Sampled:		18-June-07	18-June-07	18-June-07	18-June-07	18-June-07	18-June-07	18-June-07
			Client Description:								
Parameters	**CCME**	**Method**	**MDL**	**Units**							
Methyl Chloride	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Vinyl Chloride	ng		0.2	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bromomethane	ng		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Chloroethane	ng		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Trichlorofluoromethane	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1-Dichloroethene	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Methylene Chloride	a		5.0	µg/L	<5	<5	<5	<5	<5	<5	<5
Methyl-t-butyl ether	5000		0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
T1,2-Dichloroethylene	ng		0.2	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,1-Dichloroethane	a		0.6	µg/L	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
C1,2-Dichloroethylene	ng		0.7	µg/L	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Chloroform	a		0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1,1-Trichloroethane	a		0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Carbontetrachloride	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzene	110		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,2-Dichloroethane	a		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Trichloroethylene	a		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,2-Dichloropropane	ng		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Bromodichloromethane	ng		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
C1,3-Dichloropropene	ng		*0.4*	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Toluene	215		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
T1,3-Dichloropropene	ng		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2-Trichloroethane	a		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Tetrachloroethylene	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dibromochloromethane	a		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Ethylene Dibromide	ng		0.3	µg/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chlorobenzene	ng		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,1,2-Tetracholoroethane	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Ethylbenzene	25		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bromoform	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2,2,-Tetrachloroethane	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,3-Dichlorobenzene	a		0.3	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,4-Dichlorobenzene	a		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,2-Dichlorobenzene	42		0.4	µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
m/p-Xylene	ng		0.6	µg/L	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
o-Xylene	ng		0.2	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Styrene	ng		0.2	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2,4-Trichlorobenzene	5.4		0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acetone	ng		10.0	µg/L	<10	<10	<10	<10	<10	<10	<10
Methyl Ethyl Ketone	ng		10.0	µg/L	<10	<10	<10	<10	<10	<10	<10
MIBK	ng		10.0	µg/L	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl ether	ng		10.0	µg/L	<10	<10	<10	<10	<10	<10	<10
Surrogate Recovery											
Dibromofluoromenthane (%)				%	109	110	109	110	109	108	112
Toluene-d8 (%)				%	95	95	95	97	95	94	94
4-Bromofluorobenzene (%)				%	93	93	93	97	93	94	94

MWS - Marine Water Sample
N/A - Not Applicable
NS - Not Sampled
NR - No Lab Replicate
a - Insufficient Data

						Marine Outfall					
					Site Name:						
					Sample ID:	T12-1-Top	T12-1-Mid	T12-1-Bot	T12-2-Top	T12-2-Mid	T12-2-Bot
					Sample Area:	Outside	Outside	Outside	Inside	Inside	Inside
					Sample Location:	47°48'00.0"N 54°04'00.0"W	47°48'00.0"N 54°04'00.0"W	47°48'00.0"N 54°04'00.0"W	47°48'01.1"N 54°03'48.7"W	47°48'01.1"N 54°03'48.7"W	47°48'01.1"N 54°03'48.7"W
					Depth (m):						
					Depth relative:						
					Project Number:	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547	TF6116547
					Lab ID:	S2007-08395	S2007-08396	S2007-08397	S2007-08398	S2007-08399	S2007-08400
					Sample Class:	MWS	MWS	MWS	MWS	MWS	MWS
					Sample Number:						
					Sample Type:	P	P	P	P	P	P
					Date Sampled:	18-June-07	18-June-07	18-June-07	18-June-07	18-June-07	18-June-07
					Client Description:						
Parameters	**CCME**	**Method**	**MDL**	**Units**							
Methyl Chloride	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Vinyl Chloride	ng		0.2		µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bromomethane	ng		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Chloroethane	ng		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Trichlorofluoromethane	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1-Dichloroethene	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Methylene Chloride	a		5.0		µg/L	<5	<5	<5	<5	<5	<5
Methyl-t-butyl ether	5000		0.5		µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
T1,2-Dichloroethylene	ng		0.2		µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,1-Dichloroethane	a		0.6		µg/L	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
C1,2-Dichloroethylene	ng		0.7		µg/L	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Chloroform	a		0.5		µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1,1-Trichloroethane	a		0.5		µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Carbontetrachloride	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzene	110		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,2-Dichloroethane	a		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Trichloroethylene	a		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,2-Dichloropropane	ng		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Bromodichloromethane	ng		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
C1,3-Dichloropropene	ng		*0.4*		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Toluene	215		0.3		µg/L	< 0.3	< 0.3	< 0.3	0.4	< 0.3	< 0.3
T1,3-Dichloropropene	ng		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2-Trichloroethane	a		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Tetrachloroethylene	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dibromochloromethane	a		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Ethylene Dibromide	ng		0.3		µg/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chlorobenzene	ng		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,1,2-Tetracholoroethane	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Ethylbenzene	25		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bromoform	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2,2,-Tetrachloroethane	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,3-Dichlorobenzene	a		0.3		µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,4-Dichlorobenzene	a		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,2-Dichlorobenzene	42		0.4		µg/L	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
m/p-Xylene	ng		0.6		µg/L	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
o-Xylene	ng		0.2		µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Styrene	ng		0.2		µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2,4-Trichlorobenzene	5.4		0.5		µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acetone	ng		10.0		µg/L	<10	<10	<10	<10	<10	<10
Methyl Ethyl Ketone	ng		10.0		µg/L	<10	<10	<10	<10	<10	<10
MIBK	ng		10.0		µg/L	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl ether	ng		10.0		µg/L	<10	<10	<10	<10	<10	<10
Surrogate Recovery											
Dibromofluoromenthane (%)					%	109	110	116	109	109	112
Toluene-d8 (%)					%	97	96	99	97	97	95
4-Bromofluorobenzene (%)					%	93	92	92	91	92	92

MWS - Marine Water Sample
N/A - Not Applicable
NS - Not Sampled
NR - No Lab Replicate
a - Insufficient Data

P - Primary
D - Duplicate
ng - not given