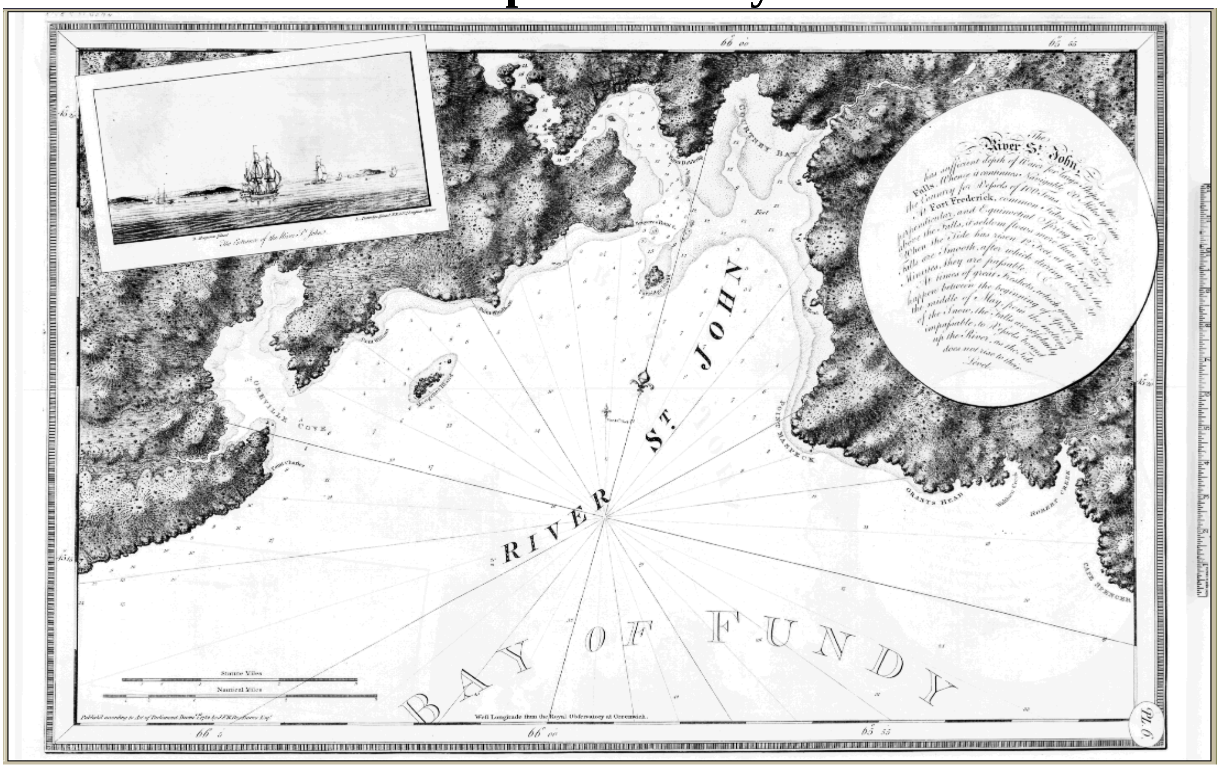
GEOLOGICAL SURVEY OF CANADA
OPEN FILE 4991

Cruise Hart99-002 Geophysical Surveys of the Liverpool, NS, and Saint John, NB, Offshore Dumpsites, 24 April – 11 May 1999



D.R. Parrott

2010

Natural Resources Canada
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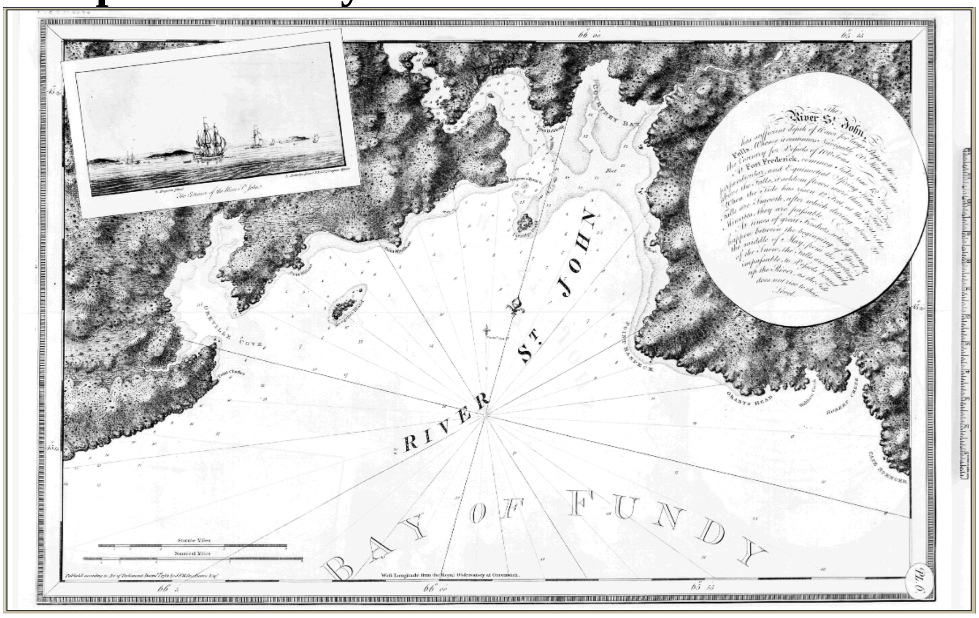

D.R. Parrott

2010

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Parrott, D.R. 2010 Cruise Hart99-002 Geophysical Surveys of the Liverpool, NS, and Saint John, NB, Offshore Dumpsites, 24 April – 11 May 1999; Geological Survey of Canada, Open File 4991, 27 p.

Open files are products that have not gone through the GSC formal publication process.

Background

The shipping channels for Saint John, New Brunswick and Liverpool, Nova Scotia have required extensive dredging to allow the passage of large vessels. Much of the dredged material has been dumped in offshore marine disposal sites. Environment Canada and the Geological Survey of Canada (GSC) have undertaken a joint project to determine the effects of offshore dumping on seafloor conditions in selected offshore disposal sites.

Survey Hart 99-002 was conducted from 24 April to 11 May 1999 from the CCGS JL Hart (Fig. 1). Geophysical data were collected to provide information on the character and distribution of seafloor sediments, and the geological and oceanographic processes which have affected the seafloor in offshore marine dumpsites at Black Point in Saint John Harbour, NB, and in Liverpool, NS. Geophysical equipment used during the survey consisted of a Simrad MS992 dual frequency (120 and 330 kHz) sidescan sonar system, IKB Seistec sub-bottom profiler, QTCView seafloor classification system. Sediment samples were collected with a vanVeen grab sampler and a small gravity corer, and bottom photographs were taken along transects through the survey areas.

Figure 1. The geophysical survey and seafloor sampling program were performed using the CCGS JL Hart shown above.

Previous Work

Earlier studies sponsored by Environment Canada have collected single and multibeam bathymetry, sub-bottom profiler and sidescan sonar surveys at the offshore dumpsites to provide information on seafloor conditions.

Liverpool, NS
At the Liverpool, NS, offshore marine dumpsites multibeam bathymetry, sub-bottom profiler and sidescan sonar data were collected in 1994 (Parrott, 1994) to determine seafloor conditions before dumping about 200,000 cmsm (cubic metres scow measure) of materials that had been dredged from the inner harbour. The geophysical surveys were repeated in September 1995 (Parrott, 1995) to determine the effects of dumping of the material. The geophysical surveys were jointly performed by GSCA and Public Works and Government Services Canada (PWGSC), using a Simrad MS992 dual frequency (120 and 330 kHz) sidescan sonar system and a 3.5 kHz sub-bottom profiler. Bathymetry data were collected with a 13-channel Navitronics sweep bathymetry system. Grab samples were collected to assist with the interpretation of the sidescan sonar and sub-bottom profiler data, and to provide information on the potential for sediment transport in the area.

Earlier geophysical and hydrographic surveys had allowed a preliminary interpretation of the geology and morphology (Piper et al., 1986). These surveys recognized a broad eroded till plain off Liverpool and the presence of a buried channel extending seaward, but did not have the resolution to identify or determine the morphology or character of the various moraines and other features.

A more detailed survey, which collected high-resolution multibeam bathymetry, sub-bottom profiler and sidescan sonar data, was conducted by the Geological Survey of Canada in 1998 (Parrott, 1999). Grab samples and bottom photographs were taken to assist with the interpretation of the geophysical data, and to provide information on the potential for sediment transport in the area. Current meters were deployed near the dumpsites.

The present survey recovered current meters and collected a very limited amount of sidescan sonar and sub-bottom profiler data over the disposal sites to determine changes in the surficial sediments since the survey in November 1999.

Black Point, Saint John, NB
For over 50 years, the Black Point Ocean Disposal Site (Fig. 2), in the approaches to Saint John Harbour, New Brunswick, has been used as a disposal site for material dredged from Saint John Harbour. Up to 1,000,000 m^3 of dredged sediment are deposited annually at the site. The site is located in a high-energy area affected by the outflow of the Saint John River and the Bay of Fundy tides. Although it was predicted that material dumped at the disposal site would be dispersed by the strong currents, studies indicated that disposal activities have resulted in a buildup of sediment with a chemical imprint and an impoverished benthic community.

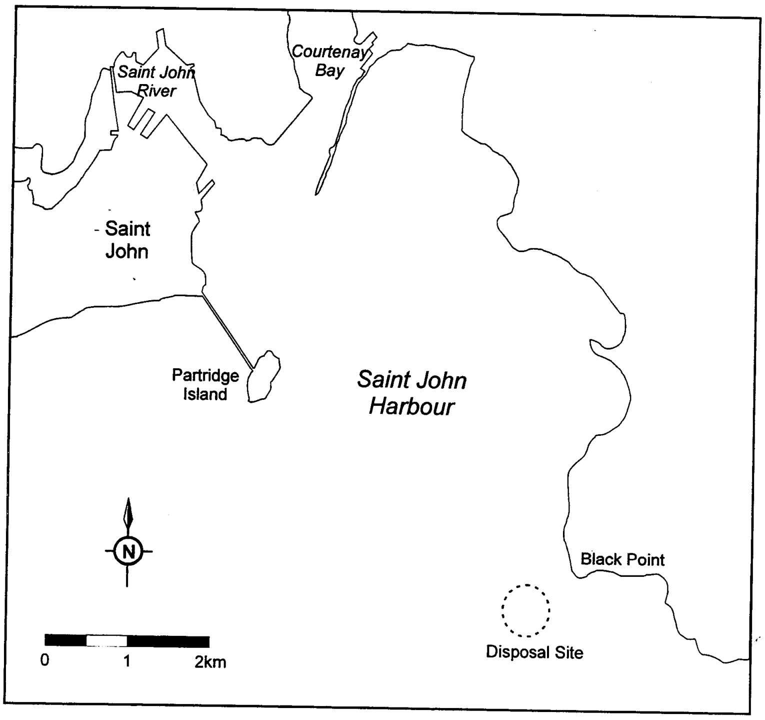

Figure 2. Location of Black Point offshore disposal site

Environment Canada had previously sponsored a three year monitoring program (1992-94) at the disposal site to define the zone of influence of the disposal activities, to assess the physical, chemical and biological impacts caused by disposal activities, and to evaluate the long-term use of the site for future dredging projects (Tay et al., 1997). Sidescan sonar, sub-bottom profiler, single beam bathymetry, seafloor photographs, and samples were collected over the disposal area. The study indicated that past disposal activities resulted in a significant buildup of dredged material within a one-kilometer radius of the disposal buoy.

A joint research program between Environment Canada and the Geological Survey of Canada was initiated in 1999 to determine recent changes in the disposal site and to study the possibility that material was being transported away from the disposal area and impacting nearby fisheries.

The present survey collected sidescan sonar, sub-bottom profiler, and seafloor classification data, as well as seafloor photographs and samples, over the disposal sites to determine changes in the surficial sediments since the survey in 1993 (Cdn. Seabed Research, 1994) and to provide additional baseline data for determining changes to the area.

Data Acquisition and Processing

The offshore dumpsites were surveyed with the following geophysical equipment:

- IKB Seistec high resolution sub-bottom profiler
- Simrad MS992 sidescan sonar system
- ORE TrackPoint II ultra short baseline towfish positioning system
- AGCNAV survey navigation package with input from differential GPS, version 3.1 software
- HP workstations running GRASS with GSCA extensions

Sidescan sonar

High-resolution, acoustic images of the seabed were produced with a Simrad MS992 dual frequency (120 and 330 kHz) sidescan sonar system equipped with a neutrally buoyant towbody deployed behind a dead weight depressor. This configuration was chosen to reduce noise on the sidescan sonar records due to vessel-induced heave and thereby improve resolution. The sidescan sonar system was capable of resolving objects down to a size of about 0.15 m.

The sidescan sonar data were collected at 100 metre range for lines in the centre of the survey area and at 200 metre range for lines outside the primary dumpsites. This provided swaths of 200 and 400 metres. Lines run at 100 m range were typically 75 metres apart, with a 300 metre spacing used for the 200 metre range lines. The towfish was deployed about 50 metres behind the vessel. An ORE TrackPoint II acoustic position system was used to position the towfish. A hardcopy graphic record of the sidescan sonar data was produced on an Alden 9315CTP thermal recorder.

Sidescan sonar data from survey Hart99-002 (both 120 and 330 kHz) were collected digitally using an AGCDIG digitizer with version 2.3 software, at a sample interval of 65 microseconds Digital gain settings for the sidescan sonar system and digitizers were logged on field sheets. During the survey, data were imported into a Unix workstation at a resolution of 0.35 metres (across track). The seafloor was detected, slant range and beam corrections applied to the raw data. The data were integrated with navigation and imported into the GRASS GIS system at 1 metre resolution. A variable layback, based on towfish positions from the TrackPoint II positioning system, was applied to the sidescan sonar data. Individual sidescan sonar lines were combined to form a digital sidescan sonar mosaic, at a resolution of 2.5 metres for the entire data set (Figure 3), and a mosaic of the disposal site generated at 1 metre resolution (Figure 4) over the same area surveyed in 1993 (Cdn. Seabed Research, 1994).

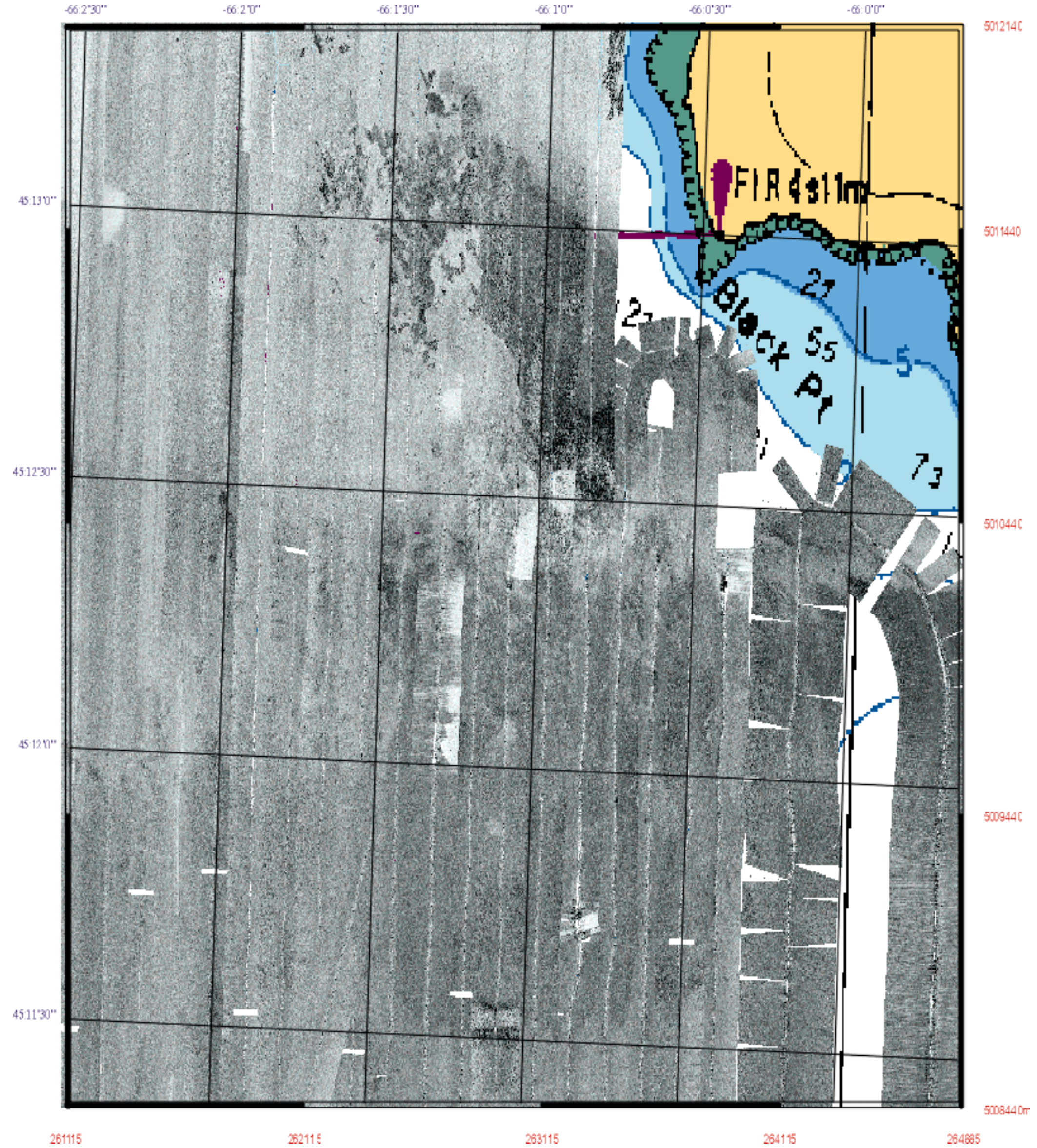

Figure 4. Sidescan sonar mosaic from data collected in 1999 over the disposal site. More detail is present in the hard copy version of this image.

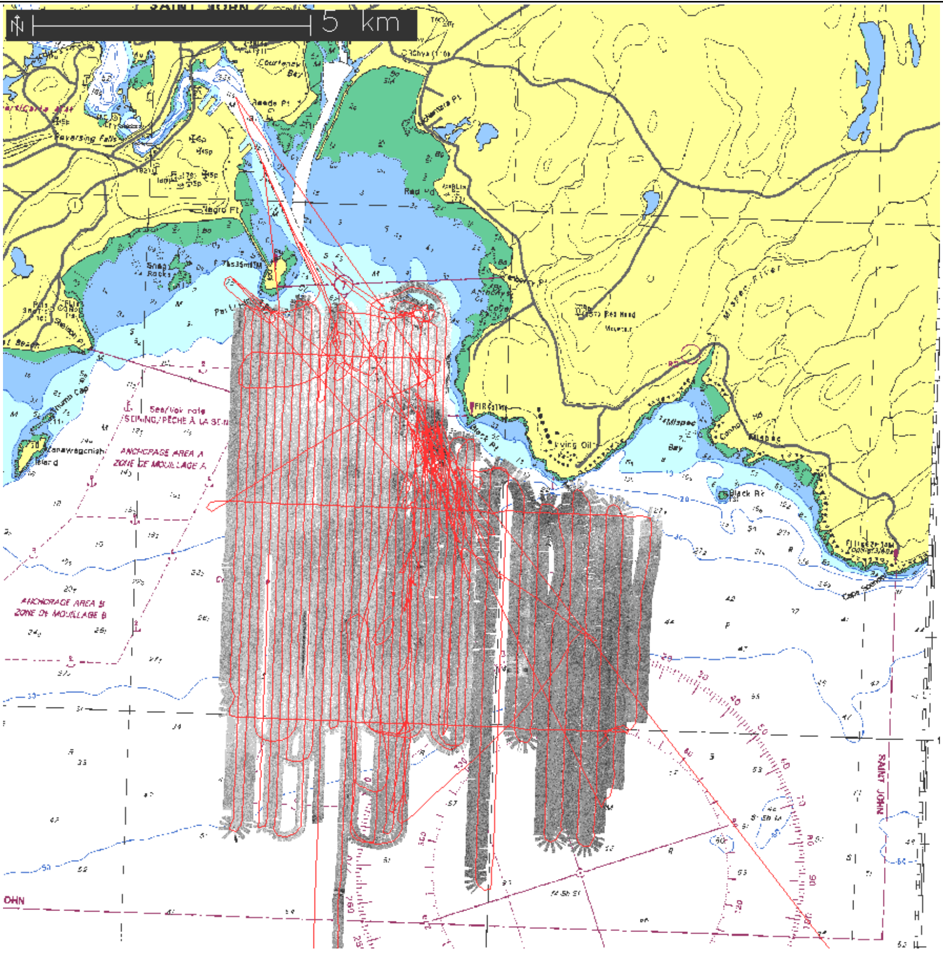

Figure 3. Sidescan sonar mosaic, showing ships tracks off Saint John, NB generated from the May 1999 data. The mosaic was produced at a cell resolution of 2.5 metres.

Sub-bottom profiler
High-resolution, sub-bottom profiler data were collected throughout the survey area using an IKB Seistec system. The system uses an electrodynamic (boomer) source to produce a repeatable impulse-like output which provides resolution of 0.25 metre or better. The Seistec system, equipped with an internal line-and-cone array and an external streamer, was deployed by crane on the starboard side of the vessel and towed at the surface. The system was fired 2 times per second, or faster, and graphic records displayed on a thermal graphic recorder.

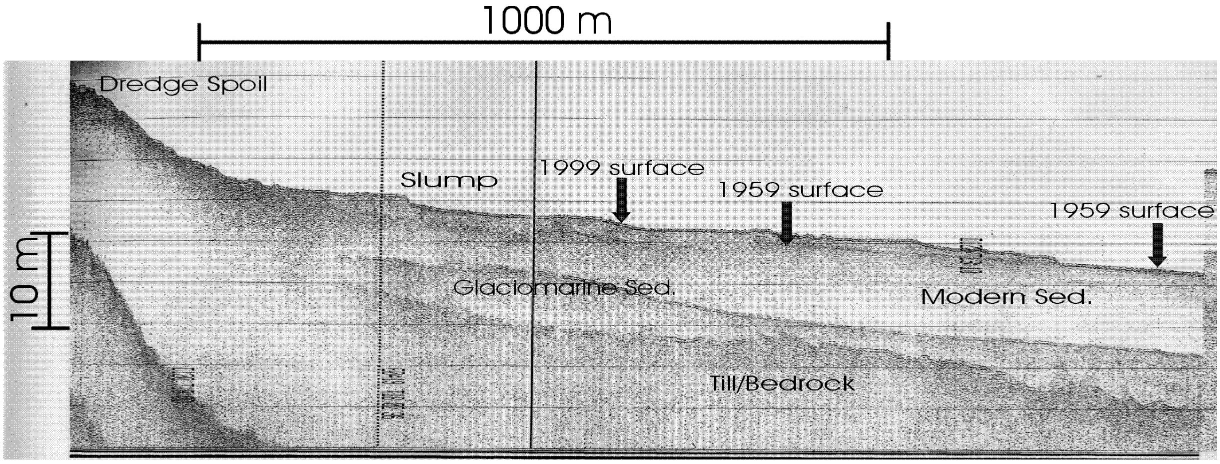

Figure 5. Seistec sub-bottom profiler section through disposal site showing the accumulated dredge spoil and slumped material overlying the naturally deposited sediments.

These systems were used to map the thickness and structure of materials on the sea floor and provide information on the genesis of the sediments. The fine sediments (Fig. 5 right) are currently being deposited as outwash from the Saint John River. They overlay a sequence of stratified glaciomarine sediments, which in turn overlie coarser glacial deposits. The dredged material presently being dumped at the disposal site is being deposited on top of both the fine-grained modern sediments and the coarser, relict sediments. A large disposal pile has accumulated at the centre of the disposal zone. The large pile subsequently failed, and formed a large slump down-slope from the disposal pile with a thickness of about a metre.

Digital data acquisition
The sidescan sonar and sub-bottom profiler data were digitized and logged on an AGCDIG digital data recorder developed at the Geological Survey of Canada (Atlantic) running version 2.3 software. The clock in the AGCDIG was synchronized to the GPS time signal. No gains or corrections were applied by the digitizer to the raw logged data. Channel configurations for the logged data were:

Sidescan sonar - 65 microseconds sample interval

Channel	Use
0	120 kHz port
1	120 kHz starboard
2	330 kHz port
3	330 kHz starboard

Sub-bottom profiler – IKB Seistec - 30 microseconds sample interval

Channel	Use
0	STB Seistec line cone receiver
1	STB GF10/15P streamer hydrophone

Navigation
Navigation was by a differential Global Positioning System utilizing corrections broadcast from the Coast Guard station at Western Head. Accuracy of the navigation was about 4 m.

Data Processing
Multibeam bathymetric and sidescan sonar data were processed and imported into a GRASS (Geographic Resources Analysis Support System developed by the U.S. Army Corps of Engineers) Geographical Information System for further analysis and display. Shaded relief images derived from the multibeam bathymetric data and sidescan sonar mosaics were combined with data from maps and aerial photographs of the area. These maps and images formed the basis for a preliminary interpretation of geological processes and features on the seabed. Post-processing of the multibeam bathymetric data, using newly developed algorithms, improved the resolution of seafloor features and provided acoustic backscatter intensity measurements. These data were used to define the distribution of coarse and fine-grained sediments and seabed features.

Digital sidescan sonar data were recovered from the ExaByte tapes recorded on the AGCDIG recorder and processed to remove geometric distortions present in sidescan sonar data. The geometrically corrected data were integrated with navigation and processed to remove the effects of varying sensor gain with angle. The sidescan sonar data from adjacent survey lines were integrated to produce a sidescan sonar mosaic using software developed by the Geological Survey of Canada.

Sea-floor Samples

Sediment samples were taken with a vanVeen grab sampler and a small gravity corer to provide groundtruth for the interpretation of the sidescan sonar and sub-bottom profiler data. The sample locations are shown in Figure 6, relative to positions of Sea Carousel deployments near the disposal site in 1992 (Amos et al., 1993). The sample positions are provided in Tables 1 and 2.

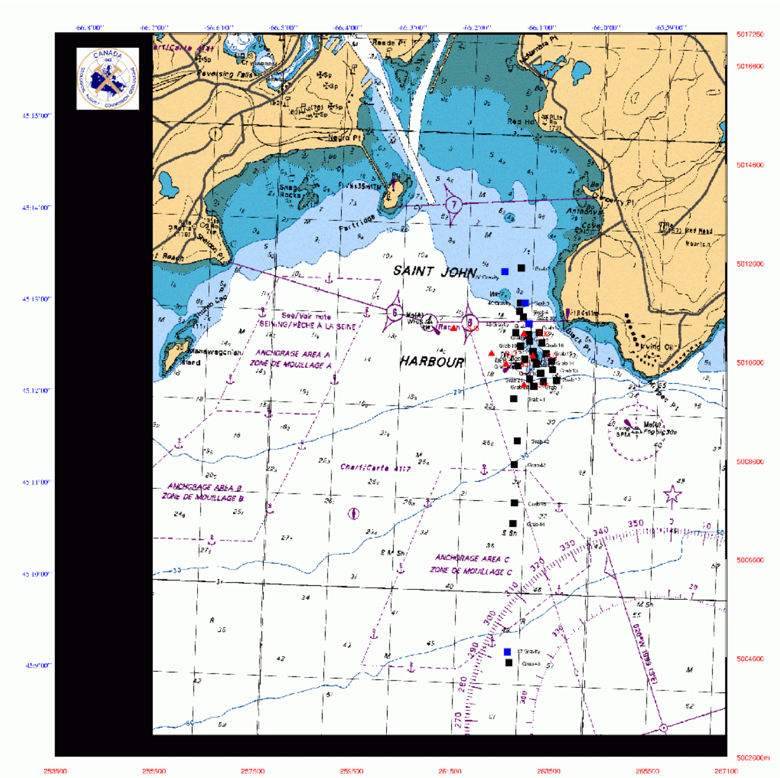

Figure 6. Location of 1999 grab samples (black squares) gravity cores (blue squares) and 1992 Sea Carousel deployments (red triangles). Positions are provided in Table1.

Sea-floor Photographs

Photographs were taken with the “Icehole” camera developed by GSCA. Images were obtained on roughly north-south transects through the disposal site. Images were digitized and stored on a CD-ROM in Photo CD (PCD) format. Locations for all camera stations are shown in Figure 7, and provided in Table 3. Sample images are shown in Figure 8. About 200 photographs were collected. The locations of the images shown in Figure 8 are shown in Figure 7.

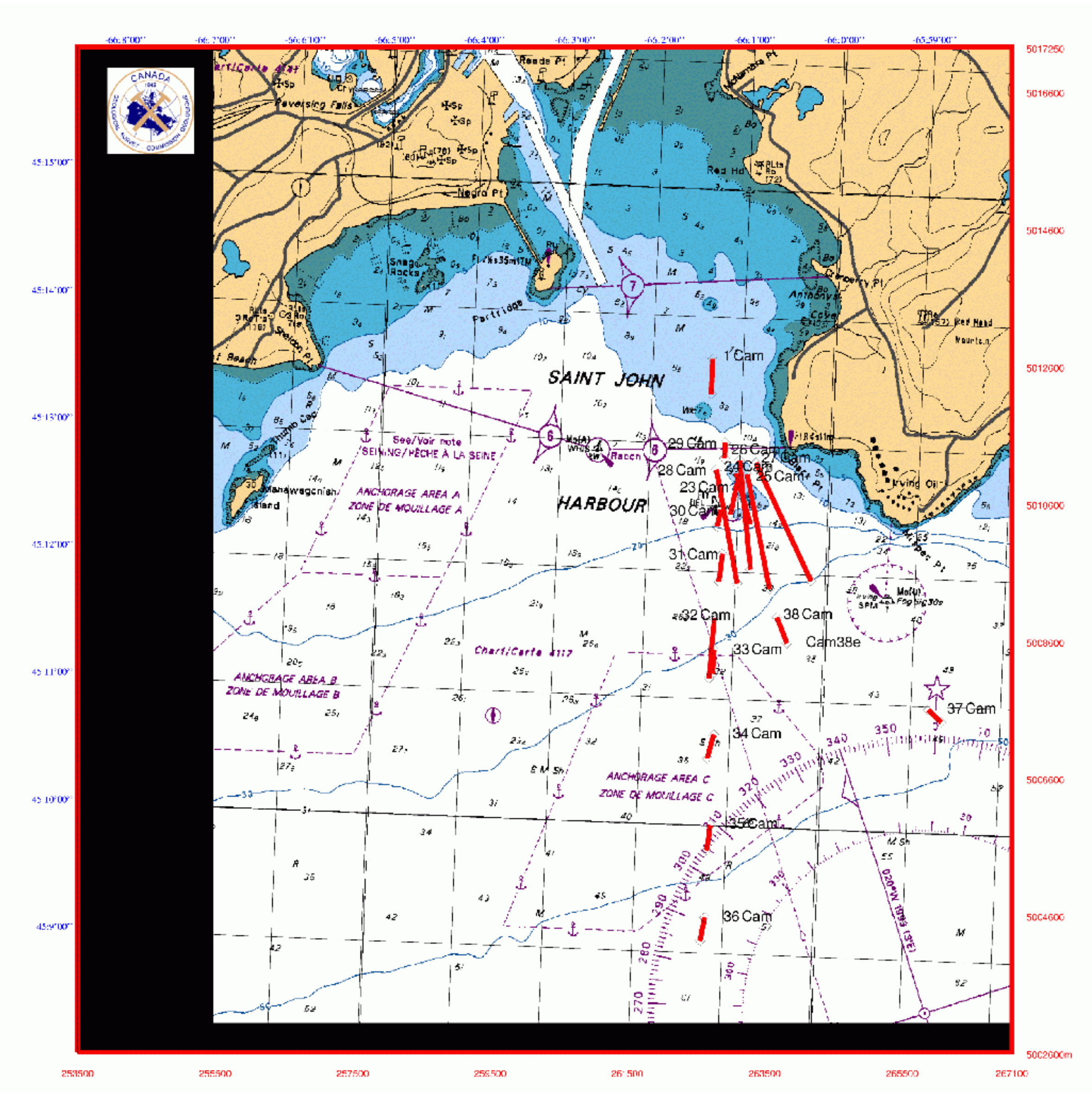

Figure 7. Location of seafloor photograph transects performed in 1999 (shown in red). Positions are provided in Appendix 1.

Photographs taken along a transect through the disposal site show a large variety of seafloor conditions. A preliminary analysis was performed to determine the abundance and type of marine life in the area, in particular infauna and suspension feeders. Preliminary results have been obtained from this analysis and are included here. A more complete analysis with more details on the significance of the results will be incorporated into a subsequent report.

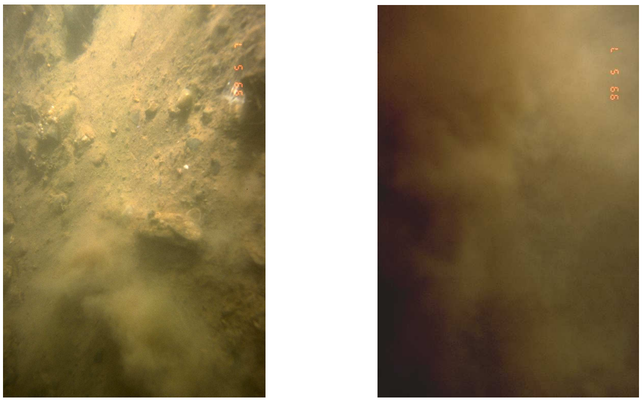

Figure 8. Seafloor photographs taken in a transect through the disposal site at Station 27.

Photographs from Station 27 (Figure 8) were taken on a transect through the disposal site at depths of 13 – 34.6 meters. They show that sediment textures on the seafloor are mixed and water turbidity is very high. One third of the photographs taken along this transect were not useful for habitat interpretation due to the extremely high concentration of suspended particles. Bioturbation features are generally rare, only small burrows are moderately abundant. Epifaunal species are represented only by barnacles (most likely *Balanus crenalus*). No mobile megafauna is visible, and species diversity and abundance is very low in general.

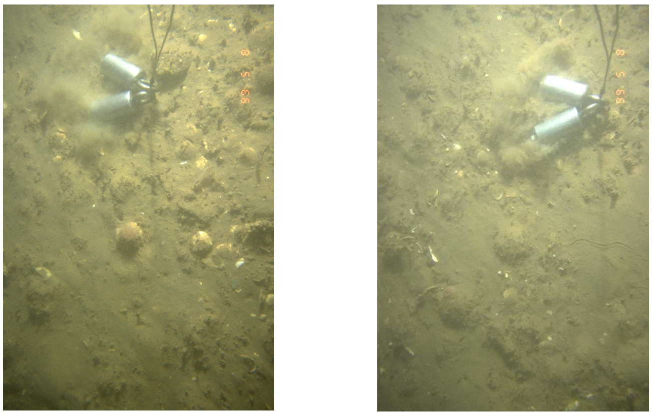

Figure 9. Photographs of the seafloor from outside the disposal area

Images taken outside the disposal area, shown in Figure 9, show the seafloor at a depth 55 – 56 meters, well outside the disposal area. The water has a much lower turbidity than that seen within the harbour. Most of the seafloor is covered with silty sand. Pebbles and granules are abundant and are covered by a layer of soft sediment. Siphons of infaunal bivalves, large and small polychaete burrows, as well as thin sabellid tubes, sometimes with open plumes, are very abundant, suggesting well-developed infaunal community. Epifauna is generally scarce and includes several species of sponges, ascidians, sea anemones (most likely *Tealia felina*). A total of 15 taxa of megabenthos are recorded on this station. This was the only station where sea stars (*Asterias* sp.) and tusk shell (*Dentalium* sp.) were found.

Preliminary Results

A review of existing geophysical and bathymetric data for the Black Point dumpsite was performed to determine existing conditions at the site and to provide background information and for the design of the new surveys. Preliminary analysis of geophysical and multibeam bathymetry data from the disposal site has shown that material dumped at the site has failed, forming a series of slumps that extend about 1.5 km south of the disposal site. Comparison of sidescan sonar mosaics from 1993 (Cdn. Seabed Research, 1994) and 1999 show that prominent features on the earlier survey (such as evidence of dredge spoils) are no longer visible and may have been buried by recent sediment deposited by the Saint John River. Detailed analysis of the sidescan sonar data from beyond the base of the slump show active bedforms, suggesting sediment transport, and the presence of fresh anchor furrows. Preliminary indications from current-formed features on the sidescan sonar records from deeper water near the base of the slump indicate transport of fine-grained sediments from east to west, out of the Bay of Fundy.

In general the disposal site appears to have more coarse-grained particles on the surface and more particulate material suspended in the water column. A preliminary analysis of the seafloor photographs collected at the disposal site, and at control sites in deeper water, show a decrease in turbidity and increase in the diversity and abundance of fauna with an increase in water depth. Bioturbation features and megafauna are more abundant at control sites outside the disposal site than near the disposal site.

Access to Data and Samples

The sidescan sonar, sub-bottom profiler and grab samples collected during this survey are archived at the Geological Survey of Canada Atlantic, in Dartmouth Nova Scotia. For access to the geophysical data and samples contact the senior scientist for the survey, Russell Parrott (902-426-7059) or Susan Merchant of the GSCA Curation group (902-426-3410). Graphical records for the sidescan sonar and subbottom profiler, digitally processed sidescan sonar mosaics, ExaByte tapes containing the sidescan sonar data in SEG-Y format, CD-ROMs containing the sidescan sonar and sub-bottom profiler data in SEG-Y format, and ExaBytes tapes of the raw data are available for viewing.

Proposed Future Work

Multibeam bathymetry, sidescan sonar and sub-bottom profiler surveys provide a quick, remote-sensing technique for determining the distribution of seafloor sediments. Repetitive surveys with these techniques will allow interpretation of reworking of the dumped materials by oceanographic processes. High precision surveys with multibeam bathymetry can provide information of the accumulation of dredged material at the disposal sites, and on the subsequent erosion and transport of these materials. Repetitive multibeam bathymetry surveys should be performed in the spring and fall of 2000 to measure the accumulation of dredge spoils, and after the effects of winter storms to determine the amount of erosion that takes place. The overlapping coverage provided by modern multibeam bathymetry systems is essential for accurate measurement of changes to the bathymetry of the disposal site, and will provide an accurate baseline for future studies. The backscatter map produced from multibeam bathymetry data provides more confidence in the actual location of features on the seafloor than that provided by sidescan sonar surveys because the multibeam transducer is firmly attached to the survey vessel, eliminating the uncertainty associated with the position of the sidescan sonar towfish. However, the sidescan sonar system resolves seafloor features less than 1 metre in size, such as small boulders, anchor drags, and small ripples (which can be used as an indicator of sediment erosion and transport). Multibeam bathymetry systems currently do not resolve features of this scale.

Detailed information on the oceanographic conditions is required to accurately predict conditions for sediment reworking and for the magnitude and direction of sediment transport. This would require monitoring of tides, currents and waves, potentially with concurrent time-lapse photography of the seafloor. Existing RALPH data collected near the Black Point disposal site should be processed to extract information on reworking of surficial sediments.

The geological maps serve as a base for evaluation of existing in-situ measurements of hydrodynamics and seabed sediment movement (from previous RALPH deployments). These data will be used to develop and calibrate sediment transport models that can predict the stability and dispersal of contaminated marine sediments from these sites. The Sea Carousel benthic flume had previously been used to make direct measurements made of sediment properties and to determine threshold velocities required for sediment erosion and transportation. A free fall penetrometer will be deployed at these and other sites to provide pore pressure and dynamic shear stress data for characterization of erosion potential. Current meters and optical backscatter sensors will be used to determine current and wave sediment transport parameters. A current meter and an Optical Backscatter Sensor should be deployed to monitor currents and measure the turbidity. This information will improve understanding of the stability of the dumped material, and allow prediction of the frequency, magnitude, and direction(s) of sediment transport. Gravity cores and surface grab samples of marine sediments and benthic biota will be collected throughout the dumpsites, and from uncontaminated background sites. Sediment redox will be measured on-board the ship to provide information on organic carbon burial, and subsamples will be collected for metals, grain size, and carbon analyses. Sediment samples will also be collected suitable for analyses of PCB and PAH concentrations. Pore waters will be extracted from gravity core subsamples for salinity, sulfate, and ammonium analyses, which will then be used to estimate sediment accumulation rates. Analysis for organic carbon content will be performed after the survey, to provide information on sediment dispersion from the dumpsite. Biogeochemical modeling calculations will be used to predict the chemical speciation of metals in the sediments, which is essential for understanding the partitioning and bioavailability of these contaminants. Macrofauna samples, bottom photographs, and seabed videos will be examined to assess the effects (both positive and negative) of dumping on marine habitats, and the distribution of bottom fauna relative to sites outside the disposal grounds.

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Tables

Table 1 Grab Sample Locations

Latitude	Longitude	Station No	Station Type	Water Depth	Day/Time
45.22592	-66.0196	2	Grab	8.4	126 / 1203
45.21955	-66.0195	3	Grab	10	126 / 1221
45.21802	-66.0197	4	Grab	10.3	126 / 1235
45.2138	-66.0171	5	Grab	9.9	126 / 1249
45.21263	-66.0169	6	Grab	8.7	126 / 1300
45.21084	-66.0158	7	Grab	8.7	126 / 1311
45.20964	-66.0155	8	Grab	8.7	126 / 1325
45.20856	-66.0149	9	Grab	8.7	126 / 1338
45.20686	-66.0136	10	Grab	8.7	126 / 1349
45.20535	-66.013	11	Grab	18.1	126 / 1357
45.20564	-66.0095	12	Grab	20.3	126 / 1409
45.20762	-66.0106	13	Grab	17.2	126 / 1422
45.20915	-66.0109	14	Grab	14.6	126 / 1432
45.21052	-66.0124	15	Grab	12.3	126 / 1531
45.21235	-66.0136	16	Grab	14.2	126 / 1541
45.21429	-66.0144	17	Grab	13.8	126 / 1552
45.21412	-66.0205	18	Grab	13.9	126 / 1601
45.21166	-66.0191	19	Grab	15.2	126 / 1610
45.20929	-66.0179	20	Grab	12.9	126 / 1619
45.20574	-66.0164	21	Grab	17.5	126 / 1627
45.20447	-66.0153	22	Grab	23	126 / 1635
45.21695	-66.0186	39	Grab	12	128 / 1716
45.20807	-66.0196	40	Grab	13.6	128 / 1729
45.2021	-66.0204	41	Grab	24.9	128 / 1740
45.1944	-66.019	42	Grab	30.5	128 / 1751
45.19009	-66.0196	43	Grab	33.6	128 / 1806
45.17936	-66.0193	44	Grab	38.3	128 / 1820
45.1831	-66.0191	45	Grab	49.1	128 / 1831
45.15395	-66.0191	46	Grab	59	128 / 1844

Table 2 Gravity Core Locations

Latitude	Longitude	Station No	Station Type	Water Depth	Day/Time
45.15597	-66.0195	47	Gravity	58	129 / 1207
45.21582	-66.0171	48	Gravity	13.2	129 / 1310
45.21951	-66.0183	49	Gravity	11.7	129/1325
45.22509	-66.0239	50	Gravity	10	129 / 1343

Table 3 Seafloor Photograph Locations

Latitude	Longitude	Station No	Station Type	Water Depth	Day/Time
45.22781	-66.0223	1	Camera	9.6	126 / 1107
45.21166	-66.0169	23	Camera	11.3	127 / 1136
45.21293	-66.0171	24	Camera	10.5	127 / 1225
45.21284	-66.0151	25	Camera	12.4	127 / 1307
45.21466	-66.0166	26	Camera	10.7	127 / 1400
45.21441	-66.0135	27	Camera	13	127 / 1538
45.21332	-66.0208	28	Camera	14.3	127 / 1642
45.21687	-66.0194	29	Camera	13.1	128 / 1210
45.20808	-66.0197	30	Camera	14.1	128 / 1226
45.20232	-66.0191	31	Camera	24.4	128 / 1302
45.19383	-66.0202	32	Camera	28.9	128 / 1339
45.18965	-66.02	33	Camera	31.8	128 / 1405
45.17861	-66.0195	34	Camera	36	128 / 1420
45.16675	-66.0195	35	Camera	45.5	128 / 1449
45.1546	-66.0199	36	Camera	55	128 / 1536
45.18287	-65.98	37	Camera	45.7	128 / 1613
45.19427	-66.0086	38	Camera	31.8	128 / 1641

Appendix A

Survey Particulars

Name of Vessel:	J.L. Hart
Vessel captain:	Pious Antle
Dates	24 April - 11 May 1999
Area of Operation	Liverpool NS and Saint John NB
Senior Scientist:	Russell Parrott, GSC

List of Participants

Geological Survey of Canada Atlantic

Russell Parrott	Senior Scientist
Darrell Beaver	Navigation
Robert Murphy	Sampling and seafloor photography
Austin Boyce	Electronics – sidescan sonar
Bruce Wile	Electronics – Remotely Operated Vehicle
Anthony Atkinson	Electronics – sub-bottom profiler

IKB Technologies

Peter Simpkin	IKB Seistec

Summary of Activities

Saturday 24 April 1999

06:30 Arrive BIO and load charts and remaining equipment on to the J.L.Hart.
07:15 Depart BIO jetty. Boyce, Atkinson, Beaver, Parrott.
07:30 Deploy Edgetech Chirp and IKB Seistec sub-bottom profilers for test lise in Halifax Harbour. Run line from old bridge to Georges Island..
08:35 recover gear and proceed to Swiss Air crash site.
12:30 Arrive Swiss Air crash site. Deploy Seistec, Chirp and sidescan sonar.
- run 11 survey lines through the crash site at a spacing of 150 metres. Sidescan sonar set for 100 metre range (200 metre swath).
- winds increase throughout the day resulting in degraded profiler records.
- the centre lines of two survey grids through the crash site were run in both directons to provide the best possible record
- much evidence of trawling on the seafloor
- sand and gravel waves appear to be migrating across the trawl marks in some locations, indicating that the surface sediments have been reworked by winter storms after the trawling.
- sub-bottom profiler records degraded by increasing wave conditions

16:15 recover survey gear and steam to Northwest Cove, St. Margarets Bay
20:00 dock vessel in Northwest Cove, St. Margaret's Bay
vessel met by R. Murphy. Drive back to BIO

Sunday 25 April 1999

06:30 check local weather conditions with Captain Pious Antle of the CCGS J.L.Hart. Conditions are much improved from the winds experienced during the previous evening. Decide to re-run the centre lines from the two grids using the IKB Seistec system in an attempt to improve the resolution achieved on the previous day.

07:30 Parrott, Boyce, Atkinson, Beaver, and Murphy meet at BIO and are joined by P. Simpkin of IKB Technologies.
09:00 arrive J.L.Hart in Northwest Cove, and depart for Swiss Air site
10:15 deploy sidescan sonar, IKB Seistec and Edgetech Chirp systems
Simpkin had rigged the Seistec sled to tow off to one side of the J.L.Hart as a paravane by shortening the starboard tow bridle.
Seistec records were good immediately after deployment but degraded due to noise contamination when the Chirp was turned on. Attempts to phase the noise out required very slow firing rates for both systems. The Chirp system was turned off.
Increase the sweep rate on the Seistec system to 1/32 sec per scan for both line array and cone and increase the firing rate to 1/4 sec. This resilted in improved record quality.
P. Simpkin explained/demonstrated the use of the new IKB processor to Atkinson and Boyce
13:10 recover survey gear. Drop personnel in Northwest Cove to allow vessel to transit to Liverpool. Personnel transit to Liverpool by vehicle.

Monday 26 April 1999 Liverpool
07:15 Arrive J.L.Hart.
07:30 Depart from Stenpro dock in Liverpool.
08;00 Deploy Chirp, Siestec, and sidescan sonar to run a series of 3 lines as a test of the Edgetech Chirp test
run central line through dumpsite A at 200 metre range on sidescan, 105 kJoule on Seistec and .5-5 kHz on Edhetech Chirp to test low frequency penetration on system
09:30 weather starting to deteriorate - recover gear.
10:00 use acoustic release to release sub-surface float and recover S4 current meter.
both meters recovered successfully.
10:50 deploy Seistec, Chirp and sidescan sonar to continue with Chirp test
finish central line and run in a northernly direction toward Liverpool. Encounter lobster traps about 1 mile from shore. Terminate line.
13:15 Recover all geophysical gear and return to Liverpool.
14:00 start to demobilize S4 current meter and Chirp system.
16:00 settle account at hotel (we had departed before the desk had opened) and return to BIO.

Tuesday 27 April 1999
CCGS J.L.Hart in transit to Saint John New Brunswick and delayed by bad weather in St. Mary's Bay, NS. GSC personnel at BIO.

Wednesday 28 April 1999
CCGS J.L.Hart departs St. Mary's Bay and Saint John, NB. GSCA personnel transit to Saint John NB.

Thursday 29 April 1999
07:30 Arrive J.L.Hart - still encountering gale force winds. Use weather time to repair problems with ship's furnace.
Re-mobilize geophysical gear after transit and removal of gear in Liverpool.
Lay out survey grid using previous surveys as a starting point.
All navigation feeds etc confirmed.
Return to hotel and set up Unix workstation to use for survey planning and data validation.

Friday 30 April 1999

07:00 arrive J.L.Hart.

07:30 depart Canadian Coast Guard base in Saint John for survey site.

08:00 deploy TrackPoint II acoustic positioning system, sidescan sonar and Seistec sub-bottom profiler.

line-and-cone signal showing excellent resolution on IKB Seistec system. Some problems with external streamer on first couple of lines. Signal much stronger after adjusting filters and TVG on Geopulse .

lines 18-25 run with all gear

- considerable evidence of old dredge spoils at Black Point dumpsite
- lobster pots throughout survey area, several caught by sidescan cable
- zone of lingoidal shaped features seen at about 35 metres depth on sidescan sonar records
- strong 'front' seen at junction of water from Saint John Harbour and the Bay of Fundy. A strong brown colour was associated with the Harbour water, along with a different wave/chop pattern than the light blue Bay of Fundy/Gulf of Maine water.
- a strong current/tide rip was encountered at the contact between the water masses

19:30 recover gear and steam to CCG base.

20:10 secure JL Hart to dock for evening.

20:30 return to hotel.

21:00 download sidescan sonar data and verify that data logged properly.

Saturday 1 May 1999

06:50 leave hotel for JL Hart.

07:00 arrive JL Hart.

07:30 depart CCG base for survey area.

- deploy TrackPoint II acoustic positioning system, sidescan sonar and Seistec sub-bottom profiler.
- run line 20 again (navigation system had locked up on first run on line).
- encounter tide rip near end of line.
  - tide near low slack water.
  - as the tide turned and started to rise the boundary line moved closer to shore and finally quite a distance up the harbour.
- snagged several lobster pots during the work of Cape Spencer. The buoys are generally dragged below the surface during the high flood tide. Finish several lines in the area but change the survey technique to reduce the number of buoys that are snagged. The gear had been deployed near the seafloor on the first day – we now deploy much closer to the surface, almost eliminating snags.

16:00 recover gear and steam to dock.

17:10 arrive CCGS base at Saint John.

19:00 download sidescan sonar data and verify that data logged properly.

Sunday 2 May 1999

07:00 arrive JL Hart.

07:00 deploy TrackPoint II acoustic positioning system, sidescan sonar and Seistec sub-bottom profiler.

- change sidescan sonar to 200 metre range (400 metre swath) and deploy 3-5 metres below surface in an effort to reduce the previous problem with snagging lobster pots.
- remove lifting strap from Seistec system – the strap had been installed for use on the CCGS Matthew, which required a much longer lift to recover the gear from the water. There appeared to be less wake at the front of the Seistec system after removing the strap.
- Continue to run line northeast of Cape Spencer. Thick sequence of Holocene clay over glaciomarine, till, and bedrock.

- Ripples, comet marks and flutes seen on sidescan sonar data.

17:00 at dockside.

Note – we have switched to the port side generator for running all geophysical gear. The output of this generator is 120 Volts vs 104-111 for the starboard side generator. The UPS system, TQC system, GeoPulse transmitter are all working much more reliably on the higher voltage output by the port generator.

19:00 download sidescan sonar data and verify that data logged properly.

Monday 3 May 1999

07:00 arrive JL Hart.

07:30 deploy TrackPoint II acoustic positioning system, sidescan sonar and Seistec sub-bottom profiler and start to run lines near centre of shipping channel.

- talk to G. Fader to determine where sub-bottom profiler data are required to tie this survey to his existing offshore surveys with the Huntec DTS system.
- run survey line from Saint John Harbour to 45^o 03'N, a 3 hour survey line.

13:15 ship's generator stops. Oil tanker in way of survey line. Stop survey until area clears.

- snag lobster pot – clear gear – switch back to port side generator.

14:00 resume survey line – all gear functioning well.

16:00 recover gear and return to dock

16:30 all secure at dockside.

19:00 download sidescan sonar data and verify that data logged properly.

Tuesday 4 May 1999

07:00 arrive JL Hart.

07:30 deploy TrackPoint II acoustic positioning system, sidescan sonar and Seistec sub-bottom profiler and start to run lines.

07:45 power failure – all systems reboot, restart survey.

08:00 power failure – all systems reboot.

08:15 restart survey – run lines west of dumpsite – good weather – good data.

16:00 recover gear and return to dock.

16:30 all secure at dockside.

19:00 download sidescan sonar data and verify that data logged properly.

Wednesday 5 May 1999

07:00 arrive JL Hart.

07:30 stream TrackPoint II acoustic positioning system, sidescan sonar and Seistec sub-bottom profiler and start to run lines.

run a series cross lines over dumpsite survey.

snagged 1 lobster trap in turn.

fog over area for most of morning.

12:30 run NS lines west of dumpsite.

15:30 recover sidescan sonar and TravckPt II system.

- run line up through harbour with Seistec systen only.
- bedrock appears to come to surface in some of the dredged corridors.

16:30 all secure at dockside.

19:00 download sidescan sonar data and verify that data logged properly..

Thursday 6 May 1999

07:00 arrive JL Hart.
retrieve sampling gear from hold.
rig ice-hole camera for use – 24 exposure using print film.

07:30 depart jetty.
- perform camera station north of dumpsite to test camera and investigate effect of turbidity on camera.
- 21 vanVeen grab samples taken through dumpsite.

15:30 all secure at dockside.
- process film to validate camera operation.
- have truck repairs performed.

19:00 download sidescan sonar data and verify that data logged properly.

20:00 Bruce Wile arrives with ROV – load gear onto JL Hart.

Friday 7 May 1999

07:00 arrive JL Hart.

07:10 depart jetty.

07:30 run 2 lines SW of Partridge Island to check for possible alternative monitoring site for Environment Canda.

08:30 deploy ROV at Black Point Dumpsite.
- strong tidal/river currents result in vessel drifting at 2.1 knots with ROV in water.
- able to keep ROV on bottom for 2-6 minutes.
- make several passes through area.

10:30 start camera transects.
- shorten trigger wire and change exposure parameters to keep camera nearer seafloor.
- ROV could only see the seafloor when it was less than .75 metres above it.
- Drifting at ~ 2 kn through camera stations.
- ROV deployed again at slack water – still drifting quite fast and unable to keep the ROV near the seafloor.

15:00 recover all gear. Start to demobilize all geophysical gear.

15:30 all secure at dockside.

17:00 return to hotel.

19:00 demobilize and pack Unix workstation.

Saturday 8 May 1999

06:30 Wile arrives at hotel to load Unix workstation and desktop computer into van.

07:15 Wile and Boyce depart Saint John NB for BIO.

08:00 leave hotel and pick up hydraulic fit.tings.

08:30 arrive JL Hart

09:05 start camera stations.
- 75 cm height off seafloor to reduce effects of turbid water.

13:00 continue camera stations in “disturbed” areas identified by Environment Canada.

14:00 grab sample transect through camera stations.

16:00 steam back to Saint John.

17:00 return to hotel.

Sunday 9 May 1999
07:00 arrive JL Hart – fuel problems with vessel.
07:30 depart jetty.
perform camera and grab sample stations .
16:00 steam back to Saint John.
17:00 return to hotel.

Monday 10 May 1999
07:00 arrive JL Hart .
load remaining gear into truck.
return to BIO.

Sidescan sonar digital tapes

File name	Start Day/Time	End Day/Time
Tp4Hi_3.dec	1201111	1201239
Tp4Hi_4.dec	1201239	1201320
Tp4Hi_5.dec	1201345	1201437
Tp4Hi_6.dec	1201437	1201559
Tp4Hi_7.dec	1201559	1201649
Tp4Hi_8.dec	1201650	1201732
Tp4Hi_9.dec	1201732	1201816
Tp4Hi_10.dec	1201816	1201838
Tp4Hi_11.dec	1201838	1201950
Tp4Hi_12.dec	1201950	1202042
Tp4Hi_13.dec	1202042	1202058
Tp4Hi_14.dec	1202058	1202148
Tp4Hi_15.dec	1202148	1202217
Tp4Hi_16.dec	1202217	1202217
Tp5Hi_3.dec	1211059	1211130
Tp5Hi_4.dec	1211130	1211213
Tp5Hi_5.dec	1211213	1211318
Tp5Hi_6.dec	1211318	1211352
Tp5Hi_7.dec	1211352	1211434
Tp5Hi_8.dec	1211434	1211521
Tp5Hi_9.dec	1211521	1211540
Tp5Hi_10.dec	1211540	1211614
Tp5Hi_11.dec	1211614	1211631
Tp5Hi_12.dec	1211631	1211711
Tp5Hi_13.dec	1211711	1211756
Tp5Hi_14.dec	1211805	1211814
Tp5Hi_15.dec	1211814	1211815
Tp5Hi_16.dec	1211815	1211852
Tp5Hi_17.dec	1211852	1211854
Tp6Lo_3.dec	1221110	1221110
Tp6Lo_4.dec	1221203	1221240
Tp6Lo_5.dec	1221240	1221311
Tp6Lo_6.dec	1221311	1221342
Tp6Lo_7.dec	1221342	1221418
Tp6Lo_8.dec	1221418	1221501
Tp6Lo_9.dec	1221501	1221556
Tp6Lo_10.dec	1221557	1221650
Tp6Lo_11.dec	1221650	1221742
Tp6Lo_12.dec	1221742	1221816
Tp6Lo_13.dec	1221816	1221816
Tp7Lo_3.dec	1231037	1231105
Tp7Lo_4.dec	1231105	1231146
Tp7Lo_5.dec	1231146	1231245
Tp7Lo_6.dec	1231246	1231314
Tp7Lo_7.dec	1231316	1231433
Tp7Lo_8.dec	1231433	1231554
Tp7Lo_9.dec	1231554	1231602
Tp7Lo_10.dec	1231602	1231605
Tp8Lo_3.dec	1231654	1231745

Tp8Lo_4.dec	1231745	1231813
Tp8Lo_5.dec	1231813	1231846
Tp8Lo_6.dec	1231846	1231846
Tp8Lo_7.dec	1241034	1241042
Tp9Lo_3.dec	1241113	1241142
Tp9Lo_4.dec	1241142	1241208
Tp9Lo_5.dec	1241209	1241238
Tp9Lo_6.dec	1241238	1241311
Tp9Lo_7.dec	1241311	1241407
Tp9Lo_8.dec	1241407	1241449
Tp9Lo_9.dec	1241449	1241513
Tp9Lo_10.dec	1241513	1241603
Tp9Lo_11.dec	1241603	1241656
Tp9Lo_12.dec	1241656	1241753
Tp9Lo_14.dec	1241830	1241904
Tp9Lo_15.dec	1241904	1241904
Tp10Lo_3.dec	1251117	1251155
Tp10Lo_4.dec	1251155	1251233
Tp10Lo_5.dec	1251233	1251326
Tp10Lo_6.dec	1251326	1251353
Tp10Lo_7.dec	1251353	1251418
Tp10Lo_8.dec	1251418	1251447
Tp10Lo_9.dec	1251447	1251514
Tp10Lo_10.dec	1251514	1251608
Tp10Lo_11.dec	1251608	1251720
Tp7Lo_1.dec	1251720	1251720
Tp10Lo_12.dec	1251720	1251801
Tp10Lo_13.dec	1251801	1251832
Tp10Lo_14.dec	1251832	1251832