Environmental Study of a Military Installation and Six Waste Disposal Sites at Iqaluit, NWT

Volume One: *Site Analysis*

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EXECUTIVE SUMMARY

In the community of Iqaluit, waste disposal both from military activities and the community itself have resulted in the creation of several dump sites. As well, some of the former military facilities have been abandoned. The aesthetic impact of these sites is apparent, but despite several studies, no definitive picture of the environmental status of the area has emerged. This report, comprising two volumes, presents a comprehensive study of the current environmental status of each site and proposes realistic and practical plans for their cleanup.

Scientific investigations at six solid waste disposal sites and a former military installation in Iqaluit were carried out by the Environmental Sciences Group, in conjunction with the Analytical Services Unit at Queen's University, during the period from August 9 to 20, 1994. The environmental assessment of the sites addressed visible debris, landfills, and contaminated soil. The extent of chemical contamination has been measured and the results compared with those of previous studies. An emphasis has been placed on the evaluation of the potential for chemical contaminants to enter the Arctic food chain.

A concurrent study of historical ocean disposal, headed by Environment Canada with participation by the Environmental Sciences Group, provided useful information regarding chemical inputs by the sites to the adjacent marine environment.

In assessing the environmental status and recommending appropriate cleanup measures at the Iqaluit sites, an environmental basis for comparison was required. The most comprehensive model for the cleanup of an Arctic environment is that provided by the DEW Line Cleanup Project. Iqaluit, in addition to being similar environmentally to the DEW Line, also shares many aspects of its past. For these reasons, the assessments and the cleanup recommendations proposed for Iqaluit are based on objectives outlined in the protocol developed for the DEW Line - the DEW Line Cleanup Protocol.

Results of the current investigation indicate that the Upper Base was the most heavily contaminated of the sites assessed. PCBs were detected in soil at concentrations in excess of the level regulated under the *Storage of PCB Material Regulations* arising from the Canadian Environmental Protection Act. The total volume of soil affected approximates 60 m^3 and was restricted to one area of the base. The Apex dump site was found to be leaching several contaminants, among which pesticides were detected at

concentrations exceeding the applicable criteria. All seven sites under investigation exhibited some contamination by inorganic elements requiring remediation under the DEW Line Cleanup Protocol.

Recommendations for the cleanup of the seven sites were made on a site-specific basis and were influenced by levels of contamination detected, whether contaminant migration was evidenced and the physical location of each site. The cleanup of PCB-contaminated soils at the Upper Base requires the most immediate action. Other contaminants, including pesticides present within the watershed of the town's water supply lake, should be addressed in a timely fashion. Measures to stop the chronic leaching of contaminants from the Apex Dump into the marine environment need to be instituted and stabilization of all the dump sites is required. The complete proposed cleanup plan, contained in this report, will restore the sites to an environmentally safe condition - one in which contaminants in soil, sediment and water do not pose a threat to living organisms (including humans) in the future.

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GLOSSARY AND LIST OF ABBREVIATIONS

Various abbreviations and terms are used throughout the report. These include;

ABN	=	Acid/Base/Neutral Extractable (semi-volatile organic priority pollutants)
AES	=	Arctic Environmental Strategy
anthropogenic	=	derived directly or indirectly from human activity
As	=	Arsenic
ASU	=	Analytical Services Unit (Queens University, Kingston, Ont)
BCMOE	=	British Columbia Ministry of Environment
Be	=	Beryllium
CCME	=	Canadian Council of Ministers of the Environment
Cd	=	Cadmium
Co	=	Cobalt
Cr	=	Chromium
Cu	=	Copper
DCC	=	DEW Line Cleanup Criteria
DDT	=	Dichlorodiphenyltrichloroethane
DEW	=	Distant Early Warning
DIAND	=	Indian and Northern Affairs Canada
DND	=	Department of National Defence
DNWSO	=	Directorate (or Director) North Warning System Office
EC	=	Environment Canada
ECMSQG	=	Environment Canada Marine Sediment Quality Guidelines
EPA	=	Environmental Protection Agency (US)
ESG	=	Environmental Sciences Group
FAL	=	Freshwater Aquatic Life
flora	=	vegetation
FOL	=	Forward Operating Location
forb	=	wildflower or flowering herb
GBM	=	Geodetic Bench Mark
GC	=	Gas Chromatography
GC/ECD	=	Gas Chromatography/Electron Capture Detection
GC/MS	=	Gas Chromatography/Mass Spectroscopy
GNWT	=	Government of the Northwest Territories

GPS	=	Global Positioning Satellite
Hazmat	=	Hazardous Material
HCB	=	Hexachlorobenzene
HCH	=	Hexachlorocyclohexane
High res	=	High resolution (usually in association with mass spectrometry)
Hg	=	Mercury
HRGC	=	High Resolution Gas Chromatography
HRMS	=	High Resolution Mass Spectrometry
HS-1	=	NRC Marine Reference Standard
I-site	=	Intermediate DEW Line site
leachate	=	substances (usually in solution) migrating from a more concentrated source.
LRR	=	Long Range Radar
MENVIQ	=	Ministère de l'Environnement du Québec
Mn	=	Manganese
Mo	=	Molybdenum
MOU	=	Memorandum of Understanding
NA	=	Not analyzed due to a coeluting interference
NCSCS	=	National Contaminated Sites Classification System
NBS	=	National Bureau of Standards (US)
NCSRP	=	National Contaminated Sites Remediation Program
NDR	=	Not reliably detected
Ni	=	Nickel
NIST	=	National Institute of Standards and Technology
NM	=	Not Measured
NRC	=	National Research Council
NWS	=	North Warning System
NWSO	=	North Warning System Office
NWT	=	Northwest Territories
permafrost	=	ground remaining frozen through two or more consecutive winters and intervening summer.
PAH	=	Polycyclic Aromatic Hydrocarbon
Pb	=	Lead
PCA	=	Principal Components Analysis
PCB	=	Polychlorinated Biphenyl

PCDDs		Polychlorinated dibenzodioxins
PCDFs		Polychlorinated dibenzofurans
POL	=	Petroleum, Oil, Lubricants
ppb	=	parts per billion; ng/g that is, nanograms of substance per gram of soil or sediment sample; µg/L that is, micrograms of substance per litre of aqueous solution.
ppm	=	parts per million; µg/g that is, microgram of substance per gram of soil or sediment sample.
ppt	=	parts per trillion; ng/L in aqueous solutions.
PV	=	Pole Vault
PWC	=	Public Works Canada
RRMC	=	Royal Roads Military College
Se	=	Selenium
SRR	=	Short Range Radar
TEL	=	Threshold Effect Level
TPH	=	Total Petroleum Hydrocarbons
TSS	=	Total Suspended Solids
UMA	=	UMA Engineering Ltd.
USAAF	=	United States Army Air Force
USAF	=	United States Air Force
US EPA	=	United Stated Environmental Protection Act
Zn	=	Zinc