



Appendix O-4

Report: Sawmill Bay Remedial Action Plan with Project Update



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**Report: Sawmill Bay Remedial Action Plan with
Project Update – PART 1**



Affaires indiennes
et du Nord Canada

Indian and Northern
Affairs Canada

FINAL

**SAWMILL BAY- NM180
NORTHWEST TERRITORIES
REMEDIAL ACTION PLAN**

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EXECUTIVE SUMMARY

Franz Environmental Inc. (FRANZ) was retained by Indian and Northern Affairs Canada (INAC) under Standing Offer Agreement (SOA) no. 00-05-6003, to develop a Remedial Action Plan (RAP) for the Sawmill Bay site, which is located on the northeast corner of the Leith Peninsula on the McTavish Arm of Great Bear Lake, Northwest Territories. The history of the site begins with the establishment of sawmills there in the 1930's, after which it was used for barging and air transportation of uranium ore from Port Radium (1940's-1950). It was subsequently used for various military activities (1950s) and, later, as a fishing lodge (late 1950s to 1987). The site is now abandoned.

Environmental issues

Findings of recent environmental site assessments and earlier reports include the following:

- Approximately 13,500 m³ of contaminated soil is present on the site.
- Contamination includes petroleum hydrocarbon, metals and low-level radiological impacted soils. Contamination is restricted to localized areas, some of which are contaminated with more than one chemical of concern (COC) ("co-contaminated").
- The total area of waste dumps on the site is approximately 5,000 m².
- Most of the waste materials on the site are non-hazardous (i.e. unpainted wood and/or scrap metal, including empty rusted barrels).
- Buildings on the site that remain standing represent approximately 1,800 m² of floor area.
- Most paints that remain on surfaces of buildings, barrels and machinery exceed guidelines for total lead (Pb) and/or Pb_{TCLP}, and some exceed guidelines for Polychlorinated Biphenols (PCBs).
- There are approximately 12,100 barrels on the site, most of which are empty and unpainted; most barrel contents are suitable for disposal on site, by incineration or disposal on land at least 30 m from any natural water courses, and roughly 340 barrels retain some of their paint.
- There was no evidence of Petroleum Hydrocarbons (PHCs) in surface waters, and only one sediment sample from the beach landing showed PHC contamination.

Remediation planning process

This RAP summarizes the current state of the site and the surrounding area. The information within has been drawn from the results of environmental site investigations, human health and ecological risk assessment studies, best practices, traditional knowledge, current use of the area, and community values. The plan takes into consideration the environmental status of the site, precedent practice, regulatory requirements, and site goals. Long-term monitoring and reporting will be carried out at the site to provide ongoing assurance that the remediation works continue to perform as intended.

Principles relevant to the Sawmill Bay site from federal policy and guidance documents were combined with the principles of the Sahtu Dene Comprehensive Land Claim Agreement to develop a site-specific approach to the development of the RAP. The final remedial plan was developed under the management of INAC's Contaminants and Remediation Directorate (CARD), which is responsible for management of all contaminated northern sites. The overall responsibility of CARD is to minimize health and safety and environmental risks associated with the site, and implement a remediation plan that meets the needs and concerns of INAC, its First Nation partners and all Northerners.

Proponents and regulators

INAC is the project proponent for the RAP and is responsible for securing appropriate approvals and resources, and implementing the plan. Environment Canada, Health Canada and the Department of Fisheries and Oceans are Federal regulators/advisors for the RAP. The proposed works will require land and water licenses from the Sahtu Land and Water Board before they can be implemented.

Proposed remediation works

A summary of the preferred remediation plan is presented in Table ES-1. The main elements of the remediation plan include activities associated with remedial actions to eliminate hazards and risks and mitigate existing or potential environmental issues associated with: buildings and infrastructure; impacted soils; barrel caches, fuel storage tanks and residual fuels; waste disposal areas; designated substances; machinery, heavy equipment and miscellaneous debris; surface waters, sediments and groundwater; old roadways and the airstrip. In general, the overall intent of the RAP is to mitigate human and ecological impact as a result of historical site activities, while minimizing further impact as a result of site remediation activities. The execution of this plan will contribute to a safe, healthy, sustainable environment for Aboriginal peoples and northern residents of the area, while preserving and enhancing the ecological integrity of the environment.

It is acknowledged that the community preferred option is for all material at the site to be removed and disposed of at a southern location. Despite an outstanding resolution on the preferred options for selected components, INAC-CARD is obligated to finalize the RAP and select preferred options according to best practices taking into consideration accepted remediation approaches for other Great Bear Lake sites. INAC-CARD remains committed to discuss issues as they arise and will follow up with the community to communicate the finalized RAP.

The Great Bear Lake (GBL) remediation project pulled all relevant sites within the community into a single project to benefit logistical co-ordination of activities and was developed in consultation with Sahtu and Tlicho representatives to ensure projects have maximum local

benefits. The project resulting from the finalization of this RAP will be designed to maximize these identified local benefits. It is anticipated that a phased remediation approach will be initiated during 2010. Phase I and III activities are focused primarily on the Sawmill Bay site with Phase I including consolidation and management of barrels and Phase III completion of the remaining remediation activities. Phase I is anticipated to start in 2010.

Table ES-1: Summary of Preferred Remedial Options for Each Component

Remediation Component	Preferred Option
Buildings and infrastructure- non-hazardous materials	Demolition, disposal of non-hazardous materials at the Terra landfill.
Impacted soils: - F1/F2 hydrocarbons - F3/F4 hydrocarbons	Treat soils on-site.
Drum caches, fuel storage tanks	Remove contents, consolidate and dispose of materials at Terra non-hazardous landfill
Residual fuels	Disposal in accordance with regulations.
Designated substances/ Hazardous materials	Consolidation and disposal in a facility designated for hazardous materials. Asbestos would be handed and disposed of at a non-hazardous landfill.
Waste disposal/Debris areas	Collection and disposal of non-hazardous materials at Terra landfill.
Machinery, heavy equipment and miscellaneous (terrestrial and submerged)	Consolidation and disposal of non-hazardous materials at Terra landfill.
Surface water, groundwater	Removal of waste debris and excavation of contaminated soil.
Sediment	Natural recovery.
Debris in Water	Removal and Disposal of materials at the Terra non-hazardous landfill.
Roadways and airstrip	Leave as is with removal of culverts.

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- Community Consultation Presentation Option Tables
- Sawmill Bay Memo Follow-Up to Délįnę Remedial Options Meeting
- (RAP) Community Consultation – Introduction to Site Contamination
- Draft Minutes RAP Options Délįnę Engagement Meeting – Jan 12, 2010 (Final) Draft Minutes – RAP Options Délįnę Engagement Meeting-Jan 13, 2010 (Final) Draft Minutes- RAP Options Délįnę Engagement Meeting-Jan 14, 2010 (Final)
- Sawmill Bay – Minutes –March 24 RAP Meeting First Draft 19 Apr., 2010 (Final)

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GLOSSARY OF TERMS

Aboriginal land claim: A claim to a specific area of land based on legal concepts of land title and the traditional use and occupancy of that land by aboriginal peoples who did not sign treaties, nor were displaced due to war or other means.

Aerial photography: Photographs taken from an aircraft either obliquely or vertically.

Aggregate: Sand, gravel, or crushed rock.

Algae: Photosynthetic organisms which live and reproduce entirely immersed in water. They range in size from simple, single-celled organisms to large kelps several metres long.

Alkalinity: The aggregate measure of the concentration of hydroxyl, carbonate and bicarbonate ions, and dissolved CO₂. Therefore, it is a general indicator of the acid-buffering capacity of the water body.

Ambient: The natural surrounding (background) conditions in a given area.

Asbestos: A naturally occurring soft fibrous mineral commonly used in fireproofing materials and considered to be highly carcinogenic.

Assessment endpoint: A quantitative or quantifiable expression of the environmental value considered to be at risk in a risk assessment.

Background radiation: The radiation in the natural environment, including cosmic rays and radiation from naturally radioactive elements. It is also called natural radiation.

Baseline: See “Environmental baseline”.

Bedrock: The solid rock that underlies gravel, soil or other surficial material.

Benthic: Refers to the bottom of a lake or river and/or the organisms that inhabit it.

Benign: Not dangerous to human health or the environment.

Benthos: The whole assemblage of plants or animals living on the lake or river bottom; distinguished from *plankton*.

Best Practice: Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources.

Bioaccumulation: The net accumulation of a chemical by an organism as a result of uptake from all routes of exposure.

Bioavailability: Degree of ability to be absorbed and ready to interact in organism metabolism.

Biological diversity (biodiversity): The variety of different species, the genetic variability of each species, and the variety of different ecosystems that they form.

Biomagnification: The tendency of some chemicals to accumulate to higher concentrations at higher levels in the food web through dietary accumulation.

Biota: The animal and plant life of a region.

Bog: An acidic, poorly drained, rainwater fed peatland characterized by hummocks or sphagnum spp. Mosses with Labrador tea usually being the dominant shrub. Bogs may be treed with stunted black spruce and tamarack (muskeg) or may be open (open bogs).

Boreal Forest: The predominantly coniferous forest of northern Canada.

Borehole: Hole made with drilling equipment typically to obtain samples.

Buffering capacity: The degree that a given volume of water or soil is able to neutralize acids.

Carbonate: Any mineral containing carbonate (CO_3^{2-}) ions.

Carcinogen: An agent that has the potential to cause cancer.

Carnivore: An animal that eats the flesh of other animals.

Clay: Soil particles that are smaller than silt (less than 0.002 mm in diameter).

Climatology: The study of weather conditions or long periods of time.

Conductivity: A measurement of the electrical conductivity of a water body or sample in order to determine the amount of dissolved material present.

Conservative: As used in the term conservative estimates, this is considered a pessimistic or an overestimate of the level, effect or hazard, as the case may be.

Contaminant migration: The movement of contaminants from one location to another.

Contamination: Elements both radioactive and non-radioactive that are present at levels above those normally found (i.e. above background).

Decontamination: The process of removing contaminants from equipment, personnel, buildings or water.

Delineate: To determine the outer limits and size of something (i.e., an ore body).

Detection limit: The limit of measurement of a given parameter, below which variations in concentration are indistinguishable from one another.

Discharge: The volume of water passing a given point per unit time, usually expressed as m^3/s .

Dose: A general term used to describe the amount of radiation or chemical absorbed by a person or in some cases a particular organ. The term dose can be used to describe two concepts. The first concept is a physical quantity; for radiation, it is the amount of energy absorbed per unit mass of tissue (see absorbed dose) and for chemicals, it is the concentration in tissue.

Drainage basin: The area of land and water bodies therein, draining to a given point, usually a lake or river.

Ecological Risk Assessment: The application of a formal framework, analytical process, or model to estimate the effects of human actions(s) on a natural resource and to interpret the significance of those effects in light of the uncertainties identified in each component of the assessment process. Such analysis includes initial hazard identification, exposure and dose response assessments, and risk characterization.

Ecosystem: Any natural system in which there is interdependence upon and interaction between living organisms and their physical environment. This interdependence is characterized by the transfer of energy between the organisms themselves and their physical environment in a complex series of cycles.

Element: A substance that is comprised of one and only one distinct kind of atom.

Environment: The sum of all external conditions, influences and forces affecting the development and life of organisms.

Environmental baseline: The data collection characterizing the “natural” environment in its pre-development or pre-impact state. This data is used as a base for determining potential and actual impacts in the defined impact area.

Environmental Assessment: An environmental analysis to determine whether a site/facility would significantly affect the environment and thus require a more detailed environmental impact statement.

Environmental Impact: A change in environmental conditions resulting from an action or development, which may be negative, positive, or neutral.

Erosion: The wearing down (weathering) and removal of soil, rock fragments and bedrock through the action of rivers, glaciers, sea and wind.

Evapotranspiration: The total return of water from the land to the atmosphere, including the process of evaporation from the soil surface and transpiration from plants.

Exposure: The amount of radiation or pollutant present in a given environment that represents a potential health threat to living organisms.

Exposure Assessment: Identifying the pathways by which toxicants may reach individuals, estimating how much of a chemical an individual is likely to be exposed to, and estimating the number likely to be exposed.

Exposure Concentration: The concentration of a chemical or other pollutant representing a health threat in a given environment.

Exposure Pathway: The path from sources of pollutants via, soil, water, or food to man and other species or settings.

Gamma radiation: The greatest penetrating power, but least ionizing, of the three principal forms of radiation from radioactive materials. Gamma radiation can completely penetrate and damage all body organs. Gamma radiation can be shielded effectively by several inches of lead, steel, or concrete, depending upon the shielding material and the energy and intensity of the gamma radiation.

Geochemistry: Refers to the chemical analysis of surface and subsurface water, rock alluvium, soil and plants.

Grade: The relative quantity or percentage of ore mineral content in an ore body (i.e. g/t Au or % U₃O₈).

Grading: The process of making a surface level or evenly sloped.

Groundwater: Water beneath the earth's surface, accumulating as a result of infiltration and seepage, and serving as a source of springs and wells.

Habitat: The natural home of a plant or animal.

Hazard: Potential for radiation, a chemical or other pollutant to cause human illness or injury. Hazard identification of a given substance is an informed judgment based on verifiable toxicity data from animal models or human studies.

Hazard Assessment: Evaluating the effects of a contaminant or determining a margin of safety for an organism by comparing the concentration that causes toxic effects with an estimate of exposure to the organism.

Heavy metals: Any metal with a high atomic weight (usually greater than 100). They are poisonous and tend to persist in living tissue once ingested, e.g. mercury, lead, cadmium and chromium.

Human Health Risk Assessment: The process of quantifying risks and determining the acceptability of those risks to humans.

Hydrogeology: The study of subsurface waters and related geologic aspects of surface water.

Hydrology: The study of the characteristics, occurrence, movement and utilization of water on or below the earth's surface and within its atmosphere.

Impervious liner: A layer of clay or manmade material such as High-Density Polyethylene (HDPE), used to seal the bottom of containment structures in order to prevent percolation and migration of potential contaminants.

Incremental: Small increase.

Leachate: The water that percolates through a porous medium such as soil and transports any salts or other dissolvable materials, which may be found in the soil.

Leaching: Washing out of soluble substances by water passing down through rock or soil. In a milling sense, indicates the dissolving of ore minerals from the ground ore.

Limnological: Referring to the scientific study of lakes and their physical, chemical and biological components.

Loadings: Total mass of contaminants to a water body or to the land surface over a specified time.

Macrophytes: Rooted aquatic vascular plants.

Maintenance Activities: activities undertaken to ensure that conditions remain in the desired state

Mean: The average value of the data.

Measurement endpoint: A quantitative summary of the results of a toxicity test, a biological monitoring study, or other activity intended to reveal the effects of a substance.

Mineral: A naturally occurring inorganic, crystalline solid that has a definite chemical composition and characteristic physical properties.

Mitigation: An action or design intended to reduce the severity or extent of an environmental impact.

Modeling: Using mathematical principles, information is arranged in a computer program to model conditions in the environment and to predict the outcome of certain operations.

Monitoring: Sampling, measurement, and/or inspection.

Neutralizing potential (NP): The potential of material to neutralize an acid or a base.

Ore: Naturally occurring rock material from which a mineral or minerals of economic value can be profitably mined.

Overburden: Unconsolidated soil and rock material overlying bedrock.

Oxidation: The process of combining with oxygen, especially at the atomic level.

Particulate: Consisting of particles.

Pathway: The physical course a chemical or pollutant takes from its source to the exposed organism.

Pathways analysis: A method of estimating the transfer of contaminants (e.g. radionuclides released in water) and subsequently accumulating up the food chain to fish, vegetation, mammals and humans and the resulting radiological dose to humans.

PCB's: A group of manufactured chemicals including 209 different, but closely related, compounds made up of carbon, hydrogen, and chlorine. If released to the environment, they persist for long periods of time and can biomagnify in the food web. They are an organic toxicant suspected of causing cancer, endocrine disruption, and other adverse impacts on organisms.

Permafrost: Thermal conditions remaining below 0 °C continuously for more than one year.

Permeability: Describes the ability of subsurface features to transport water.

pH: A number expressing the degree of alkalinity or acidity of a substance according to the hydrogen ion concentration. A substance is said to be “neutral” if its pH is 7, acidic if less than 7 and alkaline if greater than 7.

Phytoplankton: Any microscopic or near microscopic, free-floating autotrophic aquatic plant.

Pitchblende: The most common form of uranium. A mineral consisting of uranium oxide and two amounts of iodine, thorium, polonium and lead. Uraninite in massive form is called pitchblende.

Population: A group within a single species, the individuals of which can and do freely interbreed.

Porosity: The relative volume of open spaces within a rock or soil. (Usually expressed as a percentage of the total volume of the material occupied by the open spaces, or interstices.)

Porewater: Water contaminated and trapped within void spaces in soils or rocks.

Precipitation: The deposition of atmospheric moisture as rain, sleet, snow, hail, frost or dew.

Radiation: The emission and propagation of energy through space or matter in the form of electromagnetic waves (e.g. gamma rays) or fast-moving particles such as alpha and beta particles.

Radioactive: The condition of a material exhibiting the spontaneous decay of an unstable atomic nucleus into a stable or unstable nucleus (e.g. uranium-238 decays into thorium-234 (unstable) and polonium-210 decays into lead-208 (stable)).

Radionuclide: An element or isotope which is radioactive as a result of the instability of the nucleus of its atom (e.g. radium or uranium).

Radon: A radioactive element in the uranium-238 decay chain produced by the radioactive decay of radium-226. Radon occurs as an inert gas. The half-life of radon-222 is 3.8 days.

Short-lived radon decay products or, daughters, are the principal radiation hazards in the underground mine. The decay of radon-222 and short-lived decay products produces lead-210.

Receptor: A human or ecological entity exposed to a contaminant released to the environment.

Reclamation: Restoration of a site to a beneficial use, which may be for purposes other than the original use.

Remediation: The improvement of a contaminated site to prevent, minimize or mitigate damage to human health or the environment. Remediation involves the development and application of a planned approach that removes, destroys, contains or otherwise reduces the availability of contaminants to receptors of concern.

Remediation Issue: Issues of concern for a specific aspect of the site.

Risk: A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

Risk Assessment: Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants.

Risk Characterization: The last phase of the risk assessment process that estimates the potential for adverse health or ecological effects to occur from exposure to a stressor and evaluates the uncertainty involved.

Run-off: The part of rainfall that is not absorbed directly by the soil but is drained off in rills or streams.

Screening: A preliminary stage of the assessment process for quick evaluation of relatively simple and routine activities or for determining the level of effort required for evaluating more complex projects.

Sediment: Loose, solid particles resulting from the breakdown of rocks, chemical precipitation or from organisms.

Slumping: Sagging or physical subsidence of materials.

Taiga: The northern forest of coniferous trees that lies just south of the arctic tundra.

Toxicity Characteristic Leachate Procedure (TCLP): Laboratory test to determine the propensity of lead to be leached from hazardous materials (typically paint samples) by means of chemical extraction simulating landfill conditions.

Till: An unsorted heterogeneous mixture of rock debris carried and deposited directly by a glacier, with very little subsequent reworking by melt water.

Topographic map: A map showing elevations by means of contour lines (i.e. lines joining points of equal elevation).

Total dissolved solids (TDS): The sum of all the concentrations of dissolved ions in a solution usually expressed as mg/L.

Total suspended solids (TSS): The total amount of suspended solid material in a sample, usually expressed as mg/L.

Traditional knowledge: Refers to the ancient understanding of philosophy, events and things passed on orally through generations by aboriginal people.

Traditional land use: Refers to land use by aboriginal people that reflect the historic activities of their people prior to European settlement (i.e. hunting, fishing, gathering).

Traditional lifestyle: Refers to the lifestyle of aboriginal people prior to European settlement.

Uncertainty: A quantitative expression of error.

Uraninite: Black uranium ore, mineral commonly called pitchblende (composition ranges from UO_2 to U_3O_8).

Uptake: The process/act by which a contaminant (e.g. a radionuclide) enters a biological organism (e.g. inhalation, ingestion by humans).

Watershed: A drainage area or basin into which all surface water from a particular area collects and is transported.

Winter Road: A substandard, seasonal road passable only during the winter when the ground, muskegs and lakes it passes over are frozen.

Zooplankton: Any microscopic or nearly microscopic animals that move passively in aquatic ecosystems.

UNITS AND ABBREVIATIONS

g	gram	ACM	Asbestos containing material
m	metre	DDT	Dicloro-diephenyl-
m ²	square metre		trichloroethane
m ³	cubic metres	PAH	Polyaromatic hydrocarbon
m ³ /y	cubic metres per year	PCB	Polychlorinated biphenyl
µg/g	microgram per gram	PHC	Petroleum hydrocarbon
µg/L	microgram per litre	TPH	Total petroleum hydrocarbons

CHEMICAL SYMBOLS

Aluminum	Al
Ammonia	NH ₃
Arsenic	As
Barium	Ba
Beryllium	Be
Cadmium	Cd
Calcium	Ca
Chloride	Cl
Chromium	Cr
Cobalt	Co
Copper	Cu
Iron	Fe
Lead	Pb
Lithium	Li
Magnesium	Mg
Manganese	Mn
Molybdenum	Mo
Nickel	Ni
Phosphorous	P
Potassium	K
Selenium	Se
Silver	Ag
Sodium	Na
Strontium	Sr
Sulphate	SO ₄
Uranium	U
Vanadium	V
Zinc	Zn

1 INTRODUCTION

1.1 Overview of the Project

This Remedial Action Plan was developed to address human health, ecological and environmental concerns associated with the Sawmill Bay site on Great Bear Lake. It is intended to be a supporting document for consultation, regulatory and funding decisions, and will provide the basis for development of tender documents and technical designs for the implementation of remediation.

In general, the overall intent of the Remedial Action Plan (RAP) is to mitigate human and ecological impact as a consequence of historical site activities, while minimizing further impact as a result of site remediation activities. To comprehensively address all of the issues at the site, the remediation components are first identified and itemized. Each is then discussed in further detail with specific attention given to identifying issues and criteria applicable to each component, options available for remediation, monitoring and maintenance activities required to support the options and contingency plans.

The proposed Remedial Action Plan is based on the results of environmental site investigations, human health and ecological risk assessment studies, best practices in contaminated site remediation, traditional knowledge, current use of the area, and community values. The plan takes into consideration the environmental status of the site, precedent practice, regulatory requirements and site goals. Long-term monitoring and reporting will be carried out at the site to provide ongoing assurance that the remediation works continue to perform as intended.

1.1.1 Overview of Site Operation and Impacts

Sawmill Bay (N 65°43'14", W 118°55'14") is located approximately 65 km southwest of Port Radium, along the northern section of the Leith Peninsula at the eastern end of Great Bear Lake (Figures 1-1, 1-2). Situated on the edge of the Canadian Shield, the site comprises approximately 2038 Ha (20 km²) which extends from the beach landing on the south shore of the bay, to the lodge area, to the two intersecting airstrips located approximately 1,000 m inland from the tip of the bay.

Since the 1940's, the site has hosted a variety of operations (see Figure 1-3) including timber sawmills (pre 1946), an airfield for the trans-shipment of uranium ore (1946-1960), a base camp for a Loran Navigation system and the Royal Canadian Air Forces (RCAF) aerial mapping (late 1940s to early 1950s); a staging ground for the construction of the DEW Line (1954-1957), and a sport fishing lodge (1961-1987).

The site is located in an isolated area that has not been used extensively since 1987, but is still occasionally accessed by air, land, and water. It is currently vacant.

Environmental investigations have been carried out at the site, dating back to 1992. The majority of the work has focused on the presence, impact, and remediation of uranium ore. To a lesser degree, petroleum hydrocarbons, inorganic elements, and PCB contamination in soils have been evaluated. Debris quantification and a designated substances building survey were also undertaken.

1.1.2 Previous Investigations

Significant reports on Sawmill Bay that preceded this study include:

- Phase I, II, and III Investigations of the Historic Northern Uranium Transportation Network in the Northwest Territories and Northern Alberta (SENES, 1994).
- An Environmental Assessment of Sawmill Bay, NWT – Environmental Sciences Group , Royal Military College of Canada and the Low-Level Radioactive Waste Management Office, AECL, (ESG, 1997).
- Sawmill Bay 1997 Waste Removal Project - Low-Level Radioactive Waste Management Office, AECL, 1998.
- Preliminary Quantitative Risk Assessment (PQRA), Sawmill Bay site, Northwest Territories – Franz Environmental Inc. and EcoMetrix Incorporated, 2007.
- Phase IIIA Environmental Site Assessment; Sawmill Bay, Northwest Territories – Franz Environmental Inc. and EcoMetrix Incorporated, 2008a.
- 2007 Radiological Investigations Sawmill Bay, Northwest Territories in support of Phase IIIA Environmental Site Assessment- Low-Level Radioactive Waste Management Office (Port Hope), October 2007.
- Screening-Level Risk Assessment (SLRA), Sawmill Bay – NM 180, Final Report. Prepared for Contaminants and Remediation Directorate, Indian and Northern Affairs Canada,- Franz Environmental Inc. and EcoMetrix Incorporated. 2008b.
- Detailed ESA, Sawmill Bay, NWT – Franz Environmental Inc. 2008.

1.1.3 Remediation Planning Team

The technical team responsible for the development of the plan, conducting studies and reporting on the necessary technical information includes members of INAC staff in Yellowknife and Ottawa, community members from Délįnę, as well as engineers, scientists and private firms as shown below:

- Délįnę Remediation Team;
- INAC Contaminants and Remediation Directorate (CARD);

- Public Works and Government Services Canada;
- NRCan; and
- Franz Environmental Inc.

1.1.4 Remediation Objectives

The remedial objectives for the Sawmill Bay site were developed in accordance with the Federal Policies listed in Section 1.2.1.2 and Sahtu Dene and Metis Comprehensive Land Claim Agreement principles listed in Section 1.2.2.1 of this report. The objectives for the remediation of the site are to:

- minimize human health and safety risks at the Sawmill Bay site;
- protect fish, wildlife and vegetation;
- protect Great Bear Lake water quality;
- minimize environmental impacts during remediation;
- minimize long-term care and maintenance;
- return the site to its original condition where possible; and
- ensure the plan is cost-effective.

These remediation objectives have been agreed to by the remediation team in previous consultation meetings for other sites in the Sahtu area (Port Radium, Contact Lake, El Bonanza, and Silver Bear). The options were presented and discussed with community members during the remedial options engagement meetings to ensure that the same objectives apply to the Sawmill Bay site.

With the above proposed objectives in mind, remediation options for each component have been identified and analyzed as presented in Section 6.0.

1.2 INAC's Responsibilities

Indian and Northern Affairs Canada (INAC) is the project proponent for the remediation of the Sawmill Bay site. It is INAC's responsibility to develop the remediation plan, obtain appropriate approvals, secure resources, and implement the plan using approach to closure that is consistent across all INAC contaminated sites in the Northwest Territories region. Following remediation, INAC is responsible for the implementation of a long-term monitoring plan that is suitable for the site.

1.2.1 Approach to Preparation of the Remedial Plan

1.2.1.1 Overview

Section 39 of the *Northwest Territories Waters Act* (1992) identifies INAC authority to manage environmental contamination and risk to human health and safety. Abandoned contaminated

sites are sites where historic occupants cannot be identified or held responsible for addressing environmental contamination resulting from past use.

1.2.1.2 Policies and Guiding Principles for Remediation

The Sawmill Bay site is considered an abandoned site under the management of the Contaminants and Remediation Directorate (CARD) of INAC in Yellowknife. CARD works within a broader management system for all northern contaminated sites and must follow several guiding documents while managing and developing final remediation plans for the Sawmill Bay site. The following policies or guidance documents provide the broad context governing CARD's approach to remediation of contaminated sites in northern Canada:

- Treasury Board Federal Contaminated Sites Management Policy (TB, 2002),
- Northern Affairs Contaminated Sites Management Policy (INAC, 2002a),
- A Federal Approach to Contaminated Sites (CSMWG, 2000),
- Abandoned Military Site Remediation (INAC, 2005), and
- Mine Site Reclamation Guidelines for Northern Canada (DIAND, 2006b).

Principles from federal policy and guidance documents relevant to the Sawmill Bay site were combined with the principles underlying the Sahtu Dene Comprehensive Land Claim Agreement to provide the site-specific approach for the development of the Remedial Action Plan (see section 1.2.2.1, "Sahtu Dene and Metis Comprehensive Land Claim Agreement", below). The policies and principles in these documents that are of particular importance to the remediation of the Sawmill Bay site are:

- that remedial actions meet the overall INAC objective to contribute to a safer, healthier, sustainable environment for Aboriginal peoples and northern residents by striving to preserve and enhance the ecological integrity of the environment (Contaminated Sites Management Policy, INAC, 2002a);
- that immediate and reasonable action be taken to protect the environment and the health and safety of persons (Treasury Board Contaminated Sites Management Policy, Treasury Board, 2002);
- that federal and INAC policy requirements and legal obligations regarding the management of contaminated sites are met (INAC, 2002a);
- that remedial actions ensure sound environmental stewardship of federal real property by avoiding contamination and by managing contaminated sites in a consistent and systematic manner that recognizes the principle of risk management and results in the best value for the Canadian taxpayer (Treasury Board Federal Contaminated Sites Management Policy, Treasury Board, 2002);

- that a scientifically valid, risk-management-based framework be provided for setting priorities, planning, implementing and reporting on the management of contaminated sites (Contaminated Sites Management Policy, INAC, 2002a);
- that a Remediation Plan be developed that is sufficiently flexible to allow adjustments as the remediation progresses, including the flexibility to adapt to new and improved technologies and methodologies (Mine Site Reclamation Policy for the Northwest Territories, INAC, 2002b);
- that solutions be adopted that are tailored to the northern environment and peoples wherever possible (INAC, 2006a); and
- that the approach to the Remedial Action Plan should take into account the Department of Fisheries and Oceans Policy for the Management of Fish Habitat (1986), which has an overall objective for the net gain of habitat for Canada's fisheries resources
 - fish habitat restoration is one of three goals to meet this objective.

1.2.1.3 Regulatory Considerations (Federal Legislation and Land Use)

Currently, INAC holds no land use permits or water licenses associated with the Sawmill Bay site. The remediation of this site will likely require a Type "A" Land Use Permit, as the equipment and camp requirements may exceed one or more of the threshold limitations triggering a type A license, such as the use of equipment with net weight exceeding 10 tonnes, use of a campsite for more than 400 person days, or use of a petroleum fuel storage container with a capacity equal to or exceeding 4,000 L (Sahtu Land and Water Board, 2004).

The remediation plan will take into account the fish habitat protection and pollution prevention provisions of the *Fisheries Act* (sections 35 and 36). In addition, the remediation of the Sawmill Bay site will follow federal acts including the *Species at Risk Act* (SARA, 2002) and *Canadian Environmental Protection Act* (CEPA, 1999).

Once the remediation of the site is complete, long-term monitoring suitable for the site conditions and remediation options will occur as identified through the Federal Approach to Contaminated Sites (CSMWG, 2000).

1.2.1.4 NRCan Responsibilities

NRCan (AECL) is responsible for the residual contamination from the transportation of uranium ore from Port Radium to Port Hope, Ontario. NRCan has been working with Canadian Nuclear Safety Commission (CNSC) to determine the requirements for this site as well as other sites along the Northern Transportation Route, therefore no remediation options specific to uranium contamination will be proposed or completed in this remediation plan and subsequent remediation of the site.

Responsibility for any residual radioactive soils on the Sawmill Bay site rests with NRCan. Since most metal contamination in these soils is coincident and associated with zones of low-level radioactivity, NRCan's remediation strategy would address any radioactive soils co-contaminated with metals and/or petroleum hydrocarbons.

It must be emphasized that NRCan and INAC will work together within a common framework to remediate the site. NRCan will lead the development of remedial options for radiologically impacted materials, in concert with the local community and INAC.

1.2.2 Partnerships with First Nations

The following principles regarding partnerships with First Nations were adopted from the policy and guidance documents referenced above specifically for the Sawmill Bay Remedial Action Plan.

The Sahtu Dene and Metis Comprehensive Land Claim Agreement (INAC, 1993) is of particular importance to the Sawmill Bay site because it governs the consultation approach and economic benefits for future contracts regarding the site.

1.2.2.1 Sahtu Dene and Metis Comprehensive Land Claim Agreement

The Sawmill Bay site is within the Sahtu Dene and Metis Comprehensive Land Claim Agreement Settlement Area, as defined in the Land Claim Agreement that was signed in 1993 (INAC, 1993). The Land Claim Agreement was signed, among other things, to “recognize and encourage the way of life of the Sahtu Dene and Metis which is based on the cultural and economic relationship between them and the land”. The following principles from the Sahtu Dene and Metis Comprehensive Land Claim Agreement were taken into consideration during the development of the Sawmill Bay Remediation Plan and will be followed during the consultation process:

- to protect and conserve the wildlife and environment of the area for present and future generations;
- to directly involve communities and designated Sahtu organizations in land use planning; and,
- to encourage the self-sufficiency of the Sahtu and to enhance their ability to participate fully in all aspects of the economy, specifically by protecting and promoting the existing and future social, cultural and economic well being of the participants.

The Sahtu Land Use Plan, developed under the principles and objectives of the Sahtu Dene and Metis Comprehensive Land Claim Agreement (INAC, 1993) and the Mackenzie Valley Resource Management Act (MVRMA, 1998), indicates that the Sawmill Bay site is in a Special Management Zone where most land uses are possible (SLUPB, 2007). The site will, therefore,

be managed in accordance with the Special Management Zone terms and conditions, including, but not limited to:

- the maintenance of the ecological integrity of the area;
- the monitoring and management of infrastructure so as to prevent and/or rectify any negative environmental effects; and
- the monitoring and management of activities in the area so that the migration routes of migratory or semi-migratory wildlife species are not blocked (SLUPB, 2007).

1.3 Site Status (Land Tenure, Mineral Tenure and Heritage Value)

1.3.1 Land Tenure

Pursuant to Section 19.1.2 (a) Vol.1 of the Sahtu Dene and Metis Comprehensive Land Claim Agreement (INAC, 1993); lands as shown on NTS map sheet 86E/10 (Sawmill Bay) are considered Sahtu Lands, excluding minerals.

INAC is the custodian of the Sawmill Bay Site, as it relates to land and water contamination, which remain on site from previous land users. In a portion of this site there is uranium ore concentrate contamination from when it was used as the transportation route for uranium production. All uranium contamination along the transportation route falls under the responsibility of Natural Resources Canada (NRCAN). Currently, NRCAN has an exemption from permitting under a Waste Nuclear Substance Licence until they can resolve remediation options for the entire route. INAC is in contact with NRCAN but is currently working independently to address the remaining issues on site.

1.3.2 Mineral Tenure

There are no active claims or leases in the Sawmill Bay Site area.

1.3.3 Heritage Value

INAC is currently getting an opinion from the Prince of Wales Northern Heritage Centre (PWNHC). At present, PWNHC has identified the steam tractor at Sawmill Bay as a potential item of interest. Délı̨nę has also identified this item as one of potential interest.

1.4 Community Consultation

INAC, as part of the Crown, recognizes the importance of consultation and the need to respect Aboriginal and treaty rights. The Department takes this duty very seriously and recognizes that consultation is complex while working toward clarity and improved efficiency. The approach taken by CARD supports three overarching responsibilities of the Crown: Good Governance – establishing good working relationships and contributing to improved understanding of undertakings toward making informed decisions; Contractual or statutory obligations arising

from legislation, land claim agreements, and other laws and regulations (e.g. Mackenzie Valley Resource Management Act); Crown's duty to consult – gives rise to the Crown's common law duty to consult regarding adverse impacts on established or potential Aboriginal and treaty rights protected by section 35 of the Constitution Act, 1982. The community engagement process is an important element of the remedial options analysis and the development of a remedial approach.

Although remediation activities will ultimately result in a benefit to the environment, proposed clean up activities at site can have a short term or acute adverse impact. The consultation process may reveal a need to accommodate community concerns; however full agreement on approach is not a necessary outcome of consultation as Aboriginal groups do not have a veto over the Crown's contemplated conduct.

One of CARD's primary goals in these remediation projects is to ensure that the majority of the benefits from the activities go to the beneficiaries of the land claim area. Following from previously successful approaches for sites in Sahtu region (e.g. Silver Bear and Port Radium) CARD has involved the community in the process of planning for the cleanup of these sites through several public and leadership meetings as well as providing support for pre-employment training opportunities. The Remedial Action Plan has been developed with community designated representatives on a Remediation Team. The purpose of the engagement was to discuss and obtain input from the Délı̨nę Remediation Team, leadership and community members on the preferred and acceptable (secondary) options for managing the identified environmental and physical risks at the Sawmill Bay site. As part of the community engagement process, three remedial option consultation meetings were held (September 2009, Yellowknife; January 2010 Délı̨nę and March 2010 Yellowknife). Minutes of the meetings are provided in Appendix A along with the presentation materials prepared by INAC-CARD. Through open dialogue among the attendees of engagement meetings, all stakeholders were provided with an opportunity to discuss elements of the environmental conditions at Sawmill Bay, the RAP process and the remedial options.

Major meetings and presentations have included:

- September 2nd, 2009 – Site visit to Sawmill Bay with community representatives from Délı̨nę, INAC-CARD representatives (2) and Franz representative. This visit included a tour of the site with discussion of areas of concern.
- September 17 & 18, 2009 – Meeting in Yellowknife with the Délı̨nę remediation team representatives to begin discussion of remedial options for Sawmill Bay.
- October 1st 2009 – Follow up site visit as requested during Sept 17 & 18th meeting to accommodate the interest of several Remediation Team members as well as Leadership

members who were unable to attend the first trip. Trip also served to support the traditional knowledge study.

- October 28, 2009 – Presentation to Déljñę Leadership with an update on Great Bear Lake project status highlighting overarching goals and objectives including the state of issuance of Land Use and Water Licence permits, status of TK study and Sawmill Bay RAP with inclusion of gamma contamination portion with NRCan involvement. Also to provide overview of Government contracting options (PSAB and AOC) along with feedback on status of proposal for technical review support and to get required feedback on preferred options for 2010 season.
- October 28, 2009 – Community meeting to provide public an update on status of Great Bear Lake remediation project, including Sawmill Bay. Included representation from Low Level Radioactive Waste Management Office, on behalf of Natural Resources Canada, to address concerns related gamma contamination and past clean up efforts at the site.
- January 12 to 15th, 2009 – Meeting in Déljñę with the remediation team representatives to continue discussion of remedial options for Sawmill Bay. Included representation from Low Level Radioactive Waste Management Office, on behalf of Natural Resources Canada, to address concerns related gamma contamination and past clean up efforts at the site.
- March 24, 2010 – Meeting in Yellowknife with the Déljñę remediation team to finalize discussions regarding the remedial options for Sawmill Bay.

Advice and traditional knowledge (TK) from elders and community members were also taken into consideration (through a TK study) in the development of the RAP. Furthermore, a dedicated community liaison has been employed in Déljñę to provide local support and guidance to the engagement process.

Within the existing contracting framework CARD maximizes opportunity for economic benefits to the community by having an Aboriginal Opportunity Consideration built into contract, encouraging employment of beneficiaries of the settlement area. In further consideration of community concerns to local economic opportunities, CARD has committed to unbundling the Great Bear Lake remediation project into three phases. CARD has also committed to an onsite community representative position and development of an oversight committee for the duration of activities.

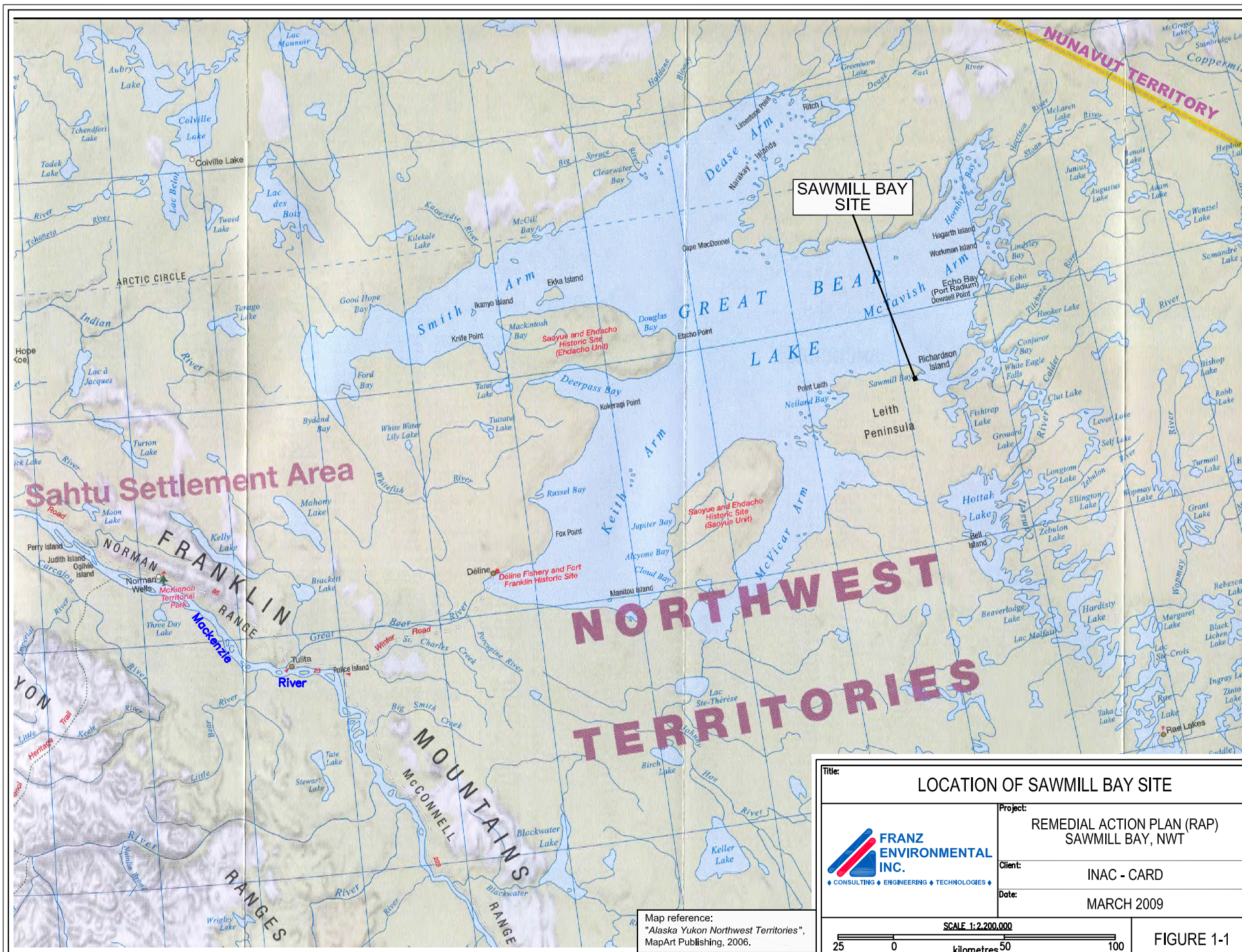
It should be noted that opportunities for additional input from the community will continue to be considered as the majority of the remediation activities for Sawmill Bay are not scheduled to begin for another 3-5 years (Phase III).


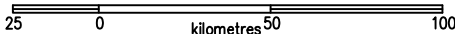
1.5 Structure of the Remedial Plan

In addition to this introductory chapter, the following information is provided in this report.

- Chapter 2 describes the site setting, including its location, history, features and relevant aspects of the natural environment.
- Chapter 3 gives an overview of previous environmental investigations of the Sawmill Bay site, and a summary of the environmental impacts observed.
- Chapter 4 summarizes the approach and results of ecological and human health risk assessments.
- Chapter 5 explains the process of analyzing and selecting possible remedial actions that may be undertaken to clean up the Sawmill Bay site.
- Chapter 6 presents remediation issues, clean-up criteria, possible and preferred remediation activities for each area of the site, and summarizes the full set of preferred remediation activities.
- Chapter 7 describes performance and environmental monitoring efforts, care and maintenance that would be required post-remediation.
- Chapter 8 is a remediation schedule.
- Chapter 9 provides a list of cited references.

FIGURES



Title: LOCATION OF SAWMILL BAY SITE	
 FRANZ ENVIRONMENTAL INC. CONSULTING • ENGINEERING • TECHNOLOGIES	Project: REMEDIAL ACTION PLAN (RAP) SAWMILL BAY, NWT
	Client: INAC - CARD
	Date: MARCH 2009
SCALE 1:2,200,000 	
FIGURE 1-1	



