Resolution Island 2001
Scientific Investigations

Prepared by

Analytical Services Unit
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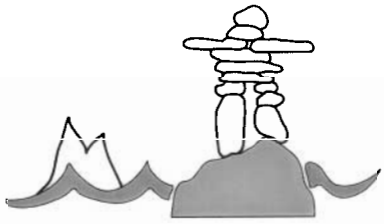

Contaminated Sites Office

ACKNOWLEDGMENTS

The project was supported by Indian and Northern Affairs Canada through its Contaminated Sites Office in Yellowknife. This is a special year since the project will be managed through the Iqaluit office in the future. We would especially like to thank Scott Mitchell for his continued support over the years and his optimism and enthusiasm in making the project a success. Thanks also to Marianne Kardash for keeping administrative affairs in order.

The work was conducted in conjunction with the Qikiqtaaluk Corporation. Thanks are due to the many QC personnel who helped us with our work.

The project was directed by John Poland, Allison Rutter, and Graham Cairns, Queen's University. They were ably assisted by Jody Bonsall, Asa Chong, Sarah Keys, Maggie Lau, Kelly Van Hoek, Shakeel Virk and Andrei Woinarski of the ASU; Andrei is a graduate student from Australia who worked with us as part of an exchange program. This report was written by John Poland, Graham Cairns and Maggie Lau and edited by Allison Rutter. Maggie Lau was responsible for the logistics and the maps were drawn by Graham Cairns.

Some laboratory analyses were conducted by Queen's University Analytical Services Unit, Kingston, Ontario. Thanks are due to Paula Whitley, Jody Bonsall, Mary Andrews, Sarah Keys, who provided their usual high professional standards.

We would like to welcome Natalie Plato and Glen Stephens from the Iqaluit Office who will be taking over management of the project next year.

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EXECUTIVE SUMMARY

This report is the eighth annual report produced by the Analytical Services Unit (ASU) relating to the environmental assessment and remediation of the former military base at Resolution Island. The first three reports, pertaining to visits from 1994 to 1996, involved site assessment, remediation of critical areas and the development of cleanup plans and strategies. The work in these three years was managed by the ASU. In 1997 and 1998 the project focussed on infrastructure improvements and the purchasing and assembly of the equipment necessary for the cleanup of the site. From 1997 onwards, the management of the work has been conducted by the Qikiqtaaluk Corporation. Remediation activities started in 1998 and have continued each year. The ASU has provided analytical services and expertise to support this work and Dr. John Poland and Dr. Allison Rutter have acted as Scientific Advisors to Indian and Northern Affairs Canada (INAC) for the project. This report details the work undertaken by the ASU, Queen's University in 2001.

A mobile laboratory was transported to the site last year and set up at the end of the season. This year the mobile laboratory was used extensively for on-site analysis and required two full time technicians. Over 200 PCB determinations were successfully carried out along with analyses for hydrocarbons, phenols and daily pH measurements. The efficient functioning of the on site laboratory greatly facilitated the excavation work. Confirmatory analysis for areas that were being remediated could be performed immediately on site and thus work was not held up in waiting for analytical results. The operation of this laboratory, under the conditions prevalent at Resolution Island and using the techniques employed, is unique.

At the S1/S4 Buildings area a new method of documenting the progress of the remediation work was developed by the ASU. Initially, a twenty meter by twenty meter grid was developed on a map of the area and the exact intercept location coordinates determined. These were then marked on the ground at the site by navigating to these points using the GPS system. Multiple maps were produced of each grid and, for each work day, these maps were used to document excavation activity and analytical results. A summary sheet for each quadrant documented the activity and, when work on a quadrant was complete, the summary sheet was signed off and copies distributed. This system increased the cooperation between all parties involved in the excavation and thus simplified the remediation project.

Excavation procedures for removal of CEPA soil at the site have now become routine. Care must still be taken to limit the amount of soil removed. Excavation must be to the appropriate soil depth, as determined from the previous analysis of soil samples. A total of 985 m^3 of CEPA soil was excavated this year of which 115 m^3 contained greater than 2000 ppm PCBs. No CEPA soil was shipped off-site. There were problems with the new steel containers, some of which were found to leak.

A protocol was developed to deal with wood present on PCB contaminated ground by conducting a series of analyses of pieces of wood from various locations. In many PCB contaminated areas wood had to be removed before excavation of the soil could be started. Several steel containers were filled with PCB contaminated wood.

At the beach dump the removal of debris is now essentially complete. An excavation protocol was produced and followed. The whole dump was delineated and samples taken and analyzed. Results showed the volumes of Tier II and Tier I contaminated soils were estimated as 500 m^3 and 300 m^3 respectively. At the airstrip dump further investigations were conducted by analyzing soil from pits dug in the dump. The results obtained, together with those from last year, were used to calculate volumes of PCB contaminated soil in the dump. These soil volumes are estimated as 50 m^3 CEPA, 600 m^3 Tier II and 750 m^3 of Tier I.

Many of the barrels at the site were dealt with this year by separating those which need to be shipped south and incinerating the contents of others. The ASU analysed the contents of 128 barrels this year. Other work at the site this year included the treatment of water contaminated with phenols from the two large POL tanks which the ASU supported through analysis, removal of a small battery pile near the furniture dump and an environmental assessment of an area at the end of the airstrip. As in previous years, the inventory of the PCB storage facility was updated and barrier inspection and monitoring, drinking and lake water analysis and air sampling were performed.

I. OVERVIEW

A. General

This is the eighth year that the Analytical Services Unit (ASU) has conducted work at Resolution Island for Indian and Northern Affairs Canada (INAC). Over the period 1993-1996, environmental work at the site was detailed in a set of reports entitled "Environmental Study of a Military Installation at Resolution Island, BAF-5". These reports[1] fully described items such as site characteristics, history, and previous investigations. Scientific investigations have continued and have been reported annually[2]. From 1997 onwards, work at the site has been managed by the Qikiqtaaluk Corporation (QC) through a contribution agreement with INAC. This work started in 1997 with infrastructure improvements and expanded from 1998 onwards to include remediation activities and training. Map I-1 shows the location and general layout of the site at Resolution Island.

The work described in this report was conducted through a Contribution Agreement between Queen's University and INAC. This report details the tasks carried out by the ASU in 2001 and outlines the progress made in the Resolution Island remediation project.

The on-site activities were again shortened this year. The Queen's University team was on site from 9 July to 3 September 2001; a normal season would be from around 20-25 June to 10-15 September.

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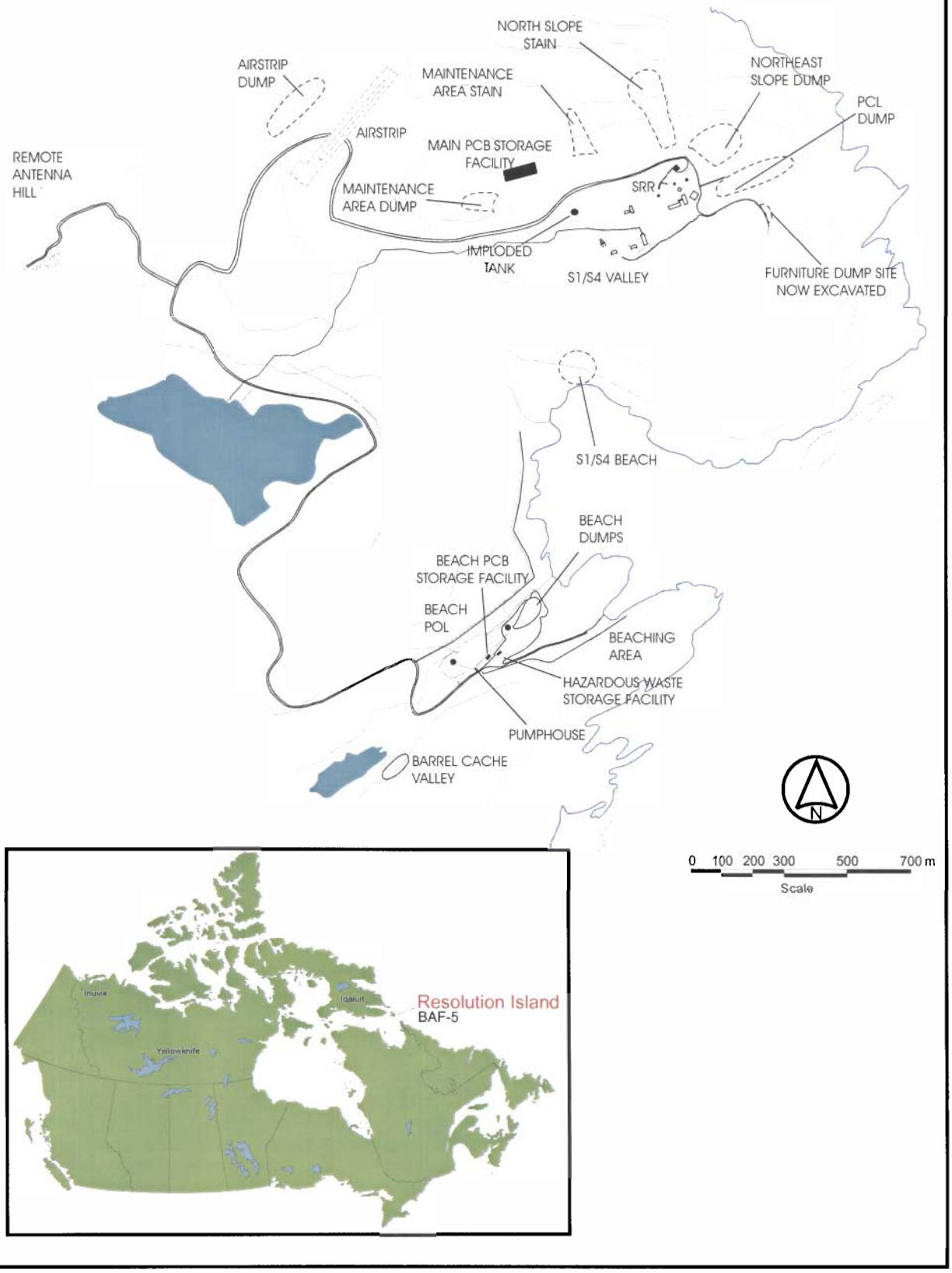
[1] Environmental Sciences Group (1994) Volume One, Analytical Services Unit (1995) Volume Two, Analytical Services Unit and Environmental Sciences Group (1996) Volume Three, and Analytical Services Unit (1997) Volume Four Environmental Study of a Military Installation at Resolution Island. BAF-5. Prepared for Indian and Northern Affairs Canada.

[2] Analytical Services Unit (1998), (1999) and (2000). Resolution Island 1997: Scientific Investigations and Analytical Services Unit, Resolution Island 1998: Scientific Investigations and Resolution Island 1999: Scientific Investigations. Prepared for Indian and Northern Affairs Canada.

Map I-1: Location and General Layout of the Site at Resolution Island



B. Site Activities

Most of the work conducted at Resolution Island this year was again managed by the Qikiqtaaluk Corporation (QC). QC managed the transportation to and from Iqaluit, provided meals and accommodation at the core camp and provided personnel and equipment to assist with our work.

The main accomplishments at the site for the year were:

- Excavation of CEPA soil from the S1/S4 Buildings Area.
- Containerization of >2000 ppm PCB contaminated soil and bulk storage of 50-2000 ppm PCB material.
- Characterization and containerization of wood debris from the S1/S4 Buildings Area.
- Excavation of debris from the Beach Dump.
- Delineation of the PCB and lead contamination in soil remaining at the Beach Dump site.
- Consolidation of barrels containing material to be shipped off-site and incineration of the contents of barrels suitable for this purpose.
- Treatment and disposal of water from two large POL tanks contaminated with phenols.
- Further investigations at the Airstrip Dump
- Removal of a small battery pile in the vicinity of the Furniture Dump.
- Further improvements to the camp facilities.

C. Scientific Investigations

The activities conducted at the site this year by the ASU and described in Chapters II-IV of this report are listed below. There were four ASU personnel on site for most of the time this summer. Two people were generally required full time to operate the laboratory. Equipment and supplies used by the ASU were flown to Iqaluit and transported into the site by helicopter or Twin Otter aircraft. Gas cylinders for the operation of the gas chromatograph were taken to Montreal and sent in by sea-lift.

This was the first year that the mobile laboratory was fully operational for the entire season. Operating a laboratory under the conditions prevalent at Resolution Island has rarely, if ever, been undertaken previously. The successful operation of the laboratory ensured the ability to analyze PCBs and other parameters on site. This greatly facilitated the excavation and other activities on site.

Another first this year was the presence of an Australian graduate student, Andrei Woinarski, at Resolution Island. This was one of the outcomes of a visit by Dr. John Poland and Scott Mitchell to Australian Antarctic Division (AAD) Environment Australia. Many profitable discussions were held relating to the remediation of sites in cold climates.

Resolution Island meetings were attended in Ottawa, Yellowknife, and Kingston this year. While on site, DND property lines were mapped by GPS for the Environmental Sciences Group, RMC. No remediation work was undertaken this year for DND.

1. On Site Activities

The main tasks completed by the ASU this year are listed below:

- Scientific and engineering support at the site.
- Analyses at the mobile laboratory. The analyses were mainly for PCBs using a gas chromatography with an electron capture detector (GC/ECD). Samples analysed included soil, water, oil and wood. The GC/ECD and associated equipment for PCB analysis worked well. The hydrogen generator did not work after a winter at Resolution Island and was replaced by helium and hydrogen gas from cylinders. PCB test kits were also used at the mobile laboratory. Water

from the POL decontamination unit was tested for total petroleum hydrocarbons (GC/FID) and total phenols. Drinking water was tested daily for pH.

- Establishment and maintenance of the grid system and related paperwork.
- Confirmation testing, mapping and roping at the S1/S4 Buildings and Valley Area. As remediation of this area was the main task at the Island this year, Queen's had a person assigned to overseeing the operation.
- Barrels – testing, sorting and labelling as required.
- PCB Storage facilities – adding materials to, and keeping an inventory of, the Beach facility as required – reporting records of the contents of both the Beach and Main PCB storage facilities to INAC at the end of the field season - and keeping INAC informed of any additional CEPA violations so that they could be reported promptly to Environment Canada.
- Further work on the environmental assessment of the airstrip dump.
- An environmental assessment of the area at the end of the airstrip and production of a map of the airstrip to include the assessment data and DND boundary line.
- Drinking water and lake water. Testing pH daily, and potability of drinking water three times during the summer, and lake water and new landfill leachate (if present) once.
- Monitoring, inspection and repair of barriers.
- As part of a cooperation with the Australian Antarctic Division (AAD), Environment Australia, the ASU brought Andrei Woinarski, a second year graduate student from the University of Wollongong, Australia, to the site this summer. Andrei performed the duties of an ASU technician/scientist on site, and also spent 5 weeks working in the laboratory at Queen's University.
- Collection and analysis of air samples for PCBs and chlorinated hydrocarbons.
- Acting as scientific resource to INAC and attending meetings as required.

Photograph I-1: Gas Cylinders Beside the Sea-Can Used to Store Supplies Used by the Queen's University Team.

Photograph I-2: Conducting Analyses for PCBs in the Mobile Laboratory.