



**VOISEY'S BAY NICKEL
COMPANY LIMITED**

A subsidiary of Inco Limited

**Monitoring/Follow-up Plan
For
Argentia Hydrometallurgical Demonstration Plant**

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1. INTRODUCTION

Voisey's Bay Nickel Company Limited (VBNC), acting on behalf of its parent company, Inco Limited, is committed to ensuring that any environmental effects that could result from the construction and operation of its hydrometallurgical demonstration plant in Argentina are identified and managed effectively. To this end, VBNC has prepared an Environmental Protection Plan, an Emergency Response Plan and Health and Safety Plan for construction. In its November 2002 Project Registration document, the company has also committed to monitoring and compliance with all applicable legislation.

The requirement for an environmental effects monitoring program has been specified as a condition of project release under the *Environmental Protection Act, SNL 2002, CE-14.2*, dated December 23, 2002. Further, Industry Canada's Environmental Screening Report on the project pursuant to the *Canadian Environmental Assessment Act*, addresses the need for a follow-up program to verify the accuracy of the environmental assessment predictions and to determine the effectiveness of mitigation measures.

The development of this monitoring/follow-up program is being undertaken by VBNC in consultation with the provincial and federal governments. This document is a draft for discussion leading to a final monitoring plan.

1.1 Background

The VBNC approach to environmental management is described in the Argentina Hydrometallurgical Demonstration Plant Project Registration. VBNC is committed to monitoring at all stages of the Project. Monitoring includes testing of such things as gas emissions and wastewater from the Facility.

2. PURPOSE

There are specific purposes for conducting a monitoring program. These are:

- To assist in the identification of target species and linkages for monitoring;
- To provide baseline data so that project activities can be scheduled or planned to avoid or reduce conflict;
- To verify effects predictions;
- To evaluate the effectiveness of mitigation;
- To identify unforeseen environmental effects;
- To provide an early warning of undesirable changes in the environment;
- To improve the understanding of cause-and-effect relationships.

Given the past land use of the Argentina Peninsula as a naval base, and the ongoing remediation projects by the Government of Canada, monitoring to establish baseline conditions is particularly important at this site. VBNC needs to be able to define and differentiate between any residual

impacts resulting from previous site activities and those which could be attributable to this project.

3. PROGRAM ELEMENTS

The selected monitoring programs have taken into account VBNC commitments as well as comments from provincial and federal government agencies on VBNC’s Registration Document (December 23, 2002) and from Industry Canada’s Environmental Screening Report dated November 27, 2002.

Table 3.1 Proposed Monitoring Program Elements

Study Program	Description
Effluent Monitoring	Measure effluent flow rates and effluent chemistry to ensure compliance with <i>Environmental Protection Act</i> and <i>Environmental Control Water and Sewage Regulations</i> . Conduct periodic bioassays (96-hour Rainbow Trout) of effluent at frequency to be determined by Environment Canada
Air Quality Monitoring	Monitor air emissions if required by permit conditions to ensure compliance with <i>Air Pollution Control Regulations</i>
Groundwater Monitoring	Monitor groundwater quality in wells in residue pond area to confirm no leakage
Marine – Water Quality	Measure pH, salinity, hydrocarbons and metals in seawater at selected sites around Argentia peninsula, including at outfall location
Marine – Sediments	Measure particle size and sediment quality (hydrocarbons and metals) at selected sites around Argentia peninsula, including at outfall location
Marine - Habitat	Monitor sediment deposition; physical and biological features at outfall location in Argentia harbour
Marine – Body Burden	Measure metals and hydrocarbons in mussels at selected sites around Argentia peninsula, including at outfall location
Migratory Birds	Monitor for presence in residue ponds; consult with Environment Canada regarding measures to address if problem arises
Rare and /or Endangered Species	Study has been conducted in 2003 on status of the endangered lichen <i>Erioderma pedicellatum</i> in the Southeast Placentia and Lockyer’s Waters areas

3.1 Effluent Monitoring

There are two effluents to be released via a diffuser system into Argentia Harbour – treated sewage effluent and treated process effluent. The volume of discharge from the sewage treatment plant is anticipated to be about 24 m³ per day, whereas treated effluent releases are

expected to range from 120 to 360 m³ per day during campaigns. VBNC will have a trained team and an analytical lab with qualified equipment (e.g., ICP-MS) in place to monitor effluent discharges on a regular basis (twice a week, or even daily if necessary). This will ensure our commitment to comply with the *Environmental Protection Act* and *Environmental Control Water and Sewage Regulations*. Further, any sampling regime as specified in the approvals from the provincial Department of Environment and Conservation will be followed.

To ensure compliance with Section 36(3) of the federal *Fisheries Act*, VBNC will conduct bioassays (96-hour Rainbow Trout) on the treated process effluent. Discussions will be held with Environment Canada regarding the appropriate frequency.

Any exceedance of a maximum allowable concentration or any failure of a bioassay test will trigger a response. The cause of the exceedance will be investigated. An action plan including further monitoring, investigation and appropriate mitigative measures will be implemented to address the problem and bring the effluent quality back into compliance.

3.2 Air Quality Monitoring

There will be virtually no air emissions from the hydrometallurgical demonstration plant, and therefore an ambient air monitoring program is not considered warranted. VBNC will comply with whatever conditions are specified in the approval pursuant to the *Air Pollution Control Regulations*; this may include periodic stack sampling to verify emission rates and dust sampling for metals analysis.

In the event of any unplanned release, or when thresholds are exceeded, VBNC will consult with appropriate regulatory agencies in order to address specific concerns. The cause of any exceedance will be investigated. An action plan including further monitoring, investigation and appropriate mitigative measures will be implemented.

3.3 Groundwater Monitoring

Monitoring will be carried out at ten wells located around the perimeter of the main residue storage area, the residue testing area, and the effluent treatment and runoff capture area. In addition, there will be monitoring of four wells located in the common berms between residue ponds and in five monitoring systems (horizontal perforated pipe) installed under the residue and test ponds. This will enable early detection of any potential leaks which could result in groundwater contamination from these areas. Since all the ponds are lined (double-lined for residue and test ponds), there is not likely to be any problem of this nature, however the monitoring will confirm that this is the case. It is anticipated that frequency of sampling and parameters to be analyzed will be specified in the approval from the provincial Department of Environment and Conservation.

In the event of any unplanned release, or when thresholds are exceeded, VBNC will consult with appropriate regulatory agencies in order to address specific concerns. The cause of any exceedance will be investigated. An action plan including further monitoring, investigation and appropriate mitigative measures will be implemented.

3.4 Marine Monitoring

VBNC initiated marine monitoring studies in 1997 at 16 sampling stations distributed around the nearshore areas to the east, north and west of the Argentia Peninsula (Figure 3.1). Eight sampling stations outside Argentia Harbour were selected based on groundwater modeling as potential points of maximum release of contaminated groundwater into the environment. Four marine sampling stations within the harbour were selected based on locations sampled previously by the Argentia Remediation Group on behalf of Public Works and Government Services Canada. The remaining sites within the harbour were selected along a gradient away from potential sources of contaminants. Water depths at sampling sites ranged from 6 m to 20 m.

Water, sediment, mussels and crab were sampled in 1997 and 1998; water, sediment and mussels were sampled again in 2002. In addition to sediment chemistry, a particle size distribution and description of the substrate at each station was also undertaken. In 1997, a marine fish habitat survey was conducted along transect lines on the eastern side of the Argentia Peninsula between Low Room Point and the next point southwest, extending from the intertidal zone seaward, up to 200m. In 1998, transects were established at each of the sixteen sampling locations and the main physical and biological features of the benthic region was described.

The extensive marine data base from these past studies allows for a good characterization of the existing marine environment, including the contaminant loading resulting from previous land use in Argentia. VBNC proposes to repeat the marine water quality, sediment quality, and mussel body burden studies at all sixteen sampling sites and at the marine outfall location in 2005 (pre-operation) and repeat the studies on an annual basis for the two to three year period of operation of the demonstration plant. The marine outfall is located in a water depth of 6 m in Cooper Cove, 280 m from sampling site MS-3 (Figure 3.1).

3.4.1 Water Quality

Surface seawater samples will be collected from the 17 sampling locations in the fall of 2005 and on an annual basis for the period of operation of the demonstration plant.

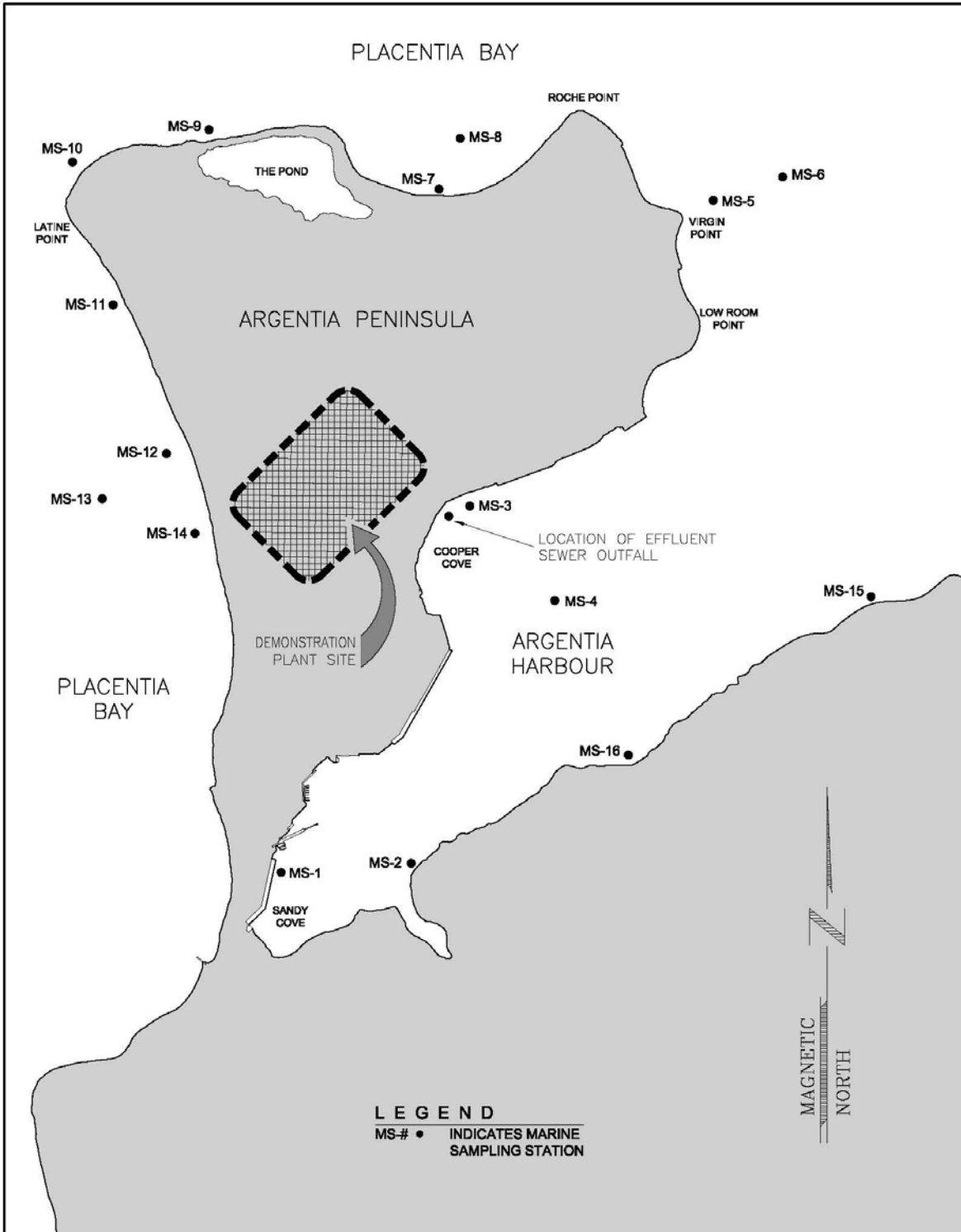


FIGURE 3.1. Marine sampling stations distributed around the Argentia Peninsula

Seawater Parameter List

Parameters	EQL	Units
pH	-	Units
Total Suspended Solids	0.5	mg/L
Mercury	0.05	ug/L
Benzene	0.001	mg/L
Toluene	0.001	mg/L
Ethylbenzene	0.001	mg/L
Xylenes	0.002	mg/L
C6-C10 HC (less BTEX)	0.01	mg/L
Modified TPH – Tier 1	0.2	mg/L
>C10-C21 (Fuel Range)	0.05	mg/L
>C21-C32 (Lube Range)	0.1	mg/L

Parameters	EQL	Units
Arsenic	0.1	ug/L
Cadmium	0.1	ug/L
Chromium	0.5	ug/L
Cobalt	0.1	ug/L
Copper	0.1	ug/L
Iron	1	ug/L
Lead	0.1	ug/L
Manganese	1	ug/L
Nickel	0.5	ug/L
Zinc	1	ug/L

3.4.2 Marine Sediments

Divers will use a scoop to obtain sediment samples for particle size analysis and for sediment chemistry. Sediment samples will be collected from the 17 sampling locations in the fall of 2005 and on an annual basis for the two to three year period of operation of the demonstration plant.

Marine Sediment Parameter List

Parameters	EQL	Units
Sulphate	10	mg/kg
Moisture	0.1	%
Mercury	0.01	mg/kg
Total Carbon	0.2	g/kg
Total Organic Carbon	0.2	g/kg
Total Inorganic Carbon	-	g/kg
C6-C10 HC (less BTEX)	2.5	mg/kg
Modified TPH – Tier 1	32	mg/kg
Benzene	0.001	mg/kg
Toluene	0.001	mg/kg
Ethylbenzene	0.025	mg/kg
Xylenes	0.05	mg/kg
>C10-C21 (Fuel Range)	15	mg/kg
>C21-C32 (Lube Range)	15	mg/kg
Aluminum	10	mg/kg
Antimony	2	mg/kg
Arsenic	2	mg/kg
Barium	5	mg/kg

Parameters	EQL	Units
Beryllium	5	mg/kg
Boron	5	mg/kg
Cadmium	0.3	mg/kg
Chromium	2	mg/kg
Cobalt	1	mg/kg
Copper	2	mg/kg
Iron	20	mg/kg
Lead	0.5	mg/kg
Manganese	2	mg/kg
Molybdenum	2	mg/kg
Nickel	2	mg/kg
Selenium	2	mg/kg
Silver	0.5	mg/kg
Strontium	5	mg/kg
Thallium	0.1	mg/kg
Uranium	0.1	mg/kg
Vanadium	2	mg/kg
Zinc	2	mg/kg

3.4.3 Habitat

Substrate type and particle size at the outfall location will be characterized prior to discharge, the site will be photographed, and the main physical and biological features within a 50 m radius will be described. This will be repeated annually to determine if there are any physical changes evident which could be linked to the effluent outfall.

3.4.4 Body Burden

A minimum of 30 blue mussels will be collected by SCUBA divers within an area of 100 m² at each sampling location. Shell length and height will be recorded and samples will be composited to provide a single analysis for the parameters shown below. If blue mussels cannot be found, horse mussels will be collected.

Mussel Tissue Parameter List

Parameters	EQL	Units	Parameters	EQL	Units
Strontium (Biota)	1.5	mg/kg	Cobalt (Biota)	0.2	mg/kg
TEH (>C10-C32)	30	mg/kg	Copper (Biota)	0.5	mg/kg
Mercury-Biota	0.01	mg/kg	Iron (Biota)	5	mg/kg
>C10-C21 (Fuel Range)	15	mg/kg	Lead (Biota)	0.18	mg/kg
>C21-C32 (Lube Range)	15	mg/kg	Manganese (Biota)	0.5	mg/kg
TEH Surrogate (IBB)	-	% Rec.	Molybdenum (Biota)	0.5	mg/kg
TEH Resemblance		Text	Nickel (Biota)	0.5	mg/kg
Aluminum (Biota)	2.5	mg/kg	Selenium (Biota)	0.5	mg/kg
Antimony (Biota)	0.5	mg/kg	Silver (Biota)	0.12	mg/kg
Arsenic (Biota)	0.5	mg/kg	Thallium (Biota)	0.02	mg/kg
Barium (Biota)	1.5	mg/kg	Tin (Biota)	0.5	mg/kg
Beryllium (Biota)	1.5	mg/kg	Uranium (Biota)	0.02	mg/kg
Boron (Biota)	1.5	mg/kg	Vanadium (Biota)	0.5	mg/kg
Cadmium (Biota)	0.08	mg/kg	Zinc (Biota)	0.5	mg/kg
Chromium (Biota)	0.5	mg/kg			

The results of the marine sampling program will be reported on an annual basis, with results compared to applicable environmental quality guidelines and interpreted in light of the existing background data. In the event of any unplanned release, or when thresholds are exceeded, VBNC will consult with appropriate regulatory agencies in order to address specific concerns. The cause of any exceedance will be investigated. An action plan including further monitoring, investigation and appropriate mitigative measures will be implemented.

3.5 Migratory Birds

There is the potential that migratory birds could be attracted to the residue ponds and therefore become exposed to contaminants. Given the close proximity of the residue ponds to the process building and the routine operations and maintenance activities at the ponds, it will become

readily apparent to staff if birds are drawn to the ponds. Staff will be made aware of the potential for such an occurrence and will be requested to report any such observations to management. VBNC would then contact Environment Canada for advice regarding appropriate deterrent measures, and such measures would be implemented in a timely manner to eliminate any problem of this nature.

3.6 Rare and/or Endangered Species

VBNC commissioned a study in the fall of 2003 to document the occurrence of the foliose lichen *Erioderma pedicellatum* in locations east of Placentia and a re-survey of the Lockyer's Waters area. This complements a 1997 study in the Lockyer's Waters area, also commissioned by VBNC, to document the presence of this species, which is highly sensitive to air pollution. Valuable baseline data are now available. Since there are virtually no air emissions emanating from the hydrometallurgical demonstration plant, there are no plans to conduct any further monitoring of this species.

4. REPORTING

VBNC proposes to report all monitoring results regularly to government at a frequency to be determined in consultation with the appropriate regulatory agencies. An annual examination and review of all study programs is proposed, to include updates as warranted. The main vehicle for dissemination of monitoring information to major stakeholders and the public will be the Placentia Area/VBNC Community Liaison Committee. This committee was formed in 2003 and meets quarterly for the purpose of fostering communication and discussion of any issues of concern. The company's annual Environmental Performance Report provides another mechanism to share monitoring information.