Jacques Whitford

REPORT

POTENTIAL CoC IDENTIFICATION USING SOIL CHEMICAL CONCENTRATION DATA IN EXCEEDANCE OF MOE GENERIC GUIDELINES

VALE INCO LIMITED

PORT COLBORNE COMMUNITY BASED RISK ASSESSMENT

PROJECT NO. ONT34645

REPORT ON

POTENTIAL CoC IDENTIFICATION
USING SOIL CHEMICAL CONCENTRATION DATA
IN EXCEEDANCE OF MOE GENERIC GUIDELINES

PORT COLBORNE COMMUNITY BASED RISK ASSESSMENT

PORT COLBORNE, ONTARIO

Prepared For

VALE INCO LIMITED

Prepared By

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JWL Project Nos. ONT34645

March 28, 2008

EXECUTIVE SUMMARY

Jacques Whitford Limited (JWL) was retained by Vale Inco Limited (Inco) to conduct a Community Based Risk Assessment (CBRA) for the City of Port Colborne. The CBRA was undertaken in accordance with a Technical Scope of Work (JWL, 2000) prepared in consultation with a Public Liaison Committee. The Technical Scope of Work (TSOW) required that a number of scientific studies and investigations be undertaken to obtain the community specific information necessary to complete the CBRA. One of these studies was to conduct various investigations for the identification and evaluation of potential chemicals of concern (CoC) based on CBRA Condition Numbers 1, 2 and 3 as outlined in the TSOW.

This report presents the results and findings on chemicals analyzed in soil samples from the Port Colborne area that are present on a community-wide basis at concentrations above the MOE generic effects-based guidelines in accordance with TSOW CoC Condition Number 2. Soils investigations were conducted to evaluate all potential relevant CoCs that may have originated from the Inco refinery, as well as from other historical industrial sources within the affected area, such as the neighbouring former Algoma steel plant.

Findings indicated that the potential CoCs attributed to Inco's historical nickel refinery operations for the CBRA under TSOW CoC Condition No. 2 were nickel, copper, cobalt and arsenic.

Findings also indicated that the potential chemicals that can be attributed to the former steel plant's iron ore operation were iron, beryllium, zinc, arsenic, selenium, lead and cadmium. Of these, only lead, zinc, arsenic and beryllium would constitute as CoCs possibly attributed to the former Algoma steel plant under TSOW Condition 2.

The soil chemistry data suggests that the former steel plant may have been a significant source of lead. However there are other potential sources of lead in Port Colborne soil that can be attributed to non-industrialized sources such as leaded paint, leaded gasoline, and batteries.

ACKNOWLEDGEMENTS

The Port Colborne community is the first to be acknowledged for their cooperation and help. Without them Jacques Whitford Limited (JWL) could not have gathered the data necessary for this study.

The MOE provided their archived 1998 and 1999 soil samples that were used for the analyses of arsenic and selenium. MOE also provided documentation on soil analytical results for the Toronto Lead study program from 1971 to 1991.

St. Lawrence Seaway Authority, the City of Port Colborne and a number of independent home owners allowed JWL to carry out test pitting and soil sampling on their properties.

JWL staff including Doug Dolby, Mahaboob Alam and Kevin Wong and Enpar's soil scientist James Warren executed the field sampling program and collated much of the analytical data.

Philip Analytical provided all of the analysis for the soil samples. JWL staff including Mahaboob Alam, Kevin Wong and Wai Chi Kwan handled the documentation and quality control for the laboratory data and analysis, and report preparation.

Kevin Wong and Luis Vieira provided technical support for data management and drafting.

This report was reviewed by CBRA Project Manager, Eric Veska, Senior Consultant and Bill Stiebel, CBRA Senior Advisor, Principal Consultant.

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1.0 INTRODUCTION

1.1 STATEMENT OF OBJECTIVES

Vale Inco Limited (Inco) operated a nickel refinery in the City of Port Colborne from 1918 to 1984. Nearby, the former Algoma Steel and former Canada Blast Furnace had operated a steel plant that reportedly sintered and smelted iron ore to form pig iron from the early 1910's to 1977, located approximately 500 m southwest and upwind of the Inco refinery. Historical operations at the Inco refinery and the former steel plant released particulate emissions that subsequently resulted in atmospheric deposition of these particulates on Port Colborne soils surrounding the Inco refinery and the former steel plant.

Jacques Whitford Limited (JWL) was retained by Inco to carry out a Community Based Risk Assessment (CBRA) for the City of Port Colborne. The CBRA was undertaken in accordance with a Technical Scope of Work (JWL, 2000) prepared in consultation with a Public Liaison Committee (PLC). The Technical Scope of Work (TSOW) required that a number of scientific studies and investigations be undertaken to obtain the community specific information necessary to complete the CBRA. One of these studies was to conduct various investigations for the identification and evaluation of potential chemicals of concern (CoC) based on CBRA Condition Numbers 1, 2 and 3 as outlined in the TSOW and summarized below.

The definition for a CoC within this CBRA is a chemical found in Port Colborne soils originating from an industrial source(s) where all of the following Conditions are met:

Condition 1) Chemicals that were historically used or generated by the industrial source(s) or its processes, **and**

Condition 2) Chemicals that are present at a community level at concentrations greater than MOE generic effects-based guidelines (Table 'A' Generic Guidelines (MOE, 1997)), **and**

Condition 3) Chemicals whose presence in soil show a scientific linkage to the historical operations of that industrial source(s).

INCO is the proponent of the CBRA. Only chemicals that meet all three of the above stated CBRA COC conditions and had originated from INCO's historical operations were considered COCs for the CBRA.

This report presents the results and findings of various JWL soils investigations in 2000 and 2001, as well as a review of the earlier 1998/1999 soils investigations carried out by the Ontario Ministry of the Environment (MOE), so as to identify and evaluate potential CoCs attributed to Inco and the nearby former Algoma steel plant in accordance with CBRA Condition Number 2.

In 2001, a draft JWL report was released, entitled "*Potential CoC Identification using Soil Chemical Concentration Data in Exceedance of MOE Generic Guidelines*" and dated November 23, 2001. Potential CoCs for the CBRA under Condition No. 2 attributed to Inco's historical Nickel Refinery operations were *Nickel, Copper, Cobalt and Arsenic*. The Ministry of the Environment (MOE) conducted a technical review of this report and other COC-related reports and produced a letter (letter of January 11, 2002 "*Review of JWEL CBRA CoC Reports*") that concurred with the outcome of JWL's findings. At a December 2001 meeting of the Technical Sub-Committee to the Public Liaison Committee of the CBRA, it was decided to leave the CoC issue open ended, that if other additional information in the future becomes available, that it too be examined for CoC identification.

Although lead had not been identified as a CoC in 2001, additional Port Colborne soil lead data that became available to JWL after 2001 to 2003 were evaluated by means of soil mapping and establishing empirical relationships, emission inventories/dispersion modeling and statistical analyses to determine if lead was a CoC in accordance to CBRA CoC Conditions 1, 2 and 3. Lead was not determined a CoC for the CBRA and the details of this determination are found in the JWL report entitled "*Re-Evaluation of Lead as a Chemical of Concern"* dated June 2004 (JWL, 2004).

The report under this cover dated March 2008 represents the finalization of the draft November 23, 2001 report *"Potential CoC Identification using Soil Chemical Concentration Data in Exceedance of MOE Generic Guidelines"*.

Other supporting reports have been prepared on additional CoC studies that relate to emission inventories/dispersion modeling and statistical analyses to address CoC Condition Numbers 1 and 3. These are as follows:

- JWL report entitled "Potential CoC Identification using Emission Inventories and Dispersion Modelling of INCO and ALGOMA Operations" dated March 28, 2008 (JWL, 2008a) and

- JWL report entitled "Potential CoC Identification using Statistical Analyses" dated March 28, 2008 (JWL, 2008b).

1.2 REVIEW OF PREVIOUS MOE INVESTIGATIONS

1.2.1 MOE 1998 AND 1999 Soil Investigations on Open Spaces

The MOE (MOE, 2000a) conducted studies of the Port Colborne area in 1998, in particular around the refinery plant. Soil samples were analyzed for seventeen (17) metals: aluminum, barium, beryllium, calcium, cadmium, cobalt, copper, chromium, iron, magnesium, manganese, molybdenum, nickel, lead, strontium, vanadium, and zinc. Arsenic and selenium were not analyzed. The MOE concluded from their investigation that soil concentrations of nickel, copper and cobalt were elevated above the MOE Table A Generic Guidelines for residential/parkland land use and for medium grained soils as listed in the MOE *Guideline for Use at Contaminated Sites in Ontario*, revised February 1997 (MOE, 1997) and that these three metals should be considered as CoCs.

The levels of nickel in soils reported in 1998 were measured at concentrations of up to 5000 ppm, generally with the highest concentrations closest to the Inco stack, and lower concentrations away from the Inco stack. Soil concentrations of copper and cobalt were measured at up to 350 ppm and 150 ppm, respectively. As with nickel, the concentrations of copper and cobalt were found to be highest near the refinery, and declined further from it. The area with concentrations of nickel, copper and cobalt exceeding the MOE Table A Generic Guidelines (MOE, 1997) as identified from the 1998 data generally occurred in the eastern portion of the City, and agricultural and forested areas to the north and east of the refinery; an area of approximately 19 km^2.

A more detailed phytotoxicology soils investigation of the Port Colborne area by the MOE in 1999 provided more soil chemical data, including arsenic analyses, to the existing data set. The new data increased the estimated areal extent of MOE Table A Generic Guidelines (MOE, 1997) exceedances for nickel, copper and cobalt from 19 km^2 to 29 km^2 (MOE, 2000b). Spatial distributions of these metals in exceedance of these soil guidelines were plotted on maps by the MOE and these are reproduced on drawings found in Appendix A.

As noted above, the analyses of arsenic and selenium by the MOE were not done for each soil sample collected in 1998 and selenium was not analyzed for the 1999 samples. Neither the 1998 nor the 1999 MOE investigations included a full suite of inorganic parameters or organic parameters (eg. PCBs).

1.2.2 MOE School Yards and Beaches Investigation

In April 2000, MOE collected soil samples from a number of school yards and beaches in Port Colborne area. Documentation was provided in MOE report "Results of Soil Sampling in School Yards and Beaches in the Port Colborne Area, April 2000" - Report No. SDB-031-3511-2000 (MOE, 2000c).

A review of this report revealed that soil concentrations of nickel, copper and cobalt exceeded the MOE Table A Generic Guidelines (MOE, 1997) for parkland/residential land uses. Soil concentrations of fourteen other analyzed metals including aluminum, barium, beryllium, cadmium, calcium, chromium, iron, lead, magnesium, manganese, molybdenum, strontium, vanadium and zinc were below the applicable MOE Table A Generic Guidelines (MOE, 1997) for parkland/residential land uses.

1.2.3 MOE Wood Lots Investigation

In October 2000, MOE collected soil samples from five rural woodlots in Port Colborne area. Documentation was provided in MOE report "Soil Contamination in Selected Port Colborne Woodlots: 2000" - Report No. SDB-012-3511-2001 (MOE, 2001a).

The five rural woodlots in this report were identified as Woodlots 1 to 5. Three of the woodlots, Woodlots 1, 2 and 3 were located within 2.5 km of the Refinery in the direction of the prevailing winds (east to northeast of Inco). Woodlot 4 was located at Forks Road East and Green Road, about 11 km northeast of Inco. Woodlot 5 was located at Highway 3 and Bassie Road in Wainfleet, about 5 km west of Inco and thus considered as representative of background conditions.

A review of this MOE woodlot report revealed that nickel, copper and cobalt concentrations in soils exceeded the MOE Table A Generic Guidelines (MOE, 1997) in woodlots downwind of the Inco refinery.

Concentrations of arsenic and selenium in soils from only one localized woodlot (Woodlot 3) exceeded the MOE Table A Generic Guidelines (MOE, 1997) by marginal factors of 1.2 and 1.1 times respectively.

Concentrations of beryllium exceeded the MOE Table A Generic Guideline (MOE, 1997) of 1.2 ppm at 5 (five) sampling locations in Woodlot 3 and at 7 (seven) locations in Woodlot 5 (ie. the background woodlot). The MOE explained the presence of beryllium in soil in all woodlots investigated as being related to natural background or non-anthropogenic.

1.2.4 MOE Rodney Street Neighbourhood Soils Investigation

In November 2000, MOE collected and chemically analyzed soil samples from 179 properties in the Rodney Street neighbourhood and documented their findings in a report entitled "Soil Investigation and Human Health Risk Assessment for the Rodney Street Community: Port Colborne (2001)" (MOE, 2001b) and a subsequent report dated October 2001 (MOE, 2001c).

A review and interpretation of the findings in these reports by JWL revealed two distinct sources of chemicals found in soils from the Rodney Street neighbourhood. Source 1 is from the Inco Refinery that would explain the observed distribution of nickel, copper and cobalt concentrations in soils. Source 2 is from south of Rodney Street, in the vicinity of a former steel blast furnace facility that would explain the arsenic and selenium concentrations in soil. It should be noted that arsenic is one of the more significant chemicals released to the air from the steel industry according to a Canadian Environmental Protection Act (1996) document, *Strategic Options for the Management of Toxic Substances from the Steel Manufacturing Sector*. The former steel furnace facility operated on lands directly south to southwest of Rodney Street from the 1913 to 1977. This steel plant had reportedly smelted iron ore to manufacture pig iron, which was then used to fabricate steel products.

Chemicals other than nickel, copper, cobalt, arsenic and selenium found in exceedance of the MOE Table A Generic Guidelines (MOE, 1997) but not related to either Inco or the former steel plant were lead, cadmium, chromium, barium, zinc and beryllium. (Note that the MOE linked zinc to the Inco refinery (MOE, 2001c), but this relationship is not evident as will be noticed towards the end of this report).

MOE concluded that soil lead contamination in the Rodney Street neighbourhood is typical of older urban residential communities in Ontario (MOE, 2001c). The sources of lead in soil given by the MOE were numerous and were property specific such as paint, pesticide use, storage, maintenance, disposal of vehicles and vehicle parts (particularly lead acid batteries), and historic use of leaded gasoline.

Antimony was in close association with lead and linked to batteries.

Cadmium, chromium, and zinc were found in close association with lead and linked to paint.

Beryllium also was found to be concurrent with high lead. MOE (2001c) concluded that the soil contamination on some properties on the south side of Rodney Street were linked with industrial process waste/fill and the generally elevated soil beryllium concentrations were associated with natural shale deposits and dust/slag from the former steel plant.

1.3 INFORMATION GAPS FROM MOE INVESTIGATIONS

Based on the findings of JWL's review of MOE's previous investigations, there were several information gaps that warranted further data collection and interpretation by JWL to properly identify potential CoCs in accordance with TSOW Condition No. 2.

Gaps found with the MOE 1998 and 1999 surface soil investigations on open spaces were absence of analytical data on arsenic and selenium in the suite of inorganic parameters analyzed and the absence of any data on concentrations of organic parameters such as PCBs, polyaromatic hydrocarbons and volatile organic compounds in soils. Without this information, a proper screening of chemicals could not be done nor could soil chemical patterns for the above mentioned chemicals be mapped to determine their source of origin.

Gaps found with the MOE Rodney Street investigation was that there was no clear evidence of soil chemical data at locations upwind and downwind of the Rodney Street neighbourhood to properly attribute the source of chemicals to either Inco's Refinery or the former steel plant, or both. Further, as a historical review of this area was not done by the MOE, it was not clear whether the chemicals identified by the MOE could have originated from industrial sources other than the Inco Refinery and the former steel plant.

1.4 SCOPE OF WORK

JWL conducted a two part study supplementary to the MOE investigations to obtain sufficient scientific information to identify CoCs as part of Condition No. 2 of the TSOW.

The first study was designed to address data gaps with the MOE 1998 and 1999 surface soil investigations of the entire Port Colborne Community. This involved supplemental work as follows:

- chemical analyses of ten (10) additional surface soil samples (0 to 5 cm depth) in the Port Colborne area in the vicinity of and downwind of the Inco Refinery for an extensive list of inorganic and organic parameters. Locations of surface soil samples to coincide with MOE-identified areas of high concentrations of nickel in soil from previous MOE phytotoxicity studies of the entire community;

- chemical analyses of 149 MOE-archived 1998 and 1999 soil samples (0 to 5 cm depth) for arsenic and selenium; and

- mapping surface soils (0 to 5 cm depth) concentration data for each chemical analyzed that exceed the MOE generic effects-based guidelines (in this case, MOE Table A Generic Guidelines (MOE, 1997)) and determine if there exists any noticeable patterns that link these exceedances on a community wide basis originating back to the Inco Refinery or to some other industrial source. *Localized exceedances of a chemical in soil were not considered community wide.*

The second study was designed to address data gaps with the MOE Rodney Street investigation and to help determine and assess the source allocation of various CoCs originating from Inco and/or Algoma Steel in the Rodney Street neighbourhood of Port Colborne. This study involved the following supplemental work:

- site background and historical land use review of other potential industrial sources of contamination in the former industrialized area west of Inco that may have contributed to the observed concentrations of chemicals in soil;

- air dispersion modelling to delineate the areal extent of historical particulate loading and fallout deposition that may have resulted from the Inco Refinery and the former steel plant;

- collection of surface and subsurface soil samples of 17 test pits excavated down to one (1) meter at locations on the former steel plant (ie. upwind of the Rodney Street neighbourhood), on the Inco Refinery property (ie. downwind of the Rodney Street neighbourhood), as well as on several residential properties within the Rodney Street neighbourhood. The test pits were located considering the areas predicted by air modelling coinciding with the highest air borne particulate deposition from the Inco refinery and the former steel plant. Chemical analyses of these samples were for the determination of inorganic parameters, including 17 metals and two nonmetallic chemicals, arsenic and selenium;

- collection and analyses of surface soil samples from four (4) additional test pits TPA, TPC, TPD and TPE located in the residential areas north and northwest of the Inco refinery and south of Killaly Street East. Data on the chemical analyses of these samples were used in conjunction with data sets on the above mentioned samples in order to obtain a better understanding of the soil chemical concentration distribution patterns; and

- mapping soils concentration data for each chemical analyzed that exceed the MOE generic effects-based guidelines and determine if there exist any noticeable patterns that link these exceedances back to either the Inco Refinery, the former steel plant or to some other industrial source(s) on a community wide basis. *Localized exceedances of chemical in soil were not considered community wide.*

Based on the above scope of work, potential CoCs will be identified in accordance with the requirements of Condition 2 of the TSOW.

2.0 METHODOLOGY

2.1 SITE HISTORY AND POTENTIAL SOURCES OF CONTAMINATION

JWL conducted a detailed historical background review of an area as defined by Welland Canal to the west, Inco property to the east, Durham Street to the north and the shores of Lake Erie to the south. Details of the site background review findings are provided in Appendix B. Based on the information gathered, the historical review has revealed evidence of industrial operations that may have resulted in potential environmental contamination in various areas as presented in Table 2.1.

Table 2.1 Findings of Site Background Historical Review

Potential Sources of Contamination	Historical Activity	Contaminants
Former Steel Plant (Canada Blas Furnace and Algoma Steel)	Historical iron smelting operation activ since 1913 to its closure in 1977. Th plant used coke, iron ore, limestone an iron shop ball as raw materials. Coa stock piles, iron ore and associate industrial activities such as generatio of slag containing spent metals.	Iron, Arsenic, Beryllium, Selenium and associated heavy metals and coal dust from metal smelting operations. Metal containing slags that were later used as road base and fill materials in the development of neighbouring eastside of the City of Port Colborne.
CN Railway Yard	Historical operation of railway yard along the eastside of Welland Canal since 1860s to 1980s. The activities included, coal yard, grain storage and associated railway operations such as fuel oil storage, railway ties.	Coal dust, petroleum hydrocarbons, arsenic (from railway ties) and other metal associated with railway yard.
Scrap Yard, Trucking Facilities and other industrial operations along eastside of Welland Cana west of Welland Street.	Historical industrial land use along the eastern part of the CN railway yard since 1930s. The activities include, scrap yard, junk metal stock piles, generation of heavy metal shavings, degreasing operation involved in metal scrapping and salvage, trucking facilities with fuel storage.	Heavy metals, petroleum hydrocarbons from scrap yard operations.

Table 2.1 Findings of Site Background Historical Review

Potential Sources of Contamination	Historical Activity	Contaminants
Gas Stations, Auto Repair Facilities, and Old Residential Dwellings	Historical mixed commercial and residential land uses of area north of Rodney Street, south of Killaly Street, west of Davis Street and east of Welland Street. Majority of the urban areas were developed after 1910s and 1920s, site development, road constructions involved use of fill (slag and spent materials) most likely obtained from the Former Steel Plant. Auto repair facilities and old houses used lead-based gasoline and paints.	Lead, antimony, cadmium, petroleum hydrocarbons from gasoline, paint, batteries and fill materials.
Inco Nickel Refinery	Historical operation of nickel refinery by Inco from 1917 to 1984. Inco's operation involved refining of nickel, copper and cobalt.	Nickel, copper and cobalt from the historical refinery operations.

2.2 PROTOCOLS

A total of five protocols were developed to undertake this work. These protocols included:

JWL's December 18, 2000 protocol (Draft) entitled 'Surface Soil Sampling for Identification of Potential Chemicals of Concern' as appended in Appendix C.

JWL's June 2001 protocol (Draft) entitled 'Protocol for Nickel and Arsenic Deposition Modelling, Port Colborne Community Based Risk Assessment' as appended in Appendix C.

JWL's June 27, 2001 protocol entitled 'Test Pitting Protocol, Additional CoC Investigation, Inco Boundary and Rodney Street Area' as appended in Appendix C.

JWL's July 9, 2001 protocol (Revised) entitled 'Surface Soil Sampling for Identification of Potential Chemicals of Concern' as appended in Appendix C.

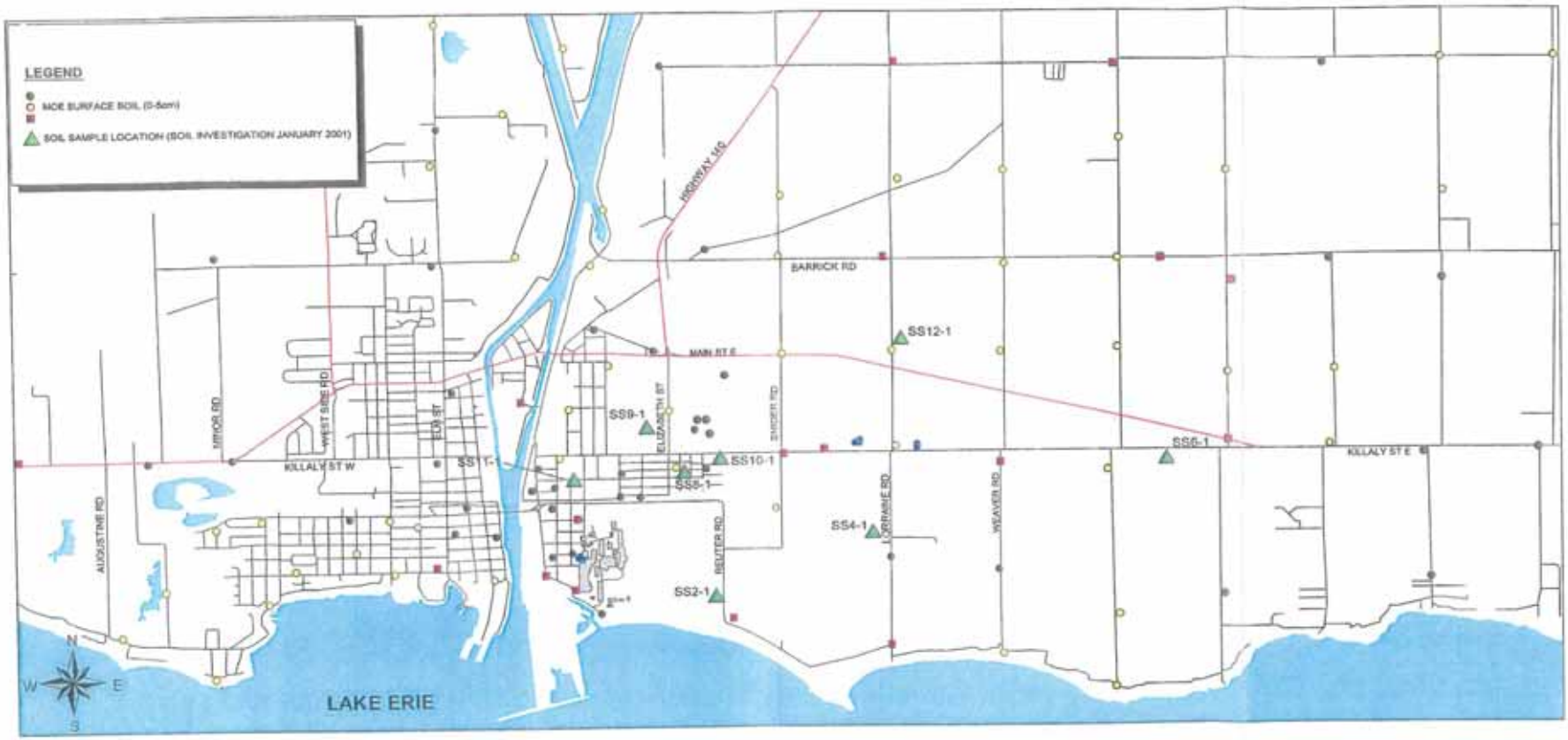
JWL's July 9, 2001 protocol entitled 'Sampling and Analysis: Quality Assurance and Quality Control' as appended in Appendix C.

Reference to the above protocols are made below in Sections 2.3, 2.4 and 2.5.

2.3 SURFACE SOIL PROGRAM

Site locations of surface soil samples taken by JWL are shown on Drawing 1. Soil samples were collected from the front yards and/or back yards of residential dwellings. *Soil sampling was carried out at eight (8) locations (sites 2, 4, 6 and sites 8 through 12 on Drawing 1) in Port Colborne which coincide with areas of high concentrations of nickel in soil as reported by the MOE (MOE, 2000a and 2000b)*. In addition, JWL collected two (2) soil samples from background locations, west (site 5) and north (site 13) of the Welland Canal, in areas with known, low concentrations of measured nickel in soil.

Soil samples at each of these 10 locations were collected from the 0 to 5 cm depth interval. The sampling program was conducted on dates of December 29, 2000, January 04 and 16, 2001 in accordance with JWL's December 18, 2000 protocol (Draft) entitled 'Surface Soil Sampling for Identification of Potential Chemicals of Concern' as appended in Appendix C. Sampling was carried out by JWL staff with a representative from Beak International Inc. (Beak), the environmental consultant for the PLC witnessing the sample collection as well as gathering duplicate samples for chemical analyses as part of third party verification.



NOTE: TWO CONTROL SAMPLES SS5 AND SS13 WERE COLLECTED FROM WAINFLEET AND WELLAND AREA ABOUT 8 Km WEST AND 13 Km NORTH OF THE INCO REFINERY

0 1000 2000 3000m

SCALE 1:40000

SITE LOCATIONS OF JWEL JANUARY 2001 SOIL INVESTIGATION

PORT COLBORNE, ONTARIO

Job No.:	Dwg. No.:
ONT34645	1
Date: 01/11/14	Dwn. by: BJC
	Appd.: MA

Jacques Whitford

All ten (10) soil samples were submitted to Philip Analytical Services Corp. (Philip), a Canadian Association of Environmental Analytical Laboratories (CAEAL) accredited laboratory, for analysis of chemical parameters listed in Table 2.2.

TABLE 2.2

SUMMARY OF SAMPLE LOCATIONS AND ANALYTICAL PARAMETERS

PORT COLBORNE, ONTARIO

Sample Number	Sample Location:	Sample Matrix:	Analytical Parameters:
Soil 2-1	Site # 2	Soil	Metals, Anions
Soil 4-1	Site # 4	Soil	Metals, Anions
Soil 5-1	Site # 5	Soil	Metals, Anions, VOCs, PAHs, PCBs
Soil 6-1	Site # 6	Soil	Metals, Anions
Soil 8-1	Site # 8	Soil	Metals, Anions
Soil 9-1	Site # 9	Soil	Metals, Anions
Soil 10-1	Site # 10	Soil	Metals, Anions, VOCs, PAHs, PCBs
Soil 11-1	Site # 11	Soil	Metals, Anions, VOCs, PAHs, PCBs
Soil 12-1	Site # 12	Soil	Metals, Anions
Soil 13-1	Site # 13	Soil	Metals, Anions
Soil 5B	Site # 5 (Resample Site # 5)	Soil	VOCs
Soil 7B	Site # 7 (Resample Site # 7)	Soil	VOCs
Soil 10B	Site # 10 (Resample Site # 10)	Soil	VOCs
Soil 11B	Site # 11 (Resample Site # 11)	Soil	VOCs

Notes:
Metals - Selected metals and nonmetals including Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Bismuth, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Phosphorous, Selenium, Silver, Sulphur, Titanium, Thallium, Vanadium, Zinc.
Anions- Selected anions including Bromide, Chloride, Fluoride, Nitrate, Nitrite, Orthophosphate, Sulphate.
VOCs - Volatile Organic Compounds
PAHs - Polynuclear Aromatic Hydrocarbons
PCBs - Polychlorinated Biphenyls (total)

2.4 TEST PIT PROGRAM

2.4.1 Purpose and Scope of Program

JWL undertook *a test pit excavation and sampling program to help determine and assess the source allocation of various CoCs from at least two industrial sources that operated adjacent to the Rodney Street community.* These sources included (1) Canada Blast Furnace and Algoma Steel (hereinafter referred to as the former steel plant) that operated from 1913 to 1977 and (2) Inco Nickel Refinery which operated from 1918 to 1984.

2.4.2 Program Design

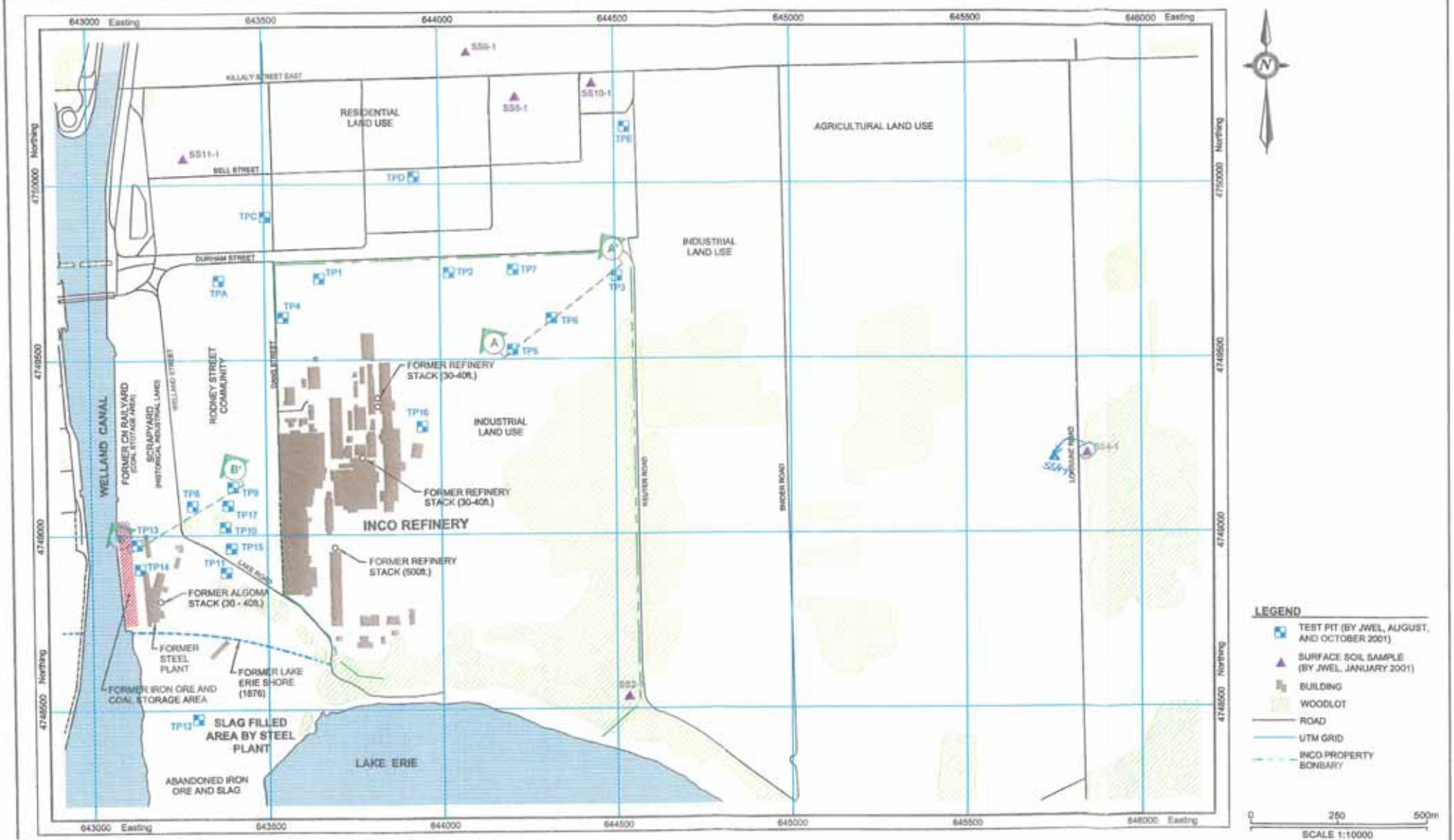
Selection of test pit locations was based on findings from the air dispersion modelling (JWL, 2001) and possible deposition fall out patterns due to emissions from the former steel plant and Inco refinery. The test pits were located to obtain a profile of soil chemicals across the predicted zones of highest atmospheric particulate deposition from historical emissions of the Inco refinery and the former steel plant.

2.4.3 Test Pitting Work

Prior to the test pit excavation, efforts to identify the locations of underground utilities and services were undertaken. Proper health and safety protocols were adhered to during the field investigation program. Permission to excavate on all properties was obtained before work commenced.

A total of seventeen (17) test pits, TP1 to TP17 were excavated from August 15 to August 21, 2001. Test pit locations are shown on Drawing No. 2. Test pits TP1 to TP7 and TP16 were located on Inco property. Test pits TP8 to TP11, TP15 and TP17 were located on properties within the Rodney Street community. Test pits TP12 to TP14 were located on the former steel plant site.

In addition to the above-mentioned 17 test pits, JWL excavated four (4) additional test pits, TPA, TPC, TPD and TPE at locations shown on Drawing No. 2 in the residential areas north and northwest of the Inco refinery and south of Killaly Street East.



SITE LOCATIONS OF JWEL AUGUST 2001 AND OCTOBER 2001 TEST PITS AND SOIL TRAVERSES A-A' AND B-B'

PORT COLBORNE, ONTARIO

Job No.:	ONT34645	Dwg. No.:	2
Date:	01/11/14	Dwn. by:	LMV
Appd.:	MA		

Jacques Whitford

The test pits were excavated by Emburgh Backhoe Services of Port Colborne, Ontario using a backhoe. Test pits were excavated to a depth below grade ranging from approximately 0.5 m to 1.1 m with the exception of TP12 which was excavated to a depth of 10 cm only because of refusal due to occurrences of very hard slag.

JWL's June 27, 2001 protocol on soil sampling entitled 'Test Pitting Protocol, Additional CoC Investigation, Inco Boundary and Rodney Street Area' as appended in Appendix C was followed.

Soil samples at each of these test pit locations were collected in the field at 2.5 cm depth intervals to a depth of 30 cm, then every 5 cm interval to a depth of 50 cm and then at 70-75 cm and 95-100 cm depth. Altogether 18 soil samples were collected from each test pit with the exception of TP12. At TP12, soils were collected at 0-2.5 cm, 2.5-5 cm and 5-10 cm depths, for a total of three samples. Sampling was carried out by JWL staff with a representative from Beak to witness the sample collection as well as to gather duplicate samples for chemical analyses as part of third party verification.

All of the collected samples were not immediately submitted to the laboratory for chemical analyses. Instead a phased approach was taken with the first phase involving the analyses of a large number of samples per test pit for a total of five test pits in critical areas downwind of the former steel plant and downwind of the Inco Refinery. These data provided a better understanding of the detailed patterns of the concentration-depth profiles of the chemicals in soils. The second phase involved chemical analyses of soil samples for the remaining test pits, concentrating on the selection and analyses of samples from similar depth intervals shown in the first five test pits to have the highest soil chemical concentrations.

Phase 1 involved the collection of eighteen (18) soil samples per test pit from three (3) test pits along a northeast transect from the former steel plant property (TP13 (on the former steel plant property), TP9 (residential property within Rodney Street neighbourhood), and TP17 residential property within Rodney Street neighbourhood) and two (2) test pits on Inco property along a northeast transect from the former Inco refinery (TP3 and TP5). The chemical analyses were used to determine the vertical concentration profiles of chemicals with depth and the depths as to where the highest concentrations of chemicals can be found.

In Phase 2, a total of seventy four (74) soil samples were analyzed for the remaining test pits including, TP1, TP2, TP4, TP6, TP7, TP8, TP10, TP11, TP14 through TP16. For TP12, soil samples were collected at 0-2.5 cm, 2.5-5 cm and 5-10 cm depth and all three samples were analyzed.

In addition, samples of remnant iron pellets, iron shot balls, slag and iron ore waste rock collected from the southern part of the former steel plant were also submitted for chemical analyses.

All samples were submitted to Philip Analytical Services Corp. (Philip), a Canadian Association of Environmental Analytical Laboratories (CAEAL) accredited laboratory, for analysis of chemical parameters listed below:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Phosphorous, Selenium, Silver, Titanium, Thallium, Vanadium, Zinc and pH.

2.5 LABORATORY PROGRAM

2.5.1 Laboratory Procedure for Inorganic Parameters

JWL Surface Soil Samples

The ten soil samples collected between December 29, 2000 and January 16, 2001 were first analyzed for inorganic parameters following the original December 2000 protocol without spiked standard reference materials (SRM). Subsequently, archived subsamples of the same ten soil samples were analyzed on July 5, 2001 following the revised protocol of July 9, 2001, this time using SRM. The latter set of analyses was conducted at the request of Beak so that the routine procedure of using SRM for organic analyses could also used done for the inorganic analyses. A discussion follows in Section 3.3 on the differences between data on inorganic parameters obtained using SRM and those without using SRM.

Details of the sample preparation and digestion, instrumentation used, analytical method numbers and method detection limits are provided in JWL's July 9, 2001 protocol entitled 'Sampling and Analysis: Quality Assurance and Quality Control' appended in Appendix C.

MOE Archived (1998 and 1999) Surface Soil Samples

A total of 149 MOE archived surface soil samples collected at depths of 0 to 5 cm depth from the MOE 1998 and 1999 investigations were also sent to Philip for chemical analyses on February 5, 2001. The MOE-archived 149 soil samples included 10 samples from agricultural fields, 20 samples from woodlots and 119 samples from residential properties, boulevards and right of ways. Site locations are shown on Map 1 and 2 in Appendix F. In addition, the MOE provided JWL with ten (10) samples of their inhouse certified reference (not to be confused with authentic SRM).

Sample preparation was not necessary on the archived samples which were already preprocessed and sieved to a less than 355 um size fraction. Samples were digested using aqua regia solution (HNO3/HCL) and the extracts were analyzed using Hydride Generation Atomic Absorption (HGAA) as per JWL's July 9, 2001 protocol entitled 'Sampling and Analysis: Quality Assurance and Quality Control' appended in Appendix C.

The analytical results were reported as mg/kg on dry weight basis.

It should be noted that these 149 MOE archive surface soil samples were not reanalyzed along with the ten JWL surface soil samples using SRM as there was not enough sample mass remaining for the required analyses.

JWL Test Pit Soil Samples

Details of the sample preparation and digestion, instrumentation used, analytical method numbers, method detection limits and QA/QC procedures are provided in JWL's July 9, 2001 protocol entitled 'Sampling and Analysis: Quality Assurance and Quality Control' appended in Appendix C.

2.5.2 Laboratory Procedure for Organic Parameters

For organic analyses, sample preparation on the ten JWL surface soil samples involved extraction of the organic components using different types of organic solvents.

Details of the sample preparation, instrumentation used, analytical method numbers and method detection limits are provided in the laboratory certificates of chemical analyses as appended in Appendix E.

2.5.3 Quality Assurance and Quality Control (QA/QC)

Laboratory QA/QC

Laboratory QA/QC involved laboratory replicate analyses of one (1) surface soil sample for VOCs, one (1) surface soil sample for PCBs, two (2) surface soil samples for metals and 17 testpit soil samples for metals.

In addition to the above-mentioned laboratory replicate analyses, the laboratory analyses also included standard reference material (SRM). For metal analyses, the SRM used by Philip in the re-analyses of ten JWL collected samples was a commercial purchased reference material from Canmet called Lake Sediment (LKsd-3).

Field QA/QC

Seventeen (17) test pit soil field duplicates, one from each test pit were collected during the August 2000 test pitting work. No field surface soil duplicates were collected during the January 2000 soil investigation.

3.0 RESULTS OF COMMUNITY-WIDE SOILS INVESTIGATION

3.1 JWL SURFACE SOILS INVESTIGATION

All analytical data were compared to the MOE Table A Generic Guidelines (MOE, 1997) for residential/parkland land use and for medium grained soils as was used by the MOE in their 1998 and 1999 soils investigations (MOE, 2000a,b).

To verify that the medium grained soil texture classification is appropriate for the study area, JWL conducted grain size analyses on randomly selected soil samples representing about 20% of all samples collected during the January 2001 investigation. Grain size distribution curves are provided in Appendix D. Based on the grain size distribution curves, the collected samples contain clay size fractions. According to the MOE Guideline (MOE, 1997), the subject area soil should be considered as medium/fine grained. This confirms with the description for the majority of the soils in the Port Colborne area as clay/silt till deposits as given by the Ministry of Agriculture and Food (OMAF, 1989).

The laboratory analytical results for the submitted soil samples and the comparative MOE Table A Generic Guidelines (MOE, 1997) are summarized in Tables 3.1 to 3.5 and the laboratory certificates are provided in Appendix E. Table 3.1 provides analytical results and comparative MOE Table A Generic Guidelines (MOE, 1997) for VOCs. Tables 3.2 and 3.3 show chemical test results and comparative MOE Table A Generic Guidelines (MOE, 1997) for PAHs and PCBs, respectively. Table 3.4 provides soil analytical results and comparative guidelines for selected metal parameters. Table 3.5 shows the test results for inorganic parameters, chloride and sulphate.

A summary of soil chemical results in Tables 3.1 to 3.5 in comparison to the applicable MOE Table A Generic Guidelines (MOE, 1997) is presented below:

3.1.1 Organic Parameters

Concentrations of all 40 VOC species, where measured, complied with the applicable MOE Table A Generic Guidelines (MOE, 1997) for residential/parkland land uses.

Concentrations of all 18 PAH species, where measured, complied with the applicable MOE Table A Generic Guidelines (MOE, 1997) for residential/parkland land uses.

Concentrations of total PCB, where measured, complied with the applicable MOE Table A Generic Guideline (MOE, 1997) for residential/parkland land uses.

TABLE 3.1

SOIL ANALYTICAL RESULTS AND COMPARATIVE CRITERIA

(Samples Collected in January 2001 at 0 to 5 cm Depth)

VOLATILE ORGANIC COMPOUNDS – VOCs

(ug/g or ppm except as noted)

Port Colborne, Ontario

PARAMETER	SOIL 5B	SOIL 7B	SOIL 10B	SOIL 11B	MOE TABLE A CRITERIA[a]
1,1,1-Trichloroethane	< 0.002	< 0.002	< 0.002	< 0.002	34
1,1,2-Trichloroethane	< 0.002	< 0.002	< 0.002	< 0.002	0.28
1,1,1,2-Tetrachloroethane	< 0.002	< 0.002	< 0.002	< 0.002	0.12
1,1,2,2-Tetrachloroethane	< 0.002	< 0.002	< 0.002	< 0.002	0.01
1,1-Dichloroethane	< 0.002	< 0.002	< 0.002	< 0.002	3.0
1,1-Dichloroethene	< 0.002	< 0.002	< 0.002	< 0.002	0.015
1,2-Dibromoethane (Ethylene dibromide)	< 0.002	< 0.002	< 0.002	< 0.002	0.01
1,2-Dichlorobenzene	< 0.002	< 0.002	< 0.002	< 0.002	0.88
1,2-Dichloroethane	< 0.002	< 0.002	< 0.002	< 0.002	0.05
1,2-Dichloropropane	< 0.002	< 0.002	< 0.002	< 0.002	0.12
1,3-Dichlorobenzene	< 0.002	< 0.002	< 0.002	< 0.002	30
1,4-Dichlorobenzene	< 0.002	< 0.002	< 0.002	< 0.002	0.32
Acetone	< 1.0	< 1.0	< 1.0	< 1.0	3.5
Benzene	0.001	< 0.002	0.003	0.003	0.24
Bromodichloromethane	< 0.002	< 0.002	< 0.002	< 0.002	0.12
Bromoform	< 0.002	< 0.002	< 0.002	< 0.002	0.11
Bromomethane	< 0.005	< 0.005	< 0.005	< 0.005	0.38
Carbon Tetrachloride	< 0.002	< 0.002	< 0.002	< 0.002	0.64
Chlorobenzene	< 0.002	< 0.002	< 0.002	< 0.002	2.4
Chloroethane	< 0.005	< 0.005	< 0.005	< 0.005	NV
Chloroform	< 0.002	< 0.002	< 0.002	< 0.002	0.13
Chloromethane	< 0.005	< 0.005	< 0.005	< 0.005	NV
Cis-1,2-Dichloroethene	< 0.002	< 0.002	< 0.002	< 0.002	2.3
Cis-1,3-Dichloropropene	< 0.002	< 0.002	< 0.002	< 0.002	0.04

PARAMETER	SOIL 5B	SOIL 7B	SOIL 10B	SOIL 11B	MOE TABLE A CRITERIA[a]
Dibromochloromethane	< 0.002	< 0.002	< 0.002	< 0.002	0.09
Dichloromethane (Methylene Chloride)	< 0.01	< 0.01	< 0.01	< 0.01	1.1
Ethyl Benzene	< 0.002	< 0.002	< 0.002	< 0.002	0.28
2-Hexanone	< 0.025	< 0.025	< 0.025	< 0.025	NV
Methyl-t-Butyl Ether	< 0.002	< 0.002	< 0.002	< 0.002	5.7
Methyl Ethyl Ketone (MEK)	< 0.025	< 0.025	< 0.025	< 0.025	0.27
Methyl Isobutyl Ketone (MIBK)	< 0.025	< 0.025	< 0.025	< 0.025	0.48
Xylenes	0.001	<0.002	0.004	0.002	25
Styrene	< 0.002	< 0.002	< 0.002	< 0.002	1.7
Tetrachloroethene (Perchloroethylene)	< 0.002	< 0.002	< 0.002	< 0.002	0.45
Toluene	0.002	< 0.002	0.007	0.004	2.1
Trans-1,2-Dichloroethene	< 0.002	< 0.002	< 0.002	< 0.002	4.1
Trans-1,3-Dichloropropene	< 0.002	< 0.002	< 0.002	< 0.002	0.04
Trichloroethene	< 0.1	< 0.1	< 0.1	< 0.1	3.9
Trichlorofluoromethane	< 0.005	< 0.005	< 0.005	< 0.005	NV
Vinyl Chloride	< 0.002	< 0.002	< 0.002	< 0.002	0.0075

Notes:

a Ontario Ministry of the Environment's *Guideline for Use At Contaminated Sites in Ontario*, February 1997, (Table A) Potable groundwater use at residential/parkland land use with medium and fine textured soils.

NV No criteria value specified.

TABLE 3.2

SOIL ANALYTICAL RESULTS AND COMPARATIVE CRITERIA

(Samples Collected in January 2001 at 0 to 5 cm Depth)

POLYNUCLEAR AROMATIC HYDROCARBONS - PAHs

(ug/g or ppm except as noted)

Port Colborne, Ontario

PARAMETER	SOIL 5-1	SOIL 7-1	SOIL 10-1	SOIL 11-1	MOE TABLE A CRITERIA[a]
1-Methylnaphthalene	<0.05	<0.05	<0.05	<0.05	1.2
2-Methylnaphthalene	<0.05	<0.05	<0.05	<0.05	1.2
Acenaphthene	<0.05	<0.05	<0.05	<0.05	15
Acenaphthylene	<0.05	<0.05	<0.05	<0.05	100
Anthracene	<0.05	<0.05	0.06	0.05	28
Benzo(a)anthracene	0.12	0.09	0.05	0.20	6.6
Benzo(a)pyrene	0.12	<0.05	<0.05	0.18	1.2
Benzo(b)fluoranthene	0.14	0.14	<0.05	0.21	12
Benzo(g,h,i)perylene	0.11	0.08	<0.05	0.14	40
Benzo(k)fluoranthene	0.13	0.10	<0.05	0.17	12
Chrysene	0.17	0.16	<0.05	0.25	12
Dibenzo(a,h)anthracene	<0.05	<0.05	<0.05	<0.05	1.2
Fluoranthene	0.31	0.25	<0.05	0.34	40
Fluorene	<0.05	<0.05	<0.05	<0.05	340
Indeno(1,2,3-cd)pyrene	0.12	0.10	<0.05	0.14	12
Naphthalene	<0.05	<0.05	<0.05	<0.05	4.6
Phenanthrene	0.11	0.09	0.07	0.18	40
Pyrene	0.24	0.18	0.06	0.28	250

Notes:

a Ontario Ministry of the Environment=s (MOE*) Guideline for use at Contaminated Sites in Ontario*(revised February,1997) Table A criteria for residential/parkland land use in a potable groundwater condition with medium and fine textured soils.

TABLE 3.3

SOIL ANALYTICAL RESULTS AND COMPARATIVE CRITERIA

(Samples Collected in January 2001 at 0 to 5 cm Depth)

POLYCHLORINATED BIPHENYLS - PCBs

(ug/g or ppm except as noted)

Port Colborne, Ontario

PARAMETER	SOIL 5-1	SOIL 7-1	SOIL 10-1	SOIL 11-1	MOE TABLE A
Total PCBs	< 0.05	< 0.05	< 0.05	0.13	5.0

Notes:

a Ontario Ministry of the Environment=s (MOE*) Guideline for use at Contaminated Sites in Ontario* (revised February, 1997) Table A criteria for residential/parkland land use in a potable groundwater condition with medium and fine textured soils.

3.1.2 Inorganic Parameters - Metals

Concentrations of selected metal parameters, where measured, did not exceed the applicable MOE Table A Generic Guidelines (MOE, 1997) with the following exceptions:

Concentrations of lead exceeded the MOE Table A Generic Guideline (MOE, 1997) (200 ppm) in localized areas at sampling location Sites 6 and 11 by factors of 1.1 and 1.3 times respectively. It should be noted that Site 6 is located about 4.2 km northeast of the Inco Refinery and Site 11 is located about 1.1 km north of the Inco Refinery.

Concentrations of nickel exceeded the MOE Table A Generic Guideline (MOE, 1997) of 200 ppm at sampling location Sites 2, 4, 6, 11 and 12 by factors of 1.4, 3.9, 1.6, 3.4 and 2.5 times respectively.

TABLE 3.4
SOIL ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES
(Samples Collected in January 2001 at 0 to 5 cm Depth)
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
Port Colborne, Ontario

Parameter	SOIL 2-1	SOIL 4-1	SOIL 5-1	SOIL 6-1	SOIL 8-1	MOE TABLE A CRITERIA [a]
Mercury	0.05 (0.07)	0.09 (0.07)	0.06 (0.05)	0.09 (0.09)	0.04 (0.04)	10
Antimony	<0.2 (0.2)	0.2 (<0.2)	<0.2 (<0.2)	<0.2 (<0.2)	0.3 (<0.2)	13
Arsenic	4.4 (6.5)	7.1 (6.6)	7.5 (2.8)	0.5 (4.3)	8.6 (8.3)	25
Bismuth	<0.2 (<0.2)	0.4 (<0.2)	<0.2 (<0.2)	<0.2 (<0.2)	<0.2 (<0.2)	NV
Selenium	0.5 (0.9)	1.5 (1.2)	0.3 (0.3)	0.8 (1.1)	0.4 (0.5)	10
Aluminum	5190 (7480)	16900	10600	4760 (6540)	12900	NV
Barium	46 (59.1)	133 (117)	75 (71.5)	57 (72.8)	69 (64.4)	1000
Beryllium	0.2 (0.4)	0.8 (0.8)	0.5 (0.7)	<0.2 (0.3)	0.5 (0.6)	1.2
Boron	<0.2 (0.6)	0.8 **(1.9)**	0.2 (0.5)	0.3 (1.0)	<0.2 (0.2)	1.5
Cadmium	<0.5 (0.5)	0.9 (0.6)	0.6 (0.4)	<0.5 (0.4)	<0.5 (0.4)	12
Chromium	10 (12)	23 (19.6)	16 (15.7)	8.0 (10.1)	19 (18.8)	1000
Cobalt	8.0 (11.2)	23 (17.8)	7.0 (5.9)	8.0 (11.1)	9.0 (9.1)	50
Copper	44 (57.8)	105 (86.7)	25 (21.2)	44 (57.9)	37 (35.2)	300
Iron	11900	19400	12500	8170 (11800)	16900	NV
Lead	26 (37.3)	32 (32.5)	19 (17.2)	**222 (304)**	29 (31.9)	200
Manganese	286 (378)	221 (194)	235 (227)	145 (182)	422 (374)	NV
Molybdenum	<3.0 (<3.0)	<3.0 (<3.0)	<3.0 (<3.0)	<3.0 (<3.0)	<3.0 (<3.0)	40
Nickel	**289 (428)**	**778 (693)**	27 (20.2)	**321 (470)**	185 (189)	200
Phosphorous	1060 (1230)	917 (805)	913 (841)	777 (1030)	1200 (964)	NV
Silver	<1.0 (<0.8)	<1.0 (<0.8)	<1.0 (<0.8)	<1.0 (<0.8)	<1.0 (<0.8)	25
Titanium	140 (154)	35 (5.9)	77 (27.9)	90 (93.1)	90 (23.4)	NV
Vanadium	20 (30.3)	30 (25.4)	23 (22.1)	13 (20.1)	26 (24.2)	250
Zinc	71 (90.2)	125 (111)	63 (57.7)	98 (125)	64 (63.6)	800
Sulphur	600 (640)	880 (600)	760 (640)	420 (600)	760 (480)	NV
PH (Unitless)	6.65 (NA)	6.00 (NA)	6.94 (NA)	7.14 (NA)	6.63 (NA)	5-9 (Unitless)

Notes:

a Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

The result in the parenthesis indicates analytical resulted conducted in January 2001 without matrix spike.

TABLE 3.4 (Continued)
SOIL ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES
(Samples Collected in January 2001 at 0 to 5 cm Depth)
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
Port Colborne, Ontario

Parameter	SOIL 9-1	SOIL 10-1	SOIL 11-1	SOIL 12-1	SOIL 13-1	MOE TABLE A CRITERIA [a]
Mercury	0.04 (0.03)	0.06 (0.04)	0.11 (0.11)	0.06 (0.05)	0.04 (0.04)	10
Antimony	<0.2 (<0.2)	0.2 (<0.2)	3.6 (2.1)	0.2 (0.2)	<0.2 (2.1)	13
Arsenic	3.2 (2.9)	2.8 (3.1)	8.7 (9.3)	5.1 (4.8)	2.4 (2.1)	25
Bismuth	<0.2 (<0.2)	<0.2 (<0.2)	0.3 (<0.2)	0.2 (<0.2)	<0.2 (<0.2)	NV
Selenium	0.3 (<0.2)	0.2 (0.3)	1.1 (1.3)	0.8 (0.7)	0.2 (<0.2)	10
Aluminum	12800 (12500)	8700 (10300)	7420 (10600)	14500 (14100)	9700 (8920)	NV
Barium	69 (60.3)	82 (89.2)	127 (184)	107 (98.2)	41 (37.6)	1000
Beryllium	0.5 (0.5)	0.3 (0.5)	0.3 (0.6)	0.6 (0.7)	0.6 (0.3)	1.2
Boron	<0.2 (0.2)	<0.2 (0.3)	0.3 (0.4)	0.3 (0.5)	0.2 (0.3)	1.5
Cadmium	<0.5 (<0.3)	<0.5 (0.3)	0.7 (1.0)	<0.5 (0.3)	<0.5 (<0.3)	12
Chromium	16 (15)	16 (14.9)	36 (119)	21 (16.6)	13 (11.5)	1000
Cobalt	8.0 (7.7)	8.0 (9.4)	19 (26.1)	19 (20.5)	4.0 (3.1)	50
Copper	27 (24.4)	43 (44.5)	106 (124)	70 (72)	11 (10.7)	300
Iron	18300 (15600)	13300 (15100)	14000 (19000)	25100 (23100)	11100 (10700)	NV
Lead	21 (20.3)	16 (22.2)	**256 (810)**	34 (34)	13 (13.4)	200
Manganese	287 (268)	388 (438)	310 (407)	440 (437)	166 (169)	NV
Molybdenum	<3.0 (<3.0)	<3.0 (<3.0)	<3.0 (6.7)	<3.0 (<3.0)	<3.0 (<3.0)	40
Nickel	120 (119)	102 (122)	**674 (850)**	**493 (470)**	15 (11.9)	200
Phosphorous	909 (856)	1660 (1530)	1080 (1160)	1260 (1170)	736 (753)	NV
Silver	<1.0 (<0.8)	<1.0 (<0.8)	<1.0 (<0.8)	<1.0 (<0.8)	<1.0 (<0.8)	25
Titanium	106 (66.5)	81 (45.5)	103 (111)	99 (25)	42 (14.4)	NV
Vanadium	26 (23.1)	19 (20.1)	19 (25.2)	30 (26.2)	20 (16)	250
Zinc	59 (66.4)	75 (81.7)	307 (536)	99 (94.6)	45 (37.3)	800
Sulphur	480 (400)	800 (400)	760 (680)	800 (680)	600 (530)	NV
PH (Units)	7.18 (NA)	7.04 (NA)	7.52 (NA)	6.84 (NA)	7.04 (NA)	5-9 (Units)

Notes:

a Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

The result in the parenthesis indicates analytical resulted conducted in January 2001 without matrix spike.

3.1.3 Inorganic Parameters - Anions

Concentrations of inorganic parameters such as chloride and sulphate ranged from 8.7 ppm to 216 ppm and from 20 ppm to 423 ppm respectively. A review of these concentrations plotted on a sample location map indicates that the higher concentrations of chlorides and sulphates are associated with the urban areas suggesting input from winter road salting activities. There are no MOE Table A Generic Guidelines (MOE, 1997) for either chloride or sulphate in soils.

TABLE 3.5

SOIL ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES

(Samples Collected in January 2001 at 0 to 5 cm Depth)

(Selected Anions)

(mg/kg or ppm except as noted)

Port Colborne, Ontario

Parameter	SOIL 2-1	SOIL 4-1	SOIL 5-1	SOIL 6-1	SOIL 8-1	MOE TABLE A CRITERIA [a]
Chloride	9.5	14.8	20.8	11.5	24	NV
Sulphate	20.2	23	14.1	11.5	29.2	NV

Parameter	SOIL 9-1	SOIL 10-1	SOIL 11-1	SOIL 12-1	SOIL 13-1	MOE TABLE A CRITERIA [a]
Chloride	4.0	42.9	56.2	116	80.5	NV
Sulphate	7.6	16.7	46.8	69.3	10.5	NV

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

3.2 ANALYSES OF MOE-ARCHIVED SURFACE SOILS

The laboratory analytical results for the submitted 149 MOE archived soil samples together with respective land use and the comparative MOE Table A Generic Guidelines (MOE, 1997) are summarized in Table 1 provided in Appendix F. The laboratory certificates are provided in Appendix F. MOE Table A Generic Guidelines (MOE, 1997) for soils of residential land use is 25 ppm for arsenic and 10 ppm for selenium. MOE Table A Generic Guideline (MOE, 1997) for soils of agricultural land use is 2 ppm for selenium.

Based on the chemical test results, concentrations of arsenic and selenium, where measured, did not exceed the comparative MOE Table A Generic Guidelines (MOE, 1997) for properties sampled on either residential/parkland or agricultural lands.

3.3 QUALITY ASSURANCE AND QUALITY CONTROL

Laboratory QA/QC

To assure the QA/QC, Philip also analyzed matrix spiked samples and a process blank for each batch of samples. The QA/QC page of the Laboratory Certificate of Analyses (Appendix E) contains matrix spiked samples ID, process blank, process % recovery, matrix spike recovery information and statement regarding overall acceptability of the QC program. The certificate of analysis also includes statement regarding analysis performed, methodology, method number and instrument used in the analysis. In addition, the laboratory certificates also include information regarding any re-digestion required because of sample concentrations and respective, matrix spike and recovery data.

For metal analyses, the acceptable laboratory variation is 30% of the matrix spike (SRM).

Based on the chemical test results as shown in Table 3.4, no apparent significant differences were observed in data with samples without SRM and those with SRM.

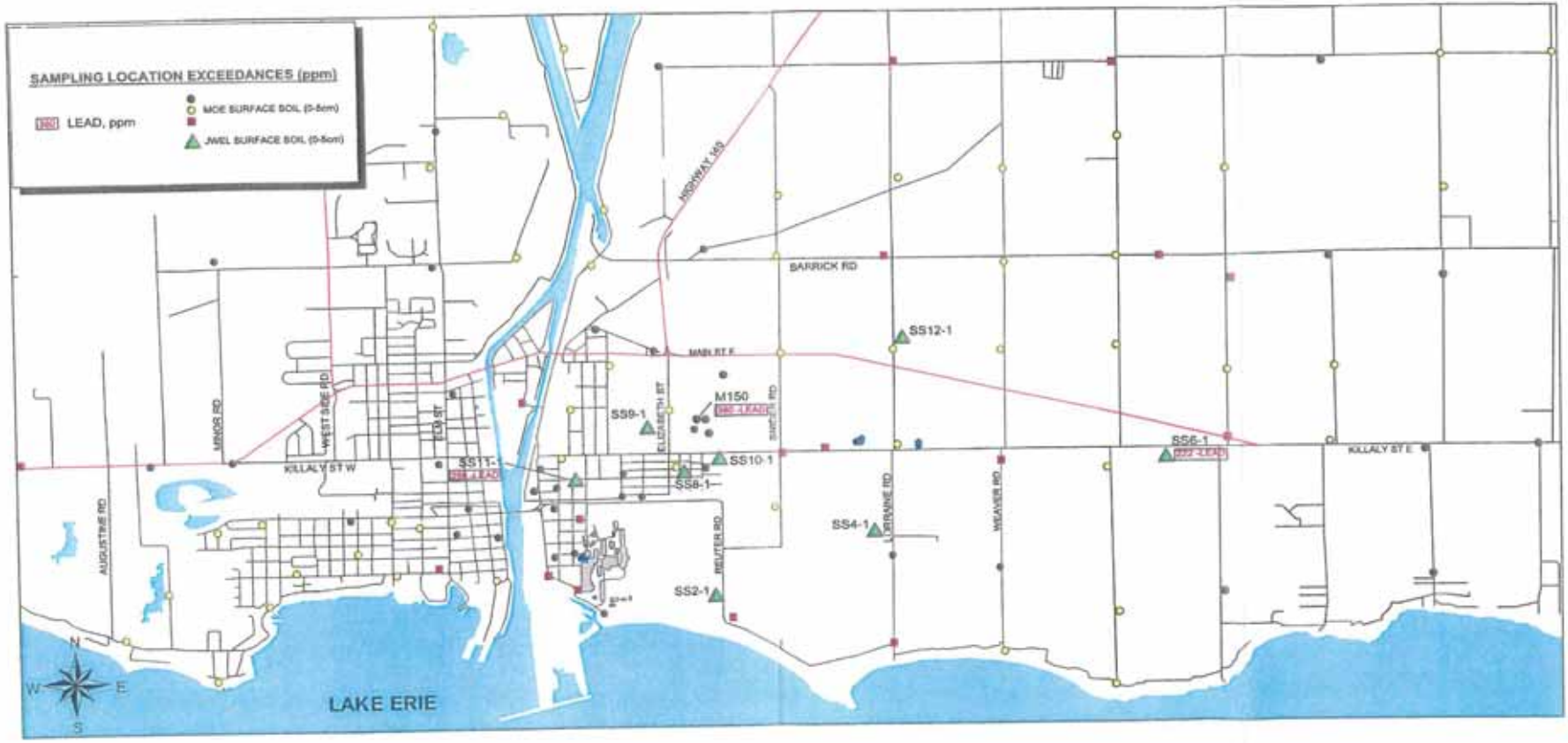
No significant variations were noted amongst the analytes between one original sample and its replicate sample (SS2-1). The replicate sample was within the typical laboratory variance of 30 percent.

3.4 AREAS OF IDENTIFIED SOIL CONTAMINATION IN COMMUNITY

On a community wide basis in Port Colborne, nickel, copper and cobalt were found to be the most prevalent chemicals in soil with concentrations greater than the MOE Table A Guideline criteria in areas east of the Welland Canal, based on evidence provided from the compilation of the JWL surface soils data and the MOE surface soils data (including both the original 1998 and the 1999 data sets (MOE, 2000a,b) and the additional data set from analyses of the archived samples). Soil concentration distribution maps for nickel, copper and cobalt are shown in Appendix A.

Lead was found to be present in soils in several localized areas at concentrations marginally above the MOE Table A Generic Guidelines (MOE, 1997). Localized exceedances of lead concentrations in soil were found at two JWL locations and also at one MOE location, representing only 3 exceedances out of 233 sample points analyzed in Port Colborne. Drawing 3 shows these three localized areas of lead concentration in soil exceeding the respective MOE Table A Generic Guidelines (MOE, 1997).

No exceedances of organic parameters, such as PCBs, volatile organic compounds or polyaromatic hydrocarbons were found above the MOE Table A Generic Guidelines (MOE, 1997).



NOTE: TWO CONTROL SAMPLES SS5 AND SS13 WERE COLLECTED FROM WAINFLEET AND WELLAND AREA ABOUT 8 Km WEST AND 13 Km NORTH OF THE INCO REFINERY

0 1000 2000 3000m

SCALE 1:40000

MAPPED EXCEEDANCES OF MOE TABLE A GENERIC GUIDELINES FOR METALS (EXCLUDING NICKEL, COPPER, AND COBALT) IN SOILS FROM OPEN SPACES IN PORT COLBORNE, ONTARIO BASED ON JWEL AND MOE 1998 AND 1999 SURFACE SOIL DATA (0 TO 5cm)

Job No.:	Dwg. No.:	
ONT34645	3	
Date: 01/11/14	Dwn. by: BJC	Appd.: MA

Jacques Whitford

4.0 RESULTS OF SURFACE AND SUBSURFACE SOILS INVESTIGATION AT INCO, ALGOMA AND RESIDENTIAL NEIGHBOURHOOD OF RODNEY STREET

4.1 FIELD OBSERVATIONS OF TEST PITS

Subsurface conditions were logged at the time of excavation. The test pit logs are appended in Appendix G. The following observations were made during test pit excavation:

4.1.1 Subsurface Conditions at former Steel Plant

As shown in Appendix G, TP12 showed occurrences of very hard slag.

At TP13 and TP14, fill was encountered to a depth of 1.0 m below grade. The fill comprised of waste rock fragments, slag, coal pieces and even deposits of iron pellets and iron shot balls abandoned from the former steel plant operation.

4.1.2 Subsurface Conditions in Rodney Street Community

At TP8, TP9, TP10 and TP17, about 0.06 m (TP8) to 0.10 m (TP10 and TP17) of topsoil was encountered overlying fill materials. The fill thickness in this area ranged from 0.12 m (TP17) to 0.37 m (TP9).

Pieces of slag and brick fragments were encountered in the fill.

At TP8 and TP17, about 0.69 m and 0.18 m of peat deposit was encountered underlying the fill.

In TP9, TP10 and TP17, native beach sand deposit was encountered underlying fill and organic deposits indicating near shore deposits with low-lying peat bogs.

4.1.3 Subsurface Conditions at Inco Property

Test pits located along the northeastern part of the Inco refinery (TP2 and TP7) and those along TP5 and TP6 encountered 0.12 to 0.18 m of topsoil overlying native clay deposit.

At TP3, about 0.09 m of reworked clay with organics and rootlets from previous ploughing was encountered beneath the topsoil overlying native clay deposit. The presence of reworked native clay at TP3 is indicative of past agricultural/tilling activities in the northeast corner of Inco property.

At TP1, about 0.47 m of fill was encountered overlying buried topsoil (about 0.05 m) and native clay deposit (0.45 m thick) over limestone bedrock at a depth of 0.95 m below grade.

At TP4, excavated along the right of way of Davis Street and Louis Street intersection, 0.51 m of fill was encountered.

At TP16, one (1.0) meter of industrial fill material was encountered suggesting the area to be part of the former Inco landfill area.

It is apparent from the above soil descriptions that fill material containing pieces of slag was found only in the Rodney Street neighbourhood and the former steel plant property. No fill material was placed northeast of the Inco Refinery beyond their landfill area (ie., northeast of testpit TP16).

4.2 CHEMICAL RESULTS

The following sub-sections describe the chemical results on the collected samples of remnant slag, iron ore waste rock, iron pellets and iron shot balls from the test pits on the former steel plant property, and of soil samples from all of the 17 test pits.

4.2.1 Former Steel Plant Remnant Slag

Table 4.1 show chemical data on slag collected from test pit TP12 excavated in the southern part of the former steel plant.

As shown in Table 4.1, the slag contains relatively high concentration of beryllium exceeding the MOE Table A generic guideline by 5 to 6 times respectively. This confirms part of the MOE data interpretation of their Rodney Street investigation (MOE, 2001c) in that the measured exceedances of beryllium in soil were related to imported fill material containing slag from the former steel plant.

It should also be noted in Table 4.1 that selenium concentrations ranged from 7.5 to 9.1 ppm (MOE Table A guideline for selenium is 10 ppm) and that the pH levels are high varying from 9.0 to 10.5 exceeding the MOE upper limit for soils at pH 9.0.

4.2.2 Former Steel Plant Remnant Waste Rock and Other Materials

Table 4.2 show chemical test data for material samples such as the abandoned iron ore waste rock, iron pellets and iron shot balls collected from test pit TP14. As shown in Table 4.2, the iron pellets and waste rock contain high concentrations of iron (25% and 41%). In addition, the waste rock contains 24 and 29.9 ppm of arsenic and 0.9 and 1.6 ppm of beryllium. The MOE Table A Generic Guidelines for arsenic in soil is 25 ppm and beryllium in soil is 1.2 ppm.

It is apparent from the chemical test results that the waste rock generated from the iron ore used by former steel plant had concentrations of arsenic and beryllium that exceed the present day MOE Table A Generic Guidelines.

4.2.3 Soil

The surface and subsurface soil chemical results for test pits TP1 through TP17 were tabulated and provided in Appendix H together with laboratory certificates of chemical analyses. The chemical results for surficial soil samples taken from test pits TPA, TPC, TPD and TPE were tabulated and provided in Table 18 of Appendix H together with the laboratory certificates of chemical analyses. The results have been mapped and the findings are discussed in Sections 4.4 to 4.6.

TABLE 4.1
DATA ON SLAG FROM FORMER STEEL PLANT
Samples Collected in August 2001
(Selected Metal Parameters)
(mg/kg or ppm except as noted)

Parameter	TP12 (0 to 2.5 cm depth)	TP12 (2.5 to 5 cm depth)	TP12 (5 to 10 cm depth)	MOE TABLE A CRITERIA [a]
Antimony	0.9	0.3	0.2	13
Arsenic	15.2	5.9	4.9	25
Selenium	7.5	9.1	9.1	10
Aluminum	42100	41200	36600	NV
Barium	691	201	160	1000
Beryllium	**6.1**	**7.5**	**7.4**	1.2
Cadmium	1.6	1.0	1.0	12
Chromium	39	23	21	1000
Cobalt	7.0	3.0	<2.0	50
Copper	73	27	20	300
Iron	73100	30300	18300	NV
Lead	11	<5.0	<5.0	200
Manganese	3980	3480	2960	NV
Molybdenum	6.0	<3.0	<3.0	40
Nickel	77	33	22	200
Phosphorous	804	271	226	NV
Silver	<1.0	1.0	2.0	25
Titanium	885	864	841	NV
Vanadium	13	7.0	6.0	250
Zinc	153	42	21	800
PH (Unitless)	9.0	**10.3**	**10.5**	5-9 (Unitless)

Notes:

a -Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 4.2

DATA ON REMNANT MATERIALS FROM FORMER STEEL PLANT

Samples Collected in August 2001

(Selected Metal Parameters)

(mg/kg or ppm except as noted)

Parameter	Iron Shot Balls	Iron Pellets	Waste Rock	Waste Rock	MOE TABLE A
Antimony	1.5	N/A	N/A	0.9	13
Arsenic	2.7	12.9	**29.9**	24	25
Selenium	<0.2	<0.2	1.0	1.1	10
Aluminum	786	1200	10800	8000	NV
Barium	7.0	8.0	84	71	1000
Beryllium	<0.2	<0.2	**1.6**	0.9	1.2
Cadmium	0.7	<0.5	<0.5	3.4	12
Chromium	24	87	48	15	1000
Cobalt	<2.0	<2.0	<2.0	<2.0	50
Copper	14	10	22	24	300
Iron	108000	254000	412000	313000	NV
Lead	<5.0	<5.0	<5.0	<5.0	200
Manganese	188	1090	1820	1920	NV
Molybdenum	<3.0	8.0	9.0	5.0	40
Nickel	32	32	31	34	200
Phosphorous	147	226	338	457	NV
Silver	<1.0	<1.0	<1.0	<1.0	25
Titanium	82	223	241	385	NV
Vanadium	9.0	15	26	22	250
Zinc	29	14	<5.0	9.0	800
PH (Unitless)	8.63	8.84	**9.65**	7.83	5-9 (Unitless)

Notes:

a -Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

4.3 QUALITY CONTROL/QUALITY ASSURANCE

4.3.1 Laboratory QA/QC

The QA/QC page of the Laboratory Certificate of Analyses (Appendix H) contains matrix spiked samples ID, process blank, process % recovery, matrix spike recovery information and statement regarding overall acceptability of the QC program. For metal analyses, the acceptable laboratory variation is 30% of the matrix spike (SRM).

4.3.2 Field QA/QC

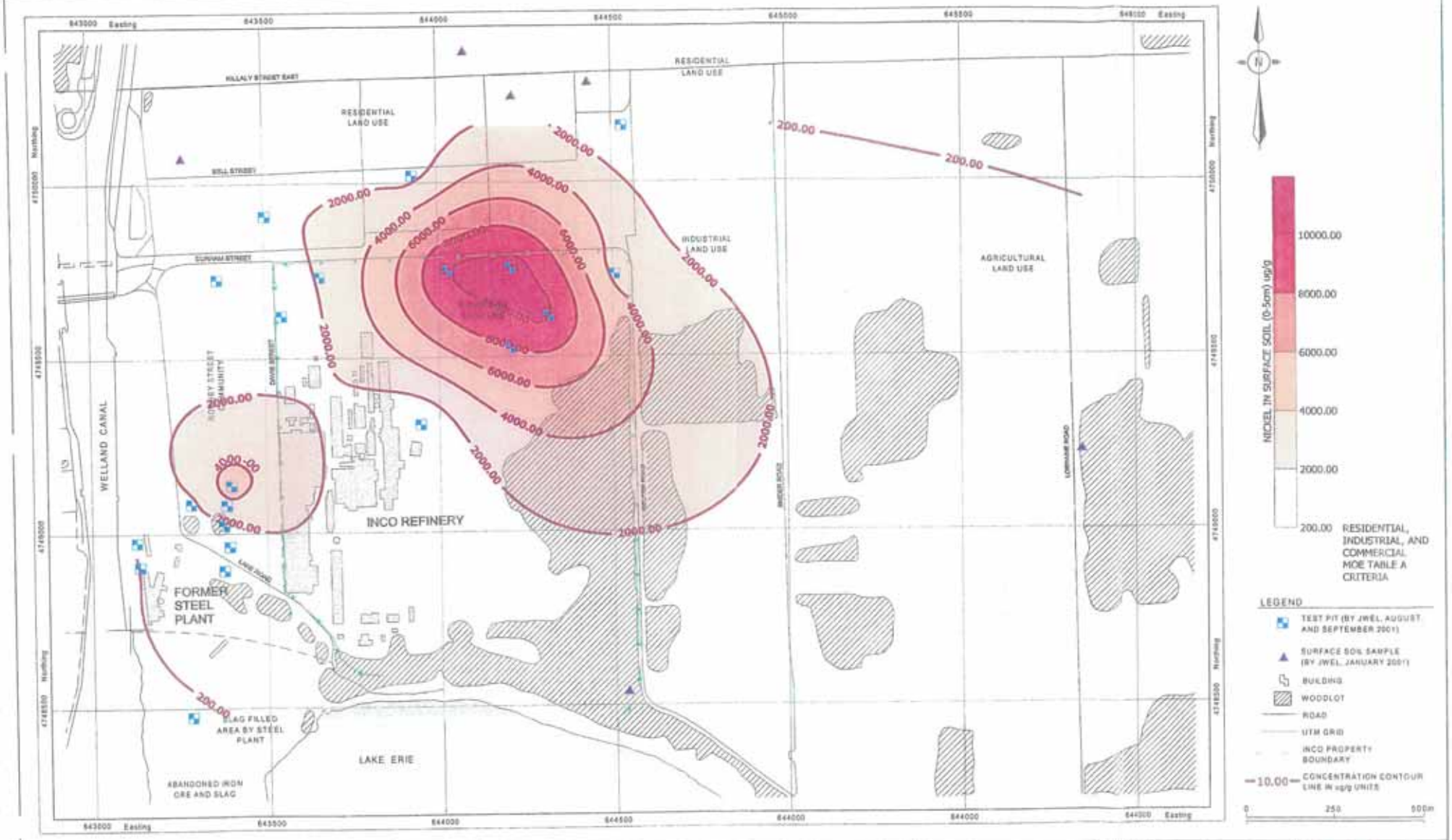
Percentage differences were calculated on chemical data of the seventeen (17) soil samples between original samples and duplicate samples according to the equation given in JWL's July 9, 2001 protocol entitled 'Sampling and Analysis: Quality Assurance and Quality Control' as appended in Appendix C.

Table 1 in Appendix I show chemical test results and calculated percentage differences for original samples and duplicate samples. A difference of 30 percent is the normal control limit. Based on the chemical test results as shown in Table 1 in Appendix I, no significant variations were noted amongst the analytes between original samples and their duplicates. Two hundred eighty one (281) out of 357 duplicate chemical tests were within a variance of 30 percent.

4.4 SOIL CHEMICAL CONCENTRATION CONTOURS AROUND FORMER STEEL PLANT AND INCO REFINERY

Soil chemical test results for TP1 through TP17 together with MOE Table A comparative guideline values are provided in tables in Appendix H.

Chemical test results in surface soil (upper 5 cm) of nickel, copper, cobalt, arsenic, selenium, cadmium, iron, lead and zinc, which were metals identified to be of concern in the Rodney Street neighbourhood by the MOE (2001b,c) were plotted on Drawings 4 to 12. These plots show the spatial distribution patterns of soil chemical concentrations around the former steel plant and the former Inco refinery.

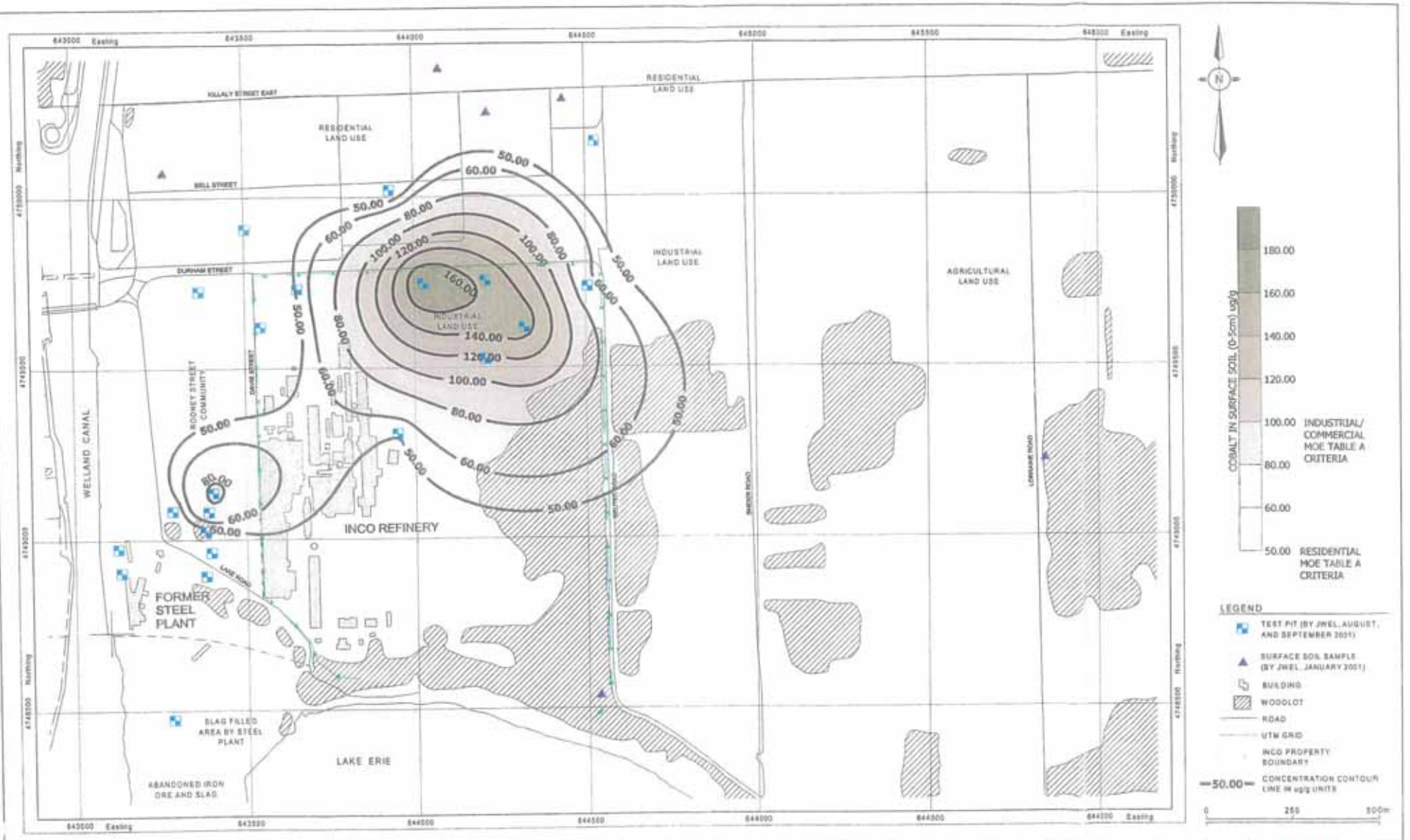


SOIL NICKEL CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg. No.:	
ONT34645	4	
Date: 01/11/14	Dwn. by: LMV	Appd.: MA

Jacques Whitford

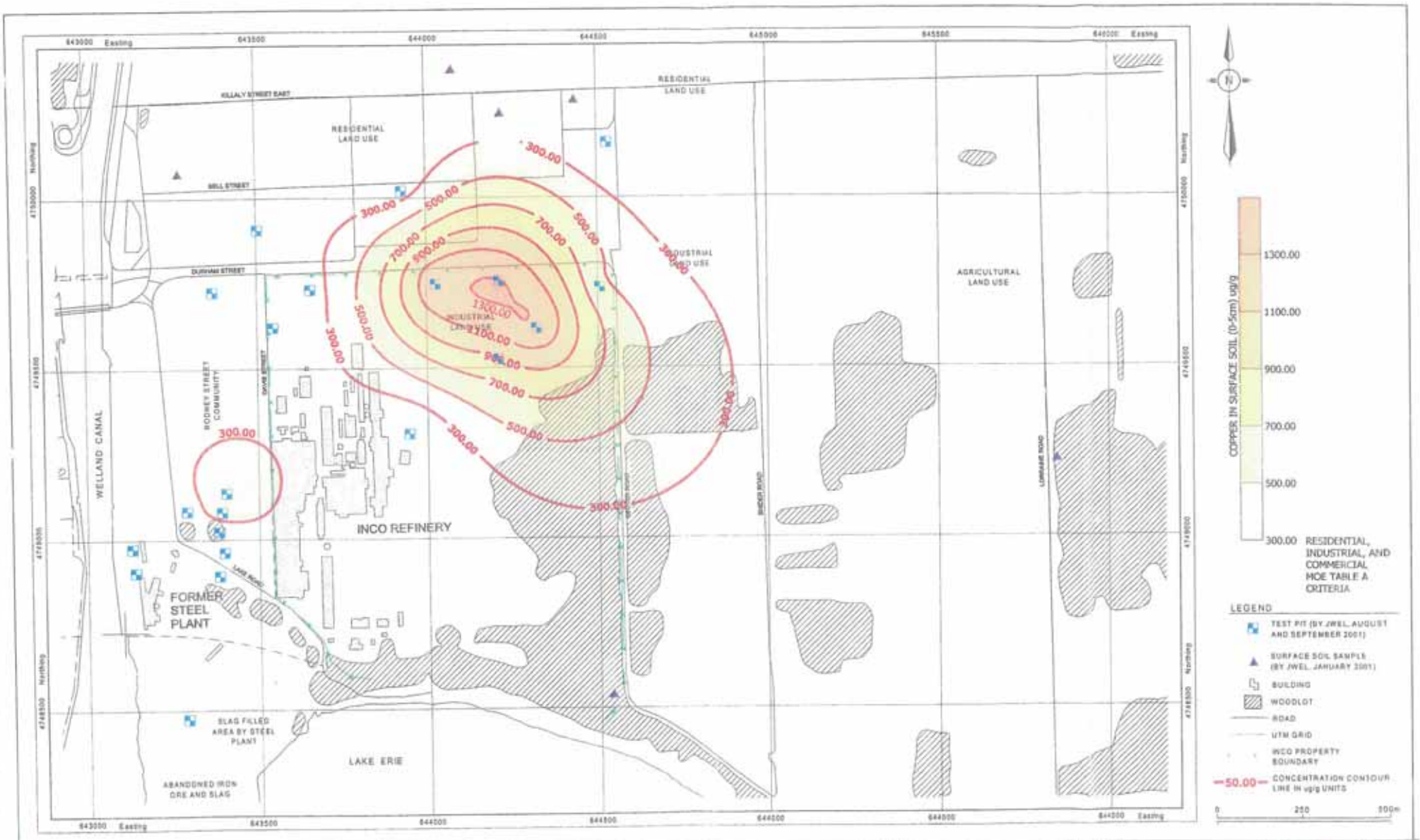


SOIL COBALT CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg. No.:	
ONT34645	5	
Date: 01/11/14	Dwn. by: LMV	Appd.: MA

Jacques Whitford



SOIL COPPER CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg. No.:	
ONT24645	6	
Date: 01/11/14	Dwn. by: LMV	Appd.: MA

Jacques Whitford

SOIL IRON CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg. No.:
ONT34645	7
Date: 01/11/14	Dwn. by: LMV
Appd.: MA	

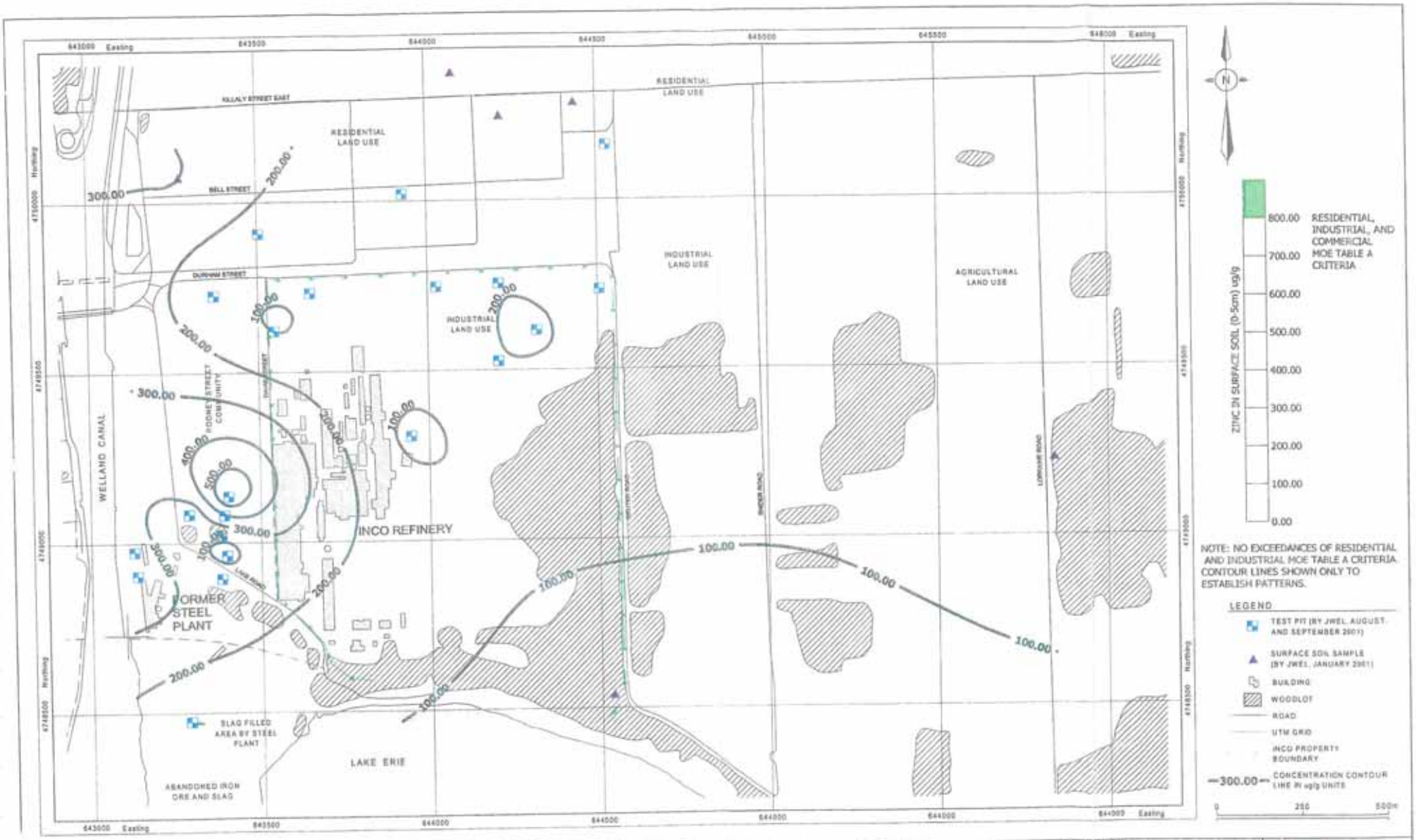
Jacques Whitford

SOIL LEAD CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg. No.:	
ONT34645	8	
Date: 01/11/14	Dwn. by: LMV	Appd.: MA

jacques Whitford



SOIL ZINC CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg. No.:	
ONT34645	9	
Date: 01/11/14	Dwn. by: LMV	Appd.: KW

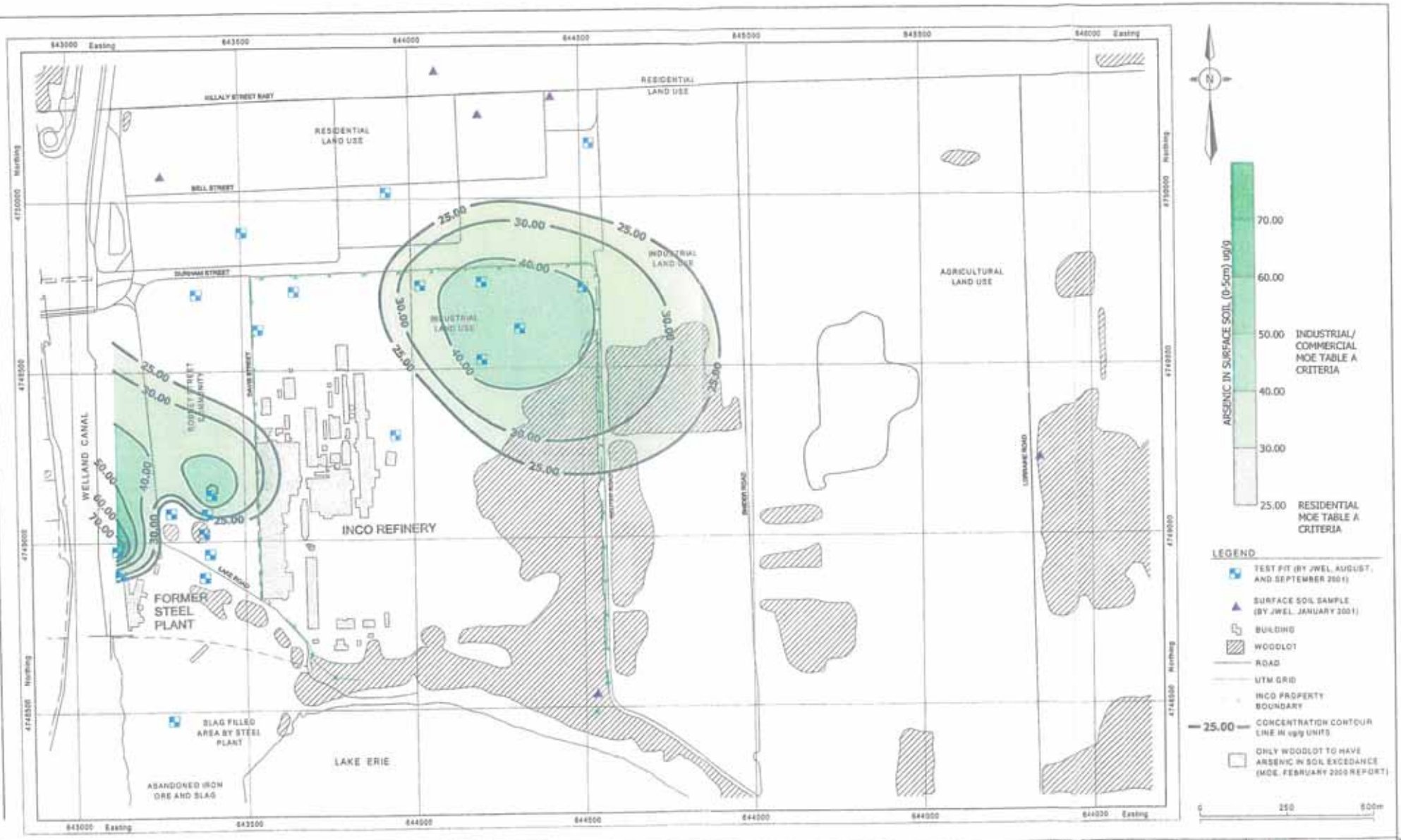
Jacques Whitford

SOIL CADMIUM CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg No.:	
ONT34645	10	
Date: 01/11/14	Dwn. by: LMV	Appd.: MA

Jacques Whitford

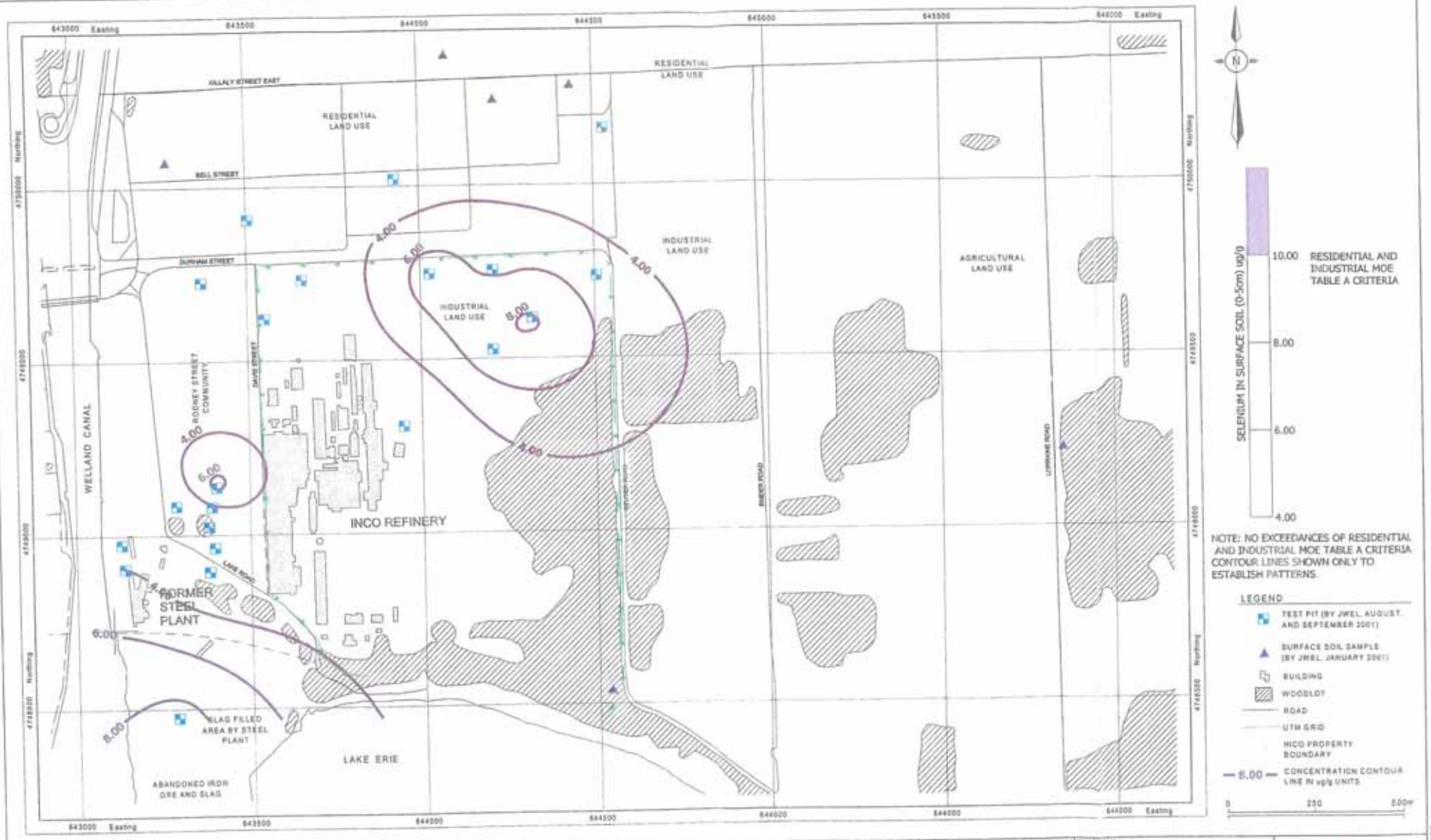


SOIL ARSENIC CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg. No.:	
ONT34645	11	
Date: 01/11/14	Dwn. by: LMV	Appd.: MA

Jacques Whitford



SOIL SELENIUM CONCENTRATION CONTOURS, 0 TO 5 cm DEPTH

EAST SIDE PORT COLBORNE COMMUNITY

Project No:	Dwg. No.:	
ONT34645	12	
Date: 01/11/14	Dwn. by: LMV	Appd.: MA

Jacques Whitford

It is apparent from the soil chemical concentration contour plots of Drawings 4 to 12 that there exists chemical-chemical associations in surface soils and that these associations appear to belong into one of three distinct groups:

Group1: Nickel Group: those soil chemicals which show similarities in contour patterns with the soil nickel concentration contour pattern. Nickel was the primary component of atmospheric fallout from the former Inco nickel refinery. Thus nickel is the primary CoC indicator for Inco as the industrial source. Chemicals that fall in this group are nickel, copper and cobalt. The chemical distribution patterns for nickel, copper and cobalt are similar to those in prior MOE investigations (MOE 2000a,b)

Group 2: Iron Group: those soil chemicals which show similarities in contour patterns with the soil iron concentration contour pattern. Iron was the primary component of atmospheric fallout from the former steel plant which used iron ore as the principal raw material. Thus iron is the primary CoC indicator for the former steel plant as the industrial source. Chemicals that fall in this group are iron, lead and zinc.

The soil concentration contour patterns for the Group 2 chemicals show an abrupt decrease in concentrations east of the Inco refinery. It is apparent that the industrial buildings located along the west face of the Inco refinery acted as a vertical barrier for any northeast airborne emission originating from the former steel plant. As the stacks of the former steel plant were 9 m to 12 m high (30 to 40 feet), most of its fallout would have been in the neighbouring Rodney Street area which is located directly in the path of prevailing northeasterly wind direction.

Group 3: Combined Nickel and Iron Group: those soil chemicals which show similarities in contour patterns with both the soil nickel and the soil iron concentration contour patterns and thus whose origins are probably from both the Inco refinery and the former steel plant. Chemicals that fall in this group are arsenic, selenium and cadmium.

4.5 SOIL CHEMICAL CONCENTRATION DEPTH PROFILES DOWNWIND OF FORMER STEEL PLANT AND INCO REFINERY

To identify the patterns in soil chemical concentrations in test pits with depth and with distance from both the Inco refinery and the former steel plant (ie. 2 industrial sources), selected soil depth profiles were plotted along northeast traverses from Inco (ie. traverse A-A' on Drawing 2) and also from the former steel plant (ie. traverse B-B' on Drawing 2). Soil concentration depth profiles of nickel, copper, cobalt, arsenic, selenium, cadmium, iron, lead, and zinc were plotted as cross sections on Drawings 13 to15. Only soils data from five (5) test pits (TP3, TP5 for traverse A-A' and TP9, TP17 and TP13 for traverse B-B') were shown on these cross sections for ease of data visualization and interpretation.

Test pit TP5 northeast of the Inco refinery is of particular importance in the interpretation of these cross sections because there was no evidence of infilling or soil disturbance within this test pit and thus a true evaluation can be made of the vertical migration of any atmospheric deposited chemical. In contrast, the test pits of TP9, TP17 and TP13 northeast of the former steel plant showed significant man-made disturbance. At TP13 on the former Algoma property, there was evidence of demolition and burial of demolition remains.

Presence of slag, similar in appearance to that found in the test pits on the former steel property, was found in fill material in test pits TP17 and TP9 located within the Rodney Street neighbourhood, indicating a source of metals other than particulate deposition from atmospheric fallout from an industrial source. Contrary to this, no slag was found in test pits TP3 and TP5 located northeast of the Inco refinery.

Similar to the findings of the soil chemical concentration contours as discussed in Section 4.4, the soil chemical concentration depth profiles of Drawings 13 to 15 show chemical-chemical association to fall into one of three distinct groups:

Group1: Nickel Group: those soil chemicals which show similarities in concentration distribution patterns with depth with the soil nickel concentration distribution pattern with depth. Nickel is the primary indicator of atmospheric fallout from the former Inco nickel refinery. Chemicals that fall in this group are nickel, copper and cobalt.

Group 2: Iron Group: those soil chemicals which show similarities in concentration distribution patterns with depth with the soil iron concentration distribution pattern with depth. Iron is the primary CoC indicator of atmospheric fallout from the former steel plant. Chemicals that fall in this group are iron, lead and zinc.

Group 3: Combined Nickel and Iron Group: those soil chemicals which show similarities in concentration distribution patterns with depth with both the soil nickel and the soil iron concentration distribution patterns with depth. Chemicals that fall in this group are arsenic, selenium and cadmium. The concentration distribution patterns with depth for soil chemicals in this group southwest of the Inco refinery follow more closely the iron concentration distribution pattern with depth (thus indicating the former steel plant as the origin of the source) whereas northeast of the Inco refinery, these patterns follow the nickel concentration distribution pattern with depth (thus indicating the Inco refinery as the origin of the source).

4.6 ORIGIN OF SOIL CHEMICALS FROM ATMOSPHERIC DEPOSITION VERSUS FROM INFILLING

To differentiate the CoCs in soils as those that resulted from infilling and those from atmospheric deposition, soil chemical concentration depth profiles were examined based on:

(1) soil descriptions in test pit logs as appended in Appendix G
(2) chemical concentration data for soils collected from test pits in Appendices H, and
(3) soil chemical concentration depth profiles from selected test pits as mapped on Drawings 13 to 15.

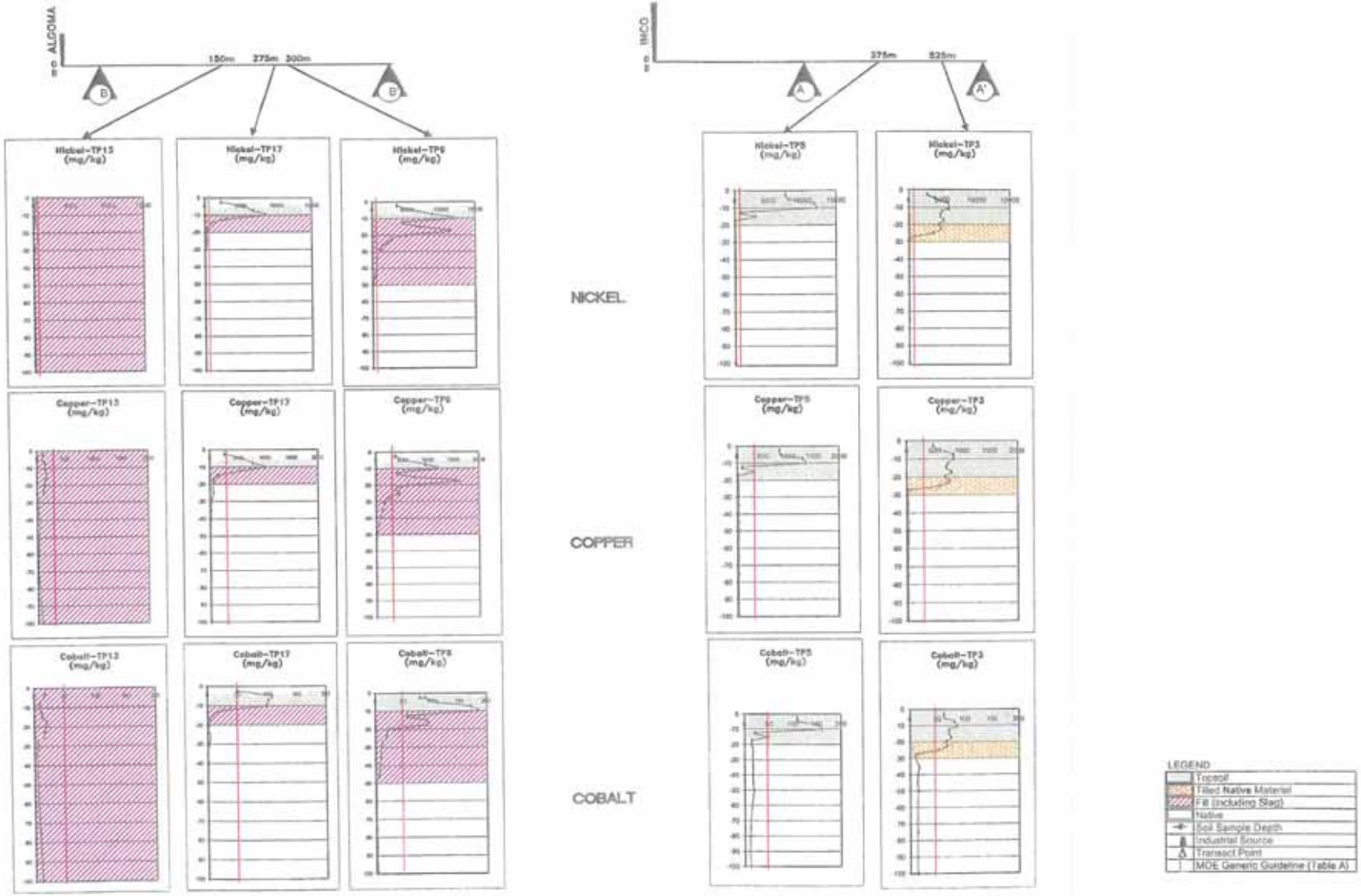
It is apparent from test pit logs appended in Appendix G that the test pits TP5, TP6 and TP7 northeast of the Inco refinery revealed no evidence of infilling or soil disturbance within these test pits and thus any collected information from soil chemical data for these test pits would be a true representation of the vertical migration of any atmospheric deposited chemical. In contrast, the test pits of TP8, TP9 and TP10 northeast of the former steel plant within the Rodney Street community showed significant man-made disturbance with depth. Presence of slag material was found in fill material in test pits TP9, TP10 and TP17 located within the Rodney Street community. Thus any collected information from soil chemical data for these test pits would be representation of not only as a result of particulate deposition from atmospheric fallout from an industrial source, but also from man-influenced infilling.

As shown on Drawings 13 to 15, the soil chemical concentration depth profiles of test pit TP9 located in Rodney Street area showed two distinctive peaks of chemical occurrence with depth, the first one within the upper 10 cm within the topsoil unit and the second one at around the 20 cm depth within the slag containing fill unit. Further evidence of this two peak signature of soil chemical occurrence with depth can also be found in test pits TP8 and TP10 (located in Rodney Street community) as shown in the soil chemical data Tables 8 and 10 in Appendix H.

Contrary to the observed two peak signature of soil chemical occurrence with depth within the Rodney Street community, test pit TP5 located within an undisturbed area on Inco property northeast of the refinery showed only a one peak signature of soil chemical occurrence with depth with the peak found in the upper 10 cm of the topsoil unit. Further evidence of this one peak signature of chemical occurrence with depth in undisturbed areas located northeast of the Inco refinery can be found for soils in test pits TP6 and TP7 as shown by the soil chemical data Tables 6 and 7 of Appendix H.

In general, soil pH measurements were found to be higher in soils northeast of the steel plant than in soils northeast of Inco. This is particularly common to fill material containing slag, most probably originating from the former steel plant.

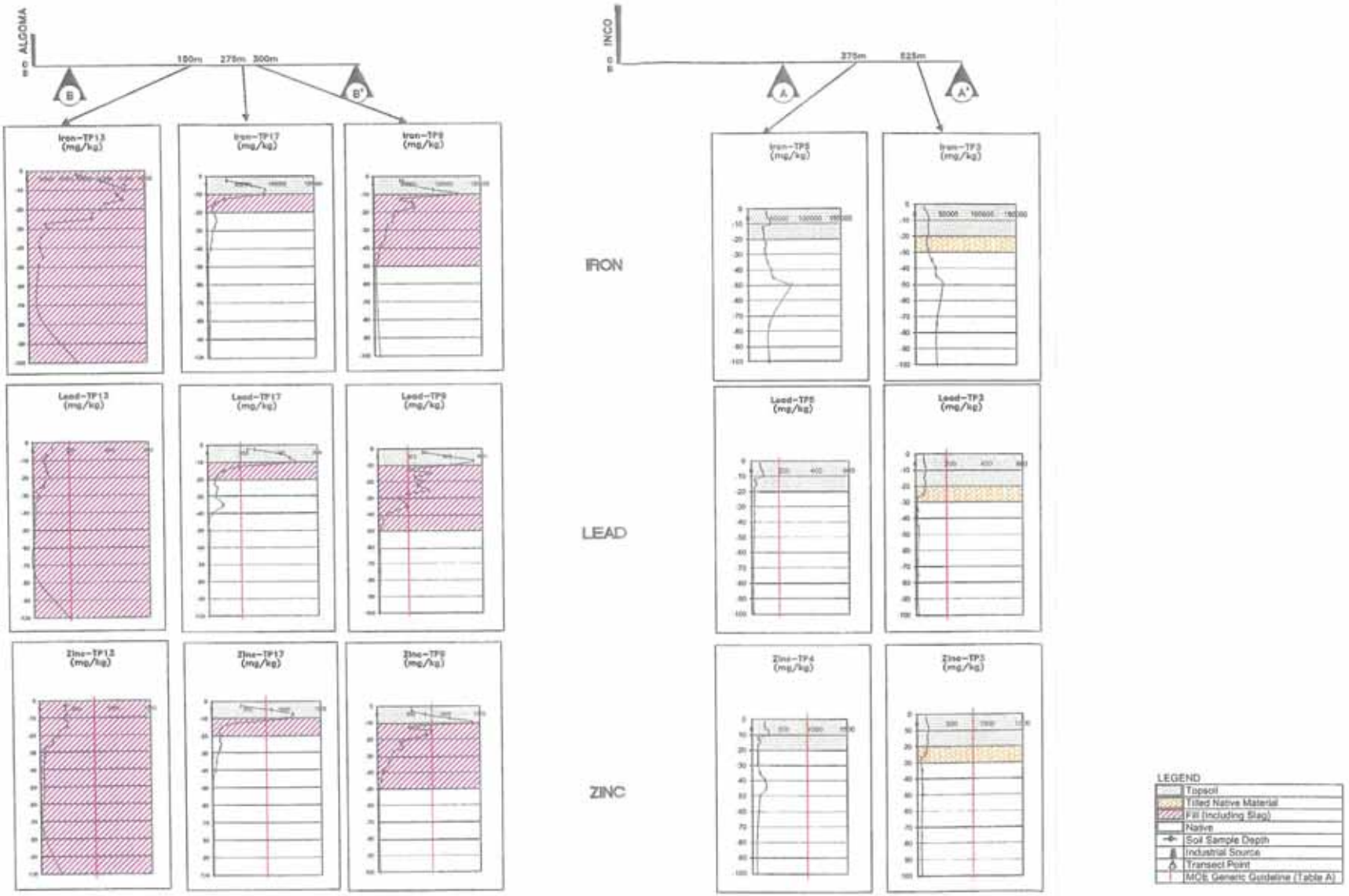
It is known in the literature that nickel oxide can dissolve over time and the geochemical processes that control its solubility are generally pH dependent. Nickel can be transported downwards with infiltrating water to depths below the zone of initial nickel oxide deposition if pore water pH values are near neutral or mildly acidic. Considering the fact that pH was found to be higher in soils of test pits northeast of the steel plant than in soils northeast of Inco, it is unlikely that the lower peak of the soil nickel concentration distribution pattern at around the 20 cm depth within the slag containing fill in test pits excavated in the Rodney Street area had resulted from solubilization of nickel oxide and downward migration of nickel to the 20 cm depth.



SOIL CHEMICAL CONCENTRATION DEPTH PROFILES ALONG TRAVERSES A-A' AND B-B' : NICKEL, COBALT AND COPPER

Job No.:	ONT34645	Dwg. No.:	13
Date:	01/11/15	Dwn. by:	LMV
Appd.:	MA		

Jacques Whitford



SOIL CHEMICAL CONCENTRATION DEPTH PROFILES ALONG TRAVERSES A-A' AND B-B' : IRON, LEAD AND ZINC

Job No.: ONT34645	Dwg. No.: 14		
Date: 01/11/15	Dwn. by: LMV	Appd.: MA	Jacques Whitford

SOIL CHEMICAL CONCENTRATION DEPTH PROFILES ALONG TRAVERSES A-A' AND B-B' : ARSENIC, CADMIUM AND SELENIUM

Job No.:	Dwg. No.:		
ONT34645	15		
Date: 01/11/15	Dwn. by: LMV	Appd.: MA	

Jacques Whitford

5.0 DISCUSSION

5.1 NICKEL, COPPER, COBALT

Nickel matte containing mainly nickel, copper and cobalt was used in Inco's refinery operation from 1917 to 1984. The observed soil chemical concentration contours and the soil chemical concentration depth profiles for nickel, copper and cobalt (Nickel Group of chemicals as discussed in this report) showed community wide exceedances above MOE Table A Generic Guidelines (MOE, 1997). Thus *nickel, copper and cobalt* satisfy Condition No.2 of the TSOW and are CoCs attributed to the Inco refinery.

5.2 IRON

During the historical sintering and smelting operations at the former steel plant from 1913 to 1977, iron ore and other raw materials were burned in the blast furnace, part of which became product, and the other parts became atmospheric particulate emissions, slag, waste rock and other waste materials. Although samples of iron ore were not found on the former steel plant property, samples of slag, waste rock, iron pellets and iron shot balls were found. Chemical analyses of these materials were found to contain iron and a large number of associated metals such as arsenic, beryllium, selenium, and zinc.

Iron and the associated Iron Group chemicals as defined earlier in this report such as lead and zinc showed soil concentration contour patterns that were high in the area of the former steel plant and then decreased abruptly east of the Inco refinery.

Based on the surficial soil concentration distribution map of iron, it was apparent that the industrial buildings located along the west face of the Inco refinery acted as a vertical barrier for air borne emissions from the former steel plant, significantly reducing travel further northeastward. Hence, most of the particulate fallout containing iron and associated chemicals was in the neighbouring Rodney Street area which is located directly in the path of the prevailing northeasterly wind direction. Travel of the atmospheric particulate emissions from the former steel plant stack further northeastward was limited due to the height of the Inco buildings.

Considering the site background history on the former steel plant and the observed soil iron concentration contours and the soil iron concentration depth profiles, it is conclusive that the occurrence of iron as well as the associated Iron Group chemicals in soils in Port Colborne east of the Welland Canal originated from the historical emissions of the former steel plant.

Therefore, iron is a CoC attributed to the former steel plant.

5.3 LEAD

Based on the soil chemical test results, regionally and not including the Rodney Street neighbourhood, lead was found to be present in soils at only two localized residences at concentrations marginally exceeding the MOE Table A Generic Guidelines (MOE, 1997).

Lead was found to exceed the MOE Table A Generic Guideline (MOE, 1997) at 143 out of 179 residences in the Rodney Street neighbourhood. A significant source of lead is believed to have originated primarily from the former steel plant based on the observed patterns of soil lead concentration contours and the soil lead concentration depth profiles which mirror those of the soil iron concentration patterns. Soil iron was considered as the indicator chemical or fingerprint of soil contamination arising from the former steel plant. Other sources of this lead are from other historical industrial sources in the area (eg. former railway operations and other activity along the Welland Canal) and from lead acid batteries, lead paint, and leaded gasoline.

Review of MOE data (MOE 2001d) collected in past thirty years in the urban area of the City of Toronto, Ontario (as shown in Tables 1 to 4, Appendix J) show significant amounts of lead in urban soils as attributed to atmospheric deposition of leaded gasoline as well as the use of leaded paints and the storage of lead acid batteries.

Therefore, lead is a CoC derived mainly from the former steel plant and other non-INCO activities. Lead is not a CBRA CoC.

5.4 ZINC

Based on the soil chemical test results, regionally and not including the Rodney Street neighbourhood, concentrations of zinc in soil samples were found to be in compliance with the MOE Table A Generic Guideline (MOE, 1997).

Zinc was found to exceed the MOE Table A Generic Guidelines (MOE, 1997) at 30 out of 179 residences in the Rodney Street community. The source of this zinc is believed to have originated from atmospheric deposition from the former steel plant based on the observed patterns of soil zinc concentration contours and the soil zinc concentration depth profiles which mirror those of the soil iron concentration patterns. Soil iron was considered as the indicator chemical or fingerprint of soil contamination arising from the former steel plant.

Therefore, zinc is a CoC derived mainly from the former steel plant.

5.5 ARSENIC

Arsenic was found to exceed the MOE Table A Generic Guideline (MOE, 1997) in soils both northeast of the former steel plant and northeast of the Inco refinery. It was apparent from the observed soil arsenic concentration contour map that the arsenic exceedances were centered around both the former steel plant and the Inco refinery.

Arsenic was evident in notable concentrations in the waste rock and slag materials found abandoned on the former steel plant.

Arsenic is a CoC for both the Inco refinery and the former steel plant.

5.6 SELENIUM

The observed soil selenium concentration contour pattern did not show any exceedances on a community wide basis above the MOE Table A Generic Guideline (MOE, 1997). Instead, selenium was found to exceed the MOE Table A Generic Guideline (MOE, 1997) at only several localized areas including one (1) residence on Rodney Street and from one (1) sample in one woodlot northeast of the Inco refinery. Localized exceedances of a chemical in soil in one part of the Port Colborne community do not warrant identification of that chemical as a CoC according to the definition of TSOW Condition 2.

Thus, selenium is not a CoC.

5.7 CADMIUM

Cadmium was found to exceed the MOE Table A Generic Guideline (MOE, 1997) but only localized in soils from two (2) residences on Rodney Street. These localized exceedances cannot be considered as community wide exceedances.

Thus, cadmium is not a CoC.

5.8 BERYLLIUM

Beryllium was found by the MOE to exceed the MOE Table A Generic Guideline (MOE, 1997) at 87 out of 179 residences in the Rodney Street community (MOE, 2001b).

Assays of the slag material excavated in a test pit at the southern part of the former steel plant showed relatively high concentrations of beryllium exceeding the MOE Table A Generic Guideline (MOE, 1997) by 5 to 6 times respectively. This confirmed part of the MOE data interpretation of their Rodney Street investigation (MOE, 2001b) in that the measured exceedances of beryllium in soil were related to imported fill material containing slag from the former steel plant.

The other part of the MOE data interpretation (MOE, 2001c) regarding the origin of the beryllium in soil was related to shale in the local area. A review of the MOE document entitled *Investigation Into The Chemical Composition of Shales in Ontario 1997* (MOE 1998) indicated that shale and sometimes the soil associated with the shale formations frequently exceed the Ontario Background soil concentrations for beryllium. Although it is limestone bedrock (Middle Devonian limestone/dolostone of the Detroit River Group, Onondaga Formation) and not shale bedrock that underlies soils in Port Colborne, nonetheless, the parent soil and glacial till material transported from other areas to this area of Port Colborne may contain weathered shale fragments elevated in beryllium.

JWL conducted a review of the natural occurrences of beryllium in bedrock and natural soil and the findings are appended in Appendix K.

Literature review of historical and current refining at Inco's refinery operation indicated that raw materials containing beryllium were not used by Inco in its processes.

Based on the above, there is strong evidence linking the occurrences of beryllium in soils with past emissions from the former steel plant and slag generated by this plant.

In summary, beryllium is a CoC derived from the former steel plant.

6.0 CONCLUSIONS

The potential CoCs for the CBRA under TSOW Condition No. 2 attributed to Inco's historical nickel refinery operations are *nickel, copper, cobalt* and *arsenic*.

The potential chemicals that can be attributed to the former steel plant's iron ore operation are iron, beryllium, zinc, arsenic, selenium, lead and cadmium. Of these, only lead, zinc, arsenic and beryllium which exceed the MOE generic effects-based guidelines would constitute as CoCs attributed to the former steel plant under TSOW Condition 2.

A significant source of lead in soil as indicated by soil data may be from the former steel plant. However there are other potential sources of lead in soil that can be attributed to non-industrialized sources such as leaded paint, leaded gasoline, and batteries.

7.0 CLOSURE

This document represents results and findings of a single component of the Community Based Risk Assessment (CBRA) that is being conducted in the City of Port Colborne. This report should not be taken out of the overall context, goals and scope of the CBRA being conducted by Jacques Whitford Limited.

We trust that the information presented herein meets your present requirements. Should you have any questions or require additional information, please do not hesitate to contact us.

Yours very truly,

JACQUES WHITFORD LIMITED

Original Signed By:

Eric Veska, Ph.D., P.Geo., C.Chem.
Principal and Project Manager

Original Signed By:

William H. Stiebel, M.Sc., P.Geo.
Principal

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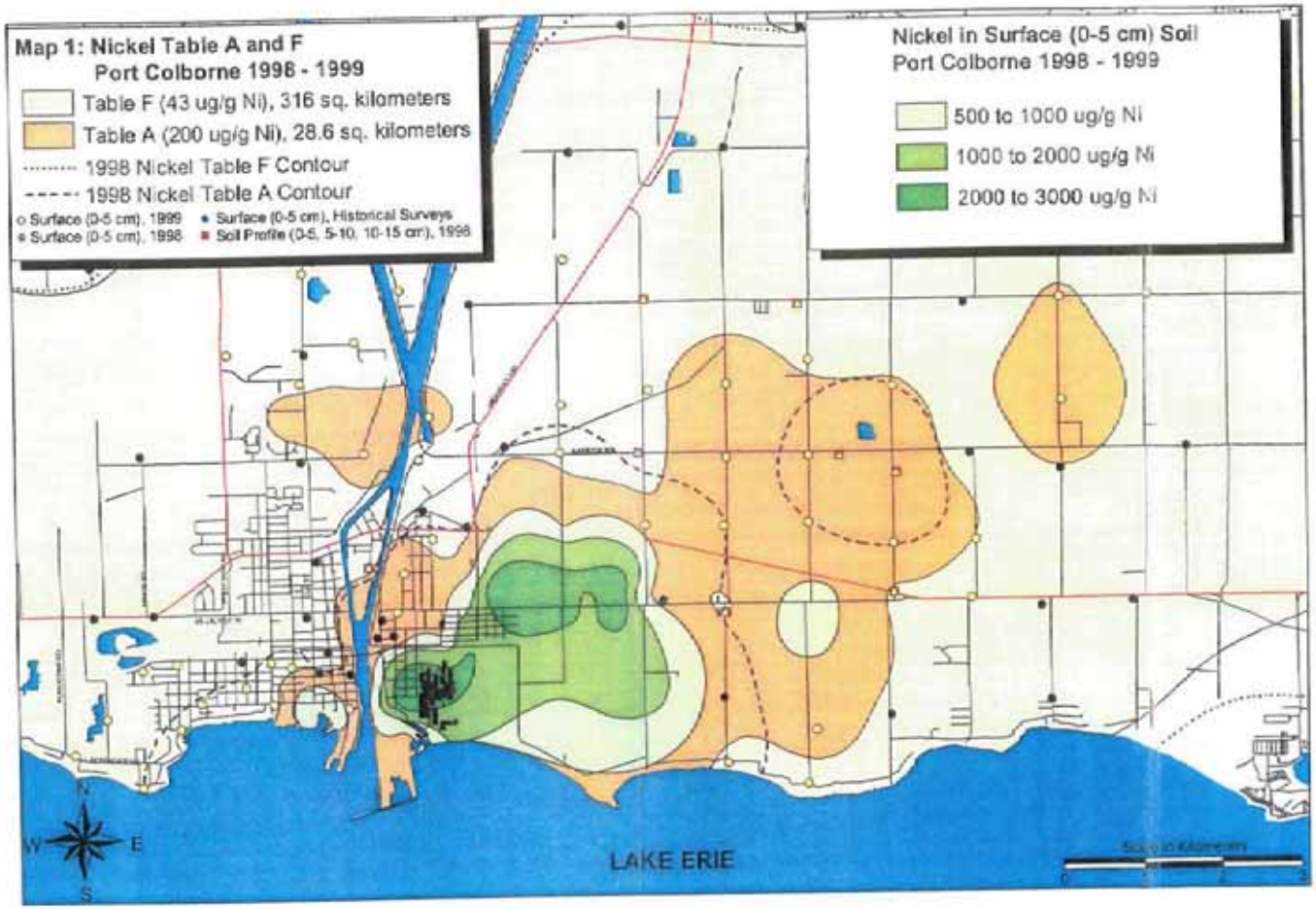
APPENDICIES

APPENDIX A

MOE - GENERATED DISTRIBUTION MAPS OF NICKEL, COBALT AND COPPER CONCENTRATIONS IN SURFACE SOIL (0-5 cm) OF

PORT COLBORNE, ONTARIO



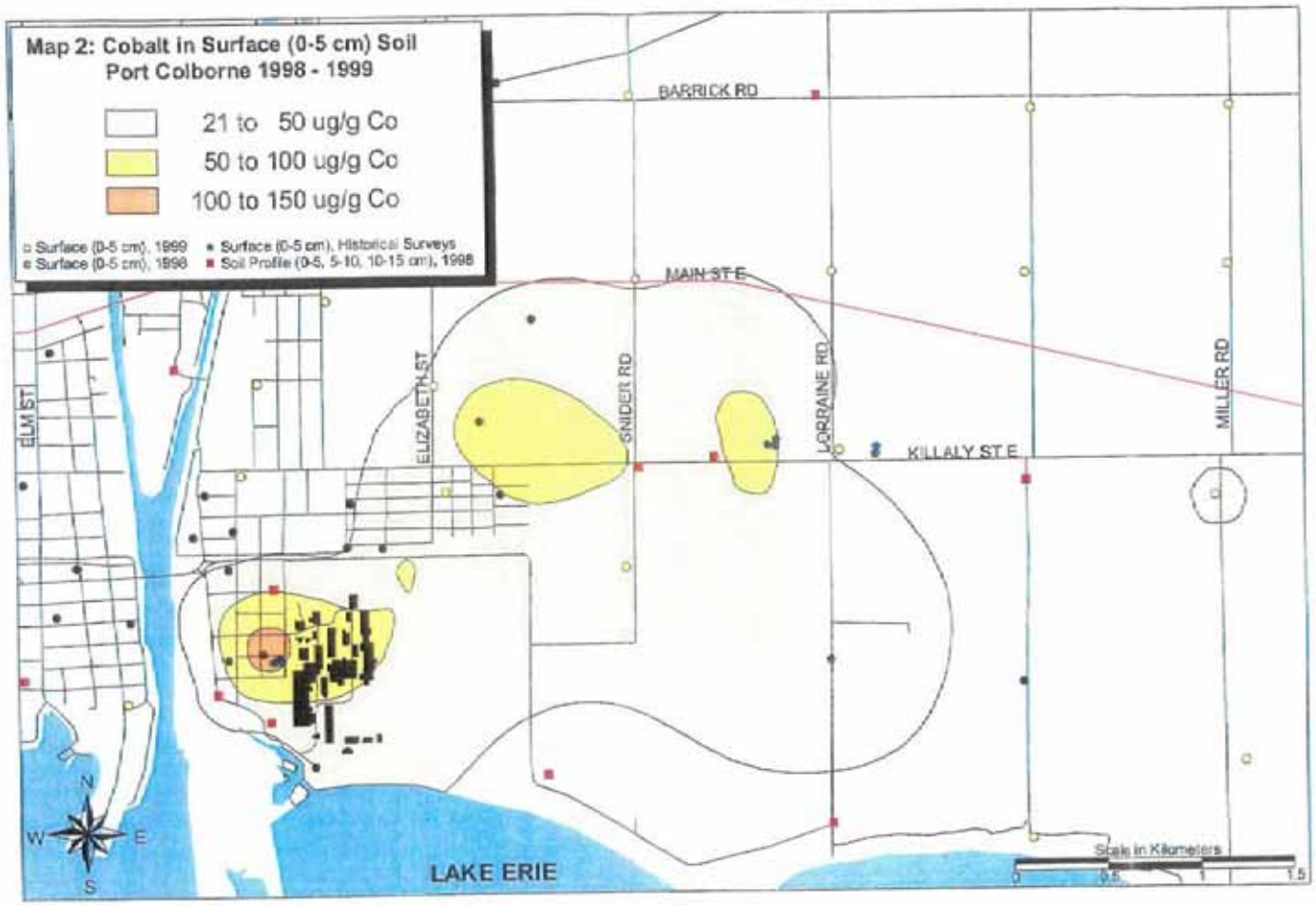
NOTE: MAP OBTAINED FROM MOE REPORT "PHYTOTOXICOLOGY TECHNICAL MEMORANDUM PHYTOTOXICOLOGY SOIL INVESTIGATION PICD-PORT COLBORNE (1999)

MOE GENERATED DISTRIBUTION MAP OF NICKEL CONCENTRATIONS IN SURFACE SOIL (0-5cm)

PORT COLBORNE, ONTARIO

Job No.:	Dwg. No.:	
ONT34546	1	
Date: 01/11/12	Dwn. by: LMV	Appd.: KW

Jacques Whitford



NOTE: MAP OBTAINED FROM MOE REPORT "PHYTOTOXICOLOGY TECHNICAL MEMORANDUM" PHYTOTOXICOLOGY SOIL INVESTIGATION INCO-PORT COLBORNE (1999)

MOE GENERATED DISTRIBUTION OF COBALT CONCENTRATIONS IN SURFACE SOIL (0-5cm)
PORT COLBORNE, ONTARIO

Job No.:	Dwg. No.:	
ONT34646	2	
Date: 01/11/12	Dwn. by: BJC	Appd.: KW

Jacques Whitford

APPENDIX B

APPENDIX B1

SITE BACKGROUND HISTORY REVIEW: EASTSIDE OF PORT COLBORNE

SITE BACKGROUND REVIEW

In order to determine potential sources of subsurface soil impact within the vicinity of Rodney Street and areas north of the Rodney Street east of the Welland Canal, JWEL conducted a detailed background review of the area. The findings are as follows:

A review of the 1876 Port Colborne, Township of Humberstone, County of Welland, Ontario map (Lincoln and Welland Atlas, 1876) as shown in Drawing 1 indicated that

- Rodney Street and surrounding areas is subdivided into lots and is undeveloped
- INCO is undeveloped and subdivided into lots
- Area where Canada Furnace was located is occupied by sand hills, further north is occupied by the Department of Public Works (engine house and wood shed)
- A drainage ditch is observed running in a north to south direction from Killaley Street along the Welland Canal then turning in a southeast direction at approximately Kinnear Street, passing through the backyard of 91 Rodney Street (formerly called Erie Street)

In addition, JWEL conducted a historical background review on properties located along the eastside of the Welland Canal north of Rodney Street (formerly Fort Erie Street), south of Durham Street and west of Fares Street. The review findings are as follows:

- A review of the 1862 Counties of Lincoln and Welland map (Tremaines Map 1862) indicated that the area located on the east side of the Welland canal north of Kinnear Street and presumably west of Welland Street were occupied by Welland Railway. At that time, the lands located immediately east of the railway yard was occupied by the Department of Public Works. Further to the east, the lands were undeveloped and divided into residential lots.
- By 1862, the Welland Railway had established operations at the Port Colborne site. Site facilities included grain, wood and coal storage (Jackson, 1978).
- By 1901, the rail service was owned by the Grand Trunk Railway. At this time, Lakeview Roller Mills operated in the central part of railway yard (west of present day Louis Street and Welland Street intersection) and an engine house, coal shed and grain elevator were in operation along the eastside of the canal (west of former Omaha Street, present day Nickel Street). Various sheds and coal storage were also located along the west edge of the railway yard at this time.
- In 1925, the Welland canal was widened in the easterly direction and some properties were demolished to allow the expansion (Welland Port Colborne Evening Tribune, June 27, 1931). At that time, rail tracks serviced the smelting plant operated by the Canada Furnace Company Ltd. (later Algoma Plant) located approximately 400 m south of Kinnear Street.
- By 1953, CN Rail had taken over the Grand Trunk Railroad. At that time Wallace Transport Company was located at the northeastern part of the railway yard close to Louis Street and DWOR Metal (metal salvage yard) has been located at its current location from prior to the 1940s to the present. From the mid/late 1940s to the mid/late 1970s Niagara Steel Products (metal salvage) was also present at this

location. Further north is Hard Rock Paving Company, located at 198 Welland Street from late 1970s/early 1980s to the present. From the early 1950s to the late 1970s/early 1980s this property was occupied by Wallace Transport. A review of the 1953 FIP showed coal and scrap iron was piled over large section of the area owned by CN Rail. During the period from the 1930's to the 1990's, the primary use of the railway yard was as a coke transfer facility.

JWEL reviewed the aerial photographs of the area from 1948 to 1988, Land Title Information on selected properties of Rodney Street properties from 1856 to the present, the directory search from 1941 to 2000, the 1914, 1925 and 1953 Fire Insurance Plans (FIPs), the 1938 and 1983 topographic maps. The 1916, 1931 and 1953 maps provided by INCO were also reviewed. In addition, JWEL also reviewed documents on file at the Port Colborne Museum, Planning Office and Library to identify previous land use of the area.

- Historically, the properties located along the eastside of Welland Canal west of Welland Street were parts of the Port Colborne Harbour area and used for industrial/commercial purposes since the construction (digging?) of the canal to the present days.
- According to the title search information, the Port Colborne Harbor area property (formerly occupied by the Canada Furnace Company) is reportedly currently owned by the Upper Lakes Shipping Limited with several plots of land owned by DWOR Metal, Hard Rock Paving and Hamilton Marine. From 1834 to 1901 several individuals and the Welland Canal Co owned this plot of land. From 1901 to 1912 The Cronmiller and White Brewing and Malting Company Limited owned the land. In 1912 the Canada Furnace Company (Algoma Steel Corporation Limited) purchased the property and sold the property to Upper Lakes Shipping Limited in 1983. According to information in an article in The Welland Telegraph, dated September 30, 1913, the property immediately east and west of the Welland Canal (approximately 32 m or 105 ft) is owned by Transport Canada, St. Lawrence Seaway.
- The Canada Furnace Company Plant came into operation in the fall of 1913. A review of The Welland Telegraph dated September 30, 1913 indicated that the production output of the plant was 400 tons of pig iron and the daily consumption of raw materials were 800 tons of iron ore, 500 tons of coke and 200 tons of limestone. The iron ores were imported from Buffalo, New York.
- Prior to the 1910s, majority of the lands north of Rodney Street east of Welland Street was undeveloped. The residential development started with the onset of former Canada Furnace in the 1910s and Inco Refienry in the 1920s.
- A review of the Inco's Port Colborne (Nickel) Refinery History of Acquisition of Plant Site indicated that Inco first acquired the lands in 1916 and 1917. The refinery came into full operation after the World War I in 1921.
- Majority of the residential dwellings located along the Rodney Street was constructed in 1910s and 1920s.

- Historically (from 1910s and onward), the areas located north of Rodney Street, east of Welland Street and west of Davis Street were used for mixed residential and commercial purposes. The commercial activities included gas stations, auto repair facilities, restaurants, hotels and stores. However, the dominant land use was residential.
- The properties located east of Welland Street, south of Rodney Street and west of Fares Street has historically consisted of undeveloped land with two residential dwellings located along Lake Road (south portion of the site) from the early 1910s to the late 1970s/early 1980s. From 1856 to 1909 several private individuals owned this property. From 1909 to 1920 the site was owned by The Cronmiller and White Brewing and Malting Company Limited. From 1920 to 1992 the Canada Furnace Company (Algoma Steel Corporation Limited) owned the property. In 1992, 968568 Ontario Inc. took possession of the site followed by INCO in 1996.

POTENTIAL SOURCES OF CONTAMINATION

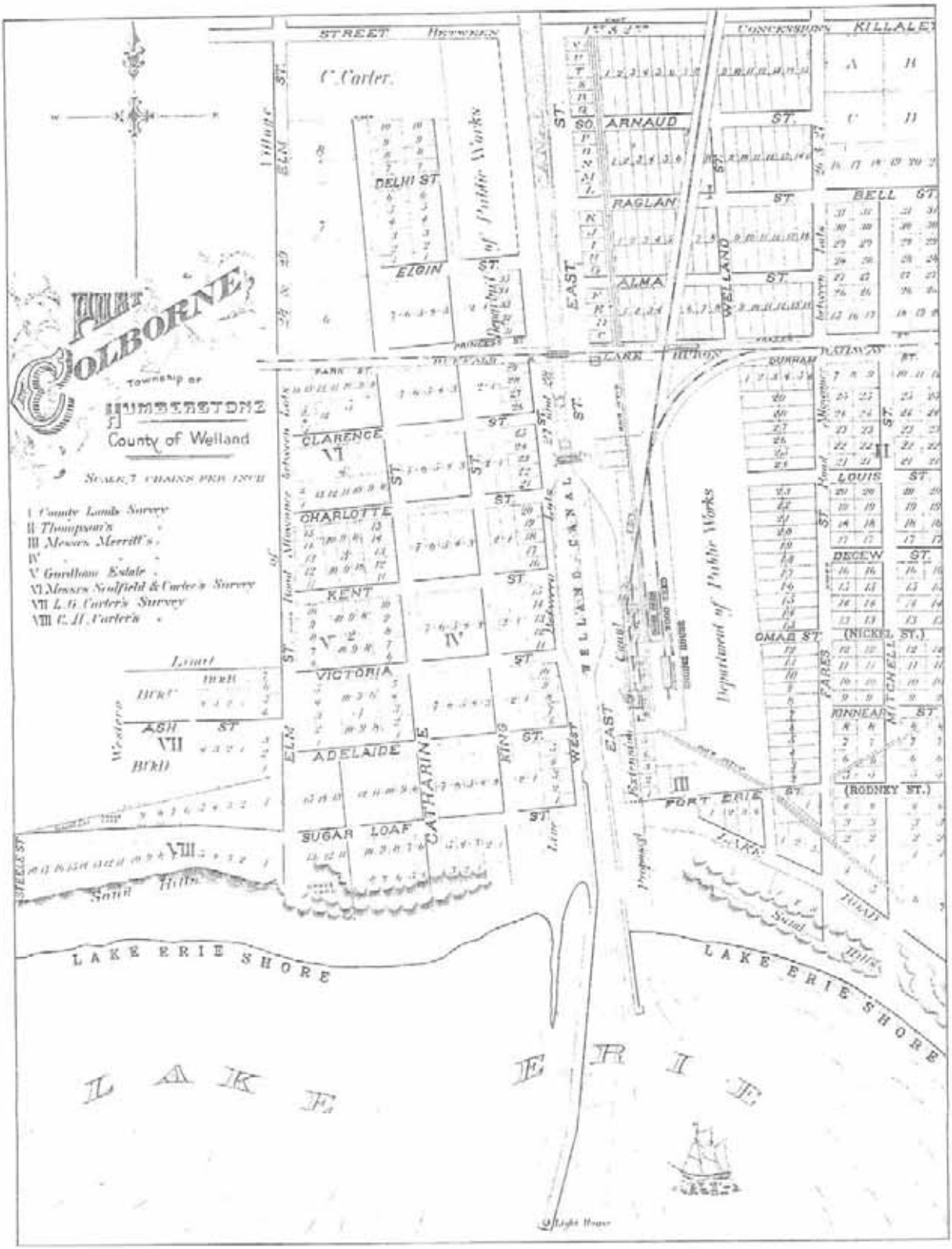
Based on the information gathered and on observations made during this investigation, the site background history has revealed evidence of potential environmental contamination associated with various land use activities in the investigation area. A summary of findings of the site history is presented in the following Table.

Table 1 Findings of Site Background History Review

Potential Sources of Contamination	Historical Activity	Contaminants
Algoma Steel Plant	Historical iron smelting operation active since 1913 to its closure in 1977. The plant used coke, iron ore, limestone and iron shop ball as raw materials. Coal stock piles, iron ore and associated industrial activities such as generation of slag containing spent metals.	Iron, Arsenic, Beryllium, Selenium and associated heavy metals and coal dust from metal smelting operations. Metal containing slags that were later used as road base and fill materials in the development of neighbouring eastside of the City of Port Colborne.
CN Railway Yard	Historical operation of railway yard along the eastside of Welland Canal since 1860s to 1980s. The activities included, coal yard, grain storage and associated railway operations such as fuel oil storage, railway ties.	Coal dust, petroleum hydrocarbons, arsenic (from railway ties) and other metal associated with railway yard.
Scrap Yard, Trucking Facilities and other industrial operations along eastside of Welland Canal west of Welland Street.	Historical industrial land use along the eastern part of the CN railway yard since 1930s. The activities include, scrap yard, junk metal stock piles, generation of heavy metal shavings, degreasing operation involved in metal scrapping and salvage, trucking facilities with fuel storage.	Heavy metals, petroleum hydrocarbons from scrap yard operations.
Gas Stations, Auto Repair Facilities, and Old Residential Dwellings	Historical mixed commercial and residential land uses of area north of Rodney Street, south of Killaly Stree, west of Davis Street and east of Welland Street. Majority of the urban areas were developed after 1910s and 1920s, site development, road constructions involved use of fill (slag and spent materials) most likely obtained from Algoma Plant. Auto repair facilities and old houses used lead-based gasoline and paints.	Lead, antimony, cadmium, petroleum hydrocarbons from gasoline, paint, batteries and fill materials.
Inco Nickel Refinery	Historical operation of nickel refinery by Inco from 1917 to 1984. Inco's operation involved refining of nickel, copper and cobalt.	Nickel, copper, cobalt with some arsenic from the historical refinery operations.

APPENDIX B2

1876 REGIONAL TOPOGRAPHIC MAP OF PORT COLBORNE



0 100 200 300 400 500m

SCALE 1:6000

NOTE: MAP OBTAINED FROM PAGE & CO. LINCOLN ATLAS, 1878
RE-PRINT EDITION-CUMMING PUBLISHERS, 1864

REGIONAL TOPOGRAPHY

PORT COLBORNE, 1876

Job No.:	Dwg. No.:	
ONT34551	1	Jacques Whitford
Date: 01/10/10	Dwn. by: LMV	Appd.: MA

APPENDIX C

PROTOCOLS

APPENDIX C1

JWEL'S DECEMBER 18, 2000 PROTOCOL (DRAFT) ENTITLED

"SURFACE SOIL SAMPLING FOR IDENTIFICATION OF POTENTIAL CHEMICALS OF CONCERN"

Soil Sampling Protocol
For Identification of Potential Chemicals of Concern

Port Colborne Community Based Risk Assessment

Revised – December 18, 2000

Introduction

A list of chemicals used or generated at the Inco Port Colborne Refinery, which may or may not be chemicals of concern (CoCs) for this Community Based Risk Assessment (CBRA) was identified by Jacques Whitford Environment Limited (JWEL) in their literature review of historical and current refining at Inco's Port Colborne Operation. This list of chemicals is divided into 2 categories:

1. Chemicals at the Refinery and Potential Offsite Airborne Migration:

- **Metals and Inorganic Parameters:** Nickel, Copper, Cobalt, Iron, Lead, Zinc, Chromium, Antimony, Aluminum, Silver, Boron, Arsenic, Selenium, Tellurium, Manganese, Sulphur, Gold, and precious metals (source: ore material)

2. Minor Feed Stock Components and Chemicals Used at the Refinery:

- **Inorganic Parameters:** Mercury (source: vapour lighting), Ammonia, Sodium, Chloride, and Sulphate (source: process chemicals, road salt, etc).
- **Organic Parameters:** PolyAromatic Hydrocarbons (source: tar/roofing waste), PCBs (source: transformers, lighting ballasts), Volatile Organics (source: paints, cleaning solvents, refractory organic chemicals, petroleum type wastes, etc), Phthalate Esters (source: plasticizers), Formaldehyde and phenols (source: resins and epoxies).
- **Acids:** Boric, Hydrochloric, Nitric and Sulphuric (source: process chemicals).
- **Alkali:** Sodium Hydroxide (source: process chemical).

Chemicals in Category 1 are those that are or would have been released as air particulates from stack and fugitive emissions to areas downwind of the Refinery. Chemicals in Category 2 are those that are or have been found within or next to the Refinery buildings and operations.

JWEL's approach in determining whether any of these chemicals are CoCs for this CBRA will involve verification sampling and testing of soils in areas of Port Colborne outside and downwind of the Inco Refinery. At the December 14, 2000 Technical SubCommittee (TSC) meeting, an analytical program was discussed and agreed to by all participants. Details of this analytical program are given on page 3 of this text.

Sampling Methodology

Soil sampling will be carried out at 10 locations in Port Colborne which coincide with areas of high concentrations of nickel as reported by the MOE from their 1998 and 1999 phytotoxicology soils investigations. Nickel is the comparative indicator to other CoCs because of its relative high abundance found by the MOE todate in Port Colborne soil in comparison to other chemicals.

Soil samples will be recovered from open space properties (ie. excluding woodlot areas for now until the MOE documents their findings) where the tenant and/or property owner has given prior permission for the sampling.

Soil samples will be collected at each of the 10 locations from the 0 to 5 cm depth interval. Soil samples will be recovered as per the MOE's Laboratory Services Branch document entitled: *Guide to the Collection and Submission of Samples for Laboratory Analyses* dated December 1993.

At each sampling location, 40 subsamples will be collected within a sample area of 2 m x 2 m utilizing the shape of an "X" or "W". Each subsample or "plug" will be placed into a stainless-steel bowl and composited to constitute a sample. The exception to this procedure of collecting composite samples will be the collection of discrete samples for Volatile Organic Compounds (VOCs) analysis to avoid loss of VOCs. This methodology follows the MOE's Phytotoxicology Section's document entitled: *Field Investigation Manual – Part I – General Methodology* dated May 1993 and the MOE document *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario* dated May 1996.

To avoid cross contamination, the soil sampling equipment and the stainless-steel bowl will be cleaned after each sample set. Cleaning will involve a detergent solution wash, followed by rinses with distilled water, followed by rinses with acetone, followed by rinses with hexane and then allowed to air-dry before the next sampling. JWEL personnel will wear latex gloves during sampling and equipment cleaning.

JWEL will take replicates of all soil samples collected and place them into clean, labelled sample jars. One set of replicate samples will be sent to the laboratory for chemical analysis. The second set will be archived by JWEL and kept for storage should additional analyses at a later date become required.

As part of an overall quality assurance/quality control (QA/QC) program to monitor and evaluate the accuracy of the JWEL data, 20% of the total number of soil samples collected by JWEL will be submitted to Beak for their submittal for chemical analyses.

In addition to the 10 sample locations, JWEL will collect a 0 to 5 cm depth sample at two (2) background locations, north and west of Port Colborne in areas with known, low concentrations of measured nickel in soil.

Analytical Program

Once collected, all 12 JWEL samples will be submitted to the Philip Analytical Services Corporation (Philip) for analysis. Philip is accredited by the Standards Council of Canada/Canadian Association Environmental Analytical Laboratories (CAEAL) program. Twelve (12) samples will be analysed for metal and inorganic parameters and 3 samples will be analyzed for organic parameters. Metal and inorganic parameters will include all those identifed in the MOE (1997) "*Guideline for Use at Contaminated Sites in Ontario*" (Guideline), in particular:

1) by ICP-MS - Ni, Co, Cu, Fe, Pb, Zn, Cr, Al, Ag, B, Bi, Ba, Mn, S
2) by AAS - Sb, As, Se, Te, Hg
3) Sulphate, Chloride

Organic parameters will include the species of PAHs, VOCs and PCBs as identified in the MOE (1997) Guideline.

The results will be tabulated by JWEL and submitted to the TSC/PLC for examination.

Interpretation of Data

Analytical data will be compared to the MOE (1997) Guideline. Any exceedance of an inorganic or organic compound will be evaluated as a potential CoC according to the criteria or conditions given in the CBRA Technical Scope of Work document (November 30, 2000). This document states that a chemical can only be considered as a CoC for this CBRA if all of the following conditions are found, as follows:

- Chemicals that were historically used or generated in the Inco Refinery or its processes, and
- Chemicals that are present at a community level at concentrations greater than MOE generic effects-based guidelines, and
- Chemicals whose presence in soil shows a scientific link to Inco's operations.

APPENDIX C2

JWEL'S JUNE 2001 PROTOCOL (DRAFT) ENTITLED

"PROTOCOL FOR NICKEL AND ARSENIC DEPOSITION MODELLING, PORT COLBORNE COMMUNITY BASED RISK ASSESSMENT"

DRAFT
PROTOCOL FOR NICKEL AND ARSENIC DEPOSITION MODELLING
PORT COLBORNE COMMUNITY BASED RISK ASSESSMENT

June, 2001

1. Objectives

Jacques Whitford Environment Limited (JWEL) will carry out an air dispersion modelling study to predict possible nickel and arsenic deposition patterns in the region around the Inco Port Colborne Refinery and the former Algoma Steel Mill. These data will be used as an aid in determining locations for additional test pits in the area around the refinery and to estimate the relative contributions of Inco and Algoma to nickel and arsenic depositions. This modelling will not be used as an input to the Human Health Risk Assessment.

This protocol focuses on acquiring representative input data, namely:

- Meteorological data
- Emissions Estimates, and
- Receptors

which will be used as input into an appropriate air quality dispersion model.

2. General Study Approach

The study will be performed in two stages:

- Stage 1 – This preliminary study will model assumed unit emission rates (1 g/s) from the Inco and Algoma properties individually. The results of the modelling will be used as an aid in determining the locations of additional test pits. Due to the short time frame in which these data are required, a detailed emissions inventory of each facility will not be possible, therefore unit emissions rates will be assumed to estimate relative deposition contours for each facility. The preliminary study is to determine probable depositional patterns radially around the Inco refinery and former Algoma site at similar distances from the sites as the Rodney Street area. As the main stacks on both the Inco and Algoma sites are expected to be too tall to be significant contributors to deposition close to the properties, fugitive emissions from buildings will be considered only.
- Stage 2 - This will be a detailed study, in which historical nickel and arsenic emissions from Inco and Algoma will be estimated and used to calculate deposition patterns. Emissions from stack and fugitive sources will be estimated from available Inco and Algoma production data over their periods of operation. These data will be utilized with a long-term meteorological data set to estimate cumulative nickel and arsenic depositions.

The dispersion modelling will be performed with the US EPA Industrial Source Complex – Prime (ISC-PRIME) model. This model includes the current state-of-the-science algorithms for modelling low level releases influenced by building wake effects.

The ISC-PRIME model uses a steady-state Gaussian plume equation to model emissions from a variety of sources (including area sources) and accepts hourly meteorological data records to define the conditions for plume rise, transport, diffusion, and deposition. The model estimates the concentration or deposition value for each source and receptor combination for each hour of input meteorology, and calculates user-selected short-term averages. The model includes algorithms for modelling emissions from area and line sources, and dry and wet deposition of particulates. Dry and wet deposition are processes by which particulates are removed from the plume by contact with the surface (dry deposition) and by coming in contact with water droplets which "wash" particulates out of the plume (wet deposition) during precipitation.

The ISC-PRIME model uses either hourly meteorological data including wind speed, wind direction, temperature, etc or long term stability array (STAR) data. Surface meteorological data for the model will be compiled from the Environment Canada station in Port Colborne, and the INCO meteorological tower. Upper air data, which provides information on the variation with height above ground of temperature, wind speed and wind direction will be obtained from the nearest representative upper air station to Port Colborne. A five-year meteorological data set will be used in the Stage 1 dispersion modelling, which follows US EPA dispersion modelling requirements.

Utilising the ISC-PRIME model, hourly and cumulative nickel and arsenic concentrations will be calculated for all receptors. The geographical variation of nickel and arsenic depositions, which are dependent on the predominant wind directions and wind speeds, will be presented graphically in deposition contour plots.

3. Meteorological Input Data

To obtain representative air quality estimates from known sources of emissions, local meteorology of the area of interest must be known. Data required to predict dispersion and transport includes wind velocities and direction; temperature; atmospheric stability; and mixing layer depth. Wind and temperature data are readily available from meteorological stations, but atmospheric stability and mixing layer depth are calculated from additional raw meteorological data including; cloud cover, snow cover and solar radiation.

For the Stage 1 preliminary study, raw hourly meteorological data from the beginning of 1996 to the end of December 2000 will be obtained from Environment Canada (Atmospheric Environment Services) and from the US National Centre for Atmospheric Research. Table 1 presents the stations and parameters to be used in the meteorological analysis.

The above data will provide hourly meteorological data, which will drive the ISC-PRIME model in the Stage 1 preliminary study.

Table 1 Meteorological Stations

Type of Station	Upper Air	Surface Station	Onsite Station
Station Name	Buffalo, NY	Buffalo, NY	Port Colborne
Location	42.55 N, 78.55 W	42.55 N, 78.43 W	42.88 N, 79.25 W
Years	January 96 – December 2000	January 96 – December 2000	January 96 – December 2000
Parameters	Pressure Altitude Temperature Wind Direction and Speed	Cloud Cover Ceiling Height Relative Humidity	Wind Speed and Direction Temperature Relative Humidity

For the Stage 2 study, a stability array (STAR) data set will be obtained from Environment Canada. The STAR data is a statistical representation of the historical meteorological conditions at the site calculated from a long-term (greater than 30-years) meteorological data set.

4. Emissions Estimation

For the Stage 1 study, a unit emissions rate (1 g/s) will be assumed for fugitive emissions (nickel and arsenic emissions due to leaks from buildings, emissions from ventilators, etc) from each facility.

For the Stage 2 study, nickel and arsenic emissions from each facility will be estimated using an emissions factor approach. Process fugitive and stack emissions will be estimated using emissions factors as specified in US EPA AP-42. Emissions estimates will be based on available production data from Inco and Algoma. Stack physical parameters (exit temperatures, velocities, etc) will be taken from available data provided by Inco or typical values from literature on the steel and nickel industries.

5. Receptors

A uniform Cartesian receptor grid with a 200-m spacing, extending 4-km to the north from the northern shores of Lake Erie and 3-km east and west from the Inco Port Colborne property line will be used in the dispersion modelling. In the vicinity of Rodney Street and the Inco and Algoma properties, a receptor spacing of 20-m will be utilized. Flat terrain will be used in the dispersion modelling and all receptors will be placed at ground level.

6. Interpretation of Data

The results of the dispersion modelling for both stages will be total cumulative nickel and arsenic depositions on the ground.

7. References

US EPA, "Users Guide for the ISC Dispersion Model", September 1995.

Electric Power Research Institute, "Addendum to ISC3 User's Guide – The PRIME Plume Rise and Building Downwash Model", November 1997.

APPENDIX C3

JWEL'S JUNE 27, 2001 PROTOCOL ENTITLED

"TEST PITTING PROTOCOL, ADDITIONAL CoC INVESTIGATION, INCO BOUNDARY AND RODNEY STREET AREA"

TEST PITTING PROTOCOL
ADDITIONAL COC INVESTIGATION
INCO BOUNDARY AND RODNEY STREET AREA
PORT COLBORNE CBRA

June 27, 2001

OBJECTIVES

As part of the Port Colborne Community Based Risk Assessment (CBRA), Jacques Whitford Environment Limited (JWEL) will carry out an additional soil sampling and chemical analyses program to evaluate the chemicals of concern (CoC). The objectives of this additional CoC investigation are to supplement the data obtained by JWEL during a previous CoC investigation in the winter and spring of 2000 and 2001.

This protocol illustrates JWEL's soil sampling methodology to undertake an investigation program within the INCO Refinery boundary and immediately west of the Refinery (Rodney Street area).

GENERAL INVESTIGATION APPROACH

As discussed in the May 30, 2001 meeting between INCO, Beak and JWEL, the additional CoC investigation will be focused on the issues related to possible arsenic and selenium and other CoC distribution patterns in soils around the INCO Port Colborne Refinery and the former Algoma Steel Mill.

As outlined the JWEL's *Soil Sampling Protocol For Identification of Potential Chemicals of Concern, Port Colborne CBRA* dated December 18, 2000 (revised), the following parameters will be analyzed during the additional CoC investigation.

- By ICP-MS: Barium, Beryllium, Boron, Nickel, Cobalt, Copper, Iron, Lead, Manganese, Sulfur, Silver, Aluminum, Chromium, Zinc;
- By AAS: Arsenic, Antimony, Selenium, Mercury and Tellurium*
- Wet Chemistry: Sulfate, Chloride

Note*

Tellurium was included in the protocol as a potential CoC because of its suspected presence in the ore material. Further to Beak and JWEL meeting of June 7, 2001, JWEL contacted various analytical laboratories (Maxxam, Philip and XRAL) for analysis of tellurium in soil samples. The concerned laboratories could not find any standard reference materials (SRM) and no standard analytical methodology exist for tellurium analysis in soil samples. Moreover, it should be noted that there is no MOE generic guideline for tellurium in soil samples and hence does not

satisfy the Condition 2 requirements to be a CoC. Therefore, JWEL is of the opinion to exclude tellurium from the analytical list.

SAMPLING METHODOLOGY

Soil sampling will be carried out at ten (10) locations within and outside the INCO Refinery in Port Colborne which coincide with areas of potential high concentrations of nickel and other candidate CoCs as discussed in the May 30, 2001 meeting between INCO, Beak and JWEL.

Sample locations will be based in areas of particulate fallout as completed by an air dispersion modelling program (referenced in JWEL's *Protocol for Nickel and Arsenic Deposition Modelling Port Colborne Community Based Risk Assessment* dated June 2001).

Soil sampling will be conducted by excavating test pits using hand shovel. Test pits will be excavated in open space areas (i.e., excluding the paved areas).

Soil samples will be collected at each of the 10 locations from the 0 to 5 cm depth interval to a depth of 25 cm and then 25-50 cm at each location. Soil samples will be collected in accordance with the MOE's June 1996, *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario.*

Three (3) of the ten (10) locations will be from areas located outside INCO's property boundary. Hence, permission will be required from the tenant and/or property owner to enter these three properties. The work on these three (3) properties will be done in conjunction with Decommissioning Consulting Services (DCS) during an upcoming soil cleanup program in the Rodney Street area.

At seven (7) sample locations within INCO's property boundary, test pits will be excavated to 100 cm deep. At three (3) sample locations outside INCO's property boundary, test pits will be excavated to a depth of 100 cm to verify the presence of any fill materials. The soil horizons will be logged at each sample location and documented. At each sampling location, samples will be collected from depth intervals of 0-5 cm, 5-10 cm, 10-15 cm, 15-20 cm, 20-25 cm and 45-50 cm and 95-100 cm.

To avoid cross contamination, the soil sampling equipment will be cleaned after each sample set. Cleaning will involve a detergent solution wash, followed by rinses with distilled water and then allowed to air-dry before the next sampling. JWEL personnel will wear latex gloves during sampling and equipment cleaning.

JWEL will take replicates of all soil samples collected and place them into clean, labelled sample jars. One set of replicate samples will be sent to the laboratory for chemical analysis. The second set will be archived by JWEL and kept for storage should additional analyses at a later date become required.

As part of an overall quality assurance/quality control (QA/QC) program to monitor and evaluate the accuracy of the JWEL data, 20% of the total number of soil samples collected by JWEL will be submitted to Beak for their submittal for chemical analyses.

Grain Size Analysis

To determine the soil texture, JWEL will conduct grain size analyses on each sample using sieve and hydrometer. The grain size analyses will be conducted at JWEL's Material Testing Laboratory in Markham, Ontario.

ANALYTICAL PROTOCOLS

Chemical analyses will be performed at Philip Analytical Services (Philip) laboratory in Mississauga, Ontario. Philip will provide JWEL with all the required sample containers.

Details of the Sampling Containers, Field QA/QC, Sample Documentation, Laboratory Testing Guidelines, Standard Reference Materials and Laboratory QA/QC are discussed in JWEL's Laboratory Standardization Protocol dated June 6, 2001.

REFERENCES

Ontario Ministry of the Environment, June 1996, *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario.*

Jacques Whitford Environment Limited (JWEL), June 6, 2001, *Laboratory Standardization Protocol.*

Jacques Whitford Environment Limited (JWEL), June 2001, *Protocol for Nickel and Arsenic Deposition Modelling Port Colborne Community Based Risk Assessment.*

Jacques Whitford Environment Limited (JWEL), dated December 18, 2000 (revised) *Soil Sampling Protocol For Identification of Potential Chemicals of Concern, Port Colborne CBRA.*

APPENDIX C4

JWEL'S JULY 9, 2001 PROTOCOL (REVISED) ENTITLED

"SURFACE SOIL SAMPLING FOR IDENTIFICATION OF POTENTIAL CHEMICALS OF CONCERN"

Surface Soil Sampling Protocol
For Identification of Potential Chemicals of Concern

Port Colborne Community Based Risk Assessment

Revised – July 9, 2001

Introduction

A list of chemicals used or generated at the Inco Port Colborne Refinery, which may or may not be chemicals of concern (CoCs) for this Community Based Risk Assessment (CBRA) was identified by Jacques Whitford Environment Limited (JWEL) in their literature review of historical and current refining at Inco's Port Colborne Operation. This list of chemicals is divided into 2 categories:

1. Chemicals at the Refinery and Potential Offsite Airborne Migration:

- **Metals and Inorganic Parameters:** Nickel, Copper, Cobalt, Iron, Lead, Zinc, Chromium, Antimony, Aluminum, Silver, Boron, Arsenic, Selenium, Tellurium, Manganese, Sulphur, Gold, and precious metals (source: ore material)

2. Minor Feed Stock Components and Chemicals Used at the Refinery:

- **Inorganic Parameters:** Mercury (source: vapour lighting), Ammonia, Sodium, Chloride, and Sulphate (source: process chemicals, road salt, etc).
- **Organic Parameters:** PolyAromatic Hydrocarbons (source: tar/roofing waste), PCBs (source: transformers, lighting ballasts), Volatile Organics (source: paints, cleaning solvents, refractory organic chemicals, petroleum type wastes, etc), Phthalate Esters (source: plasticizers), Formaldehyde and phenols (source: resins and epoxies).
- **Acids:** Boric, Hydrochloric, Nitric and Sulphuric (source: process chemicals).
- **Alkali:** Sodium Hydroxide (source: process chemical).

Chemicals in Category 1 are those that are or would have been released as air particulates from stack and fugitive emissions to areas downwind of the Refinery. Chemicals in Category 2 are those that are or have been found within or next to the Refinery buildings and operations.

JWEL's approach in determining whether any of these chemicals are CoCs for this CBRA will involve verification sampling and testing of soils in areas of Port Colborne outside and downwind of the Inco Refinery. At the December 14, 2000 Technical SubCommittee (TSC) meeting, an analytical program was discussed and agreed to by all participants. Details of this analytical program are given on page 3 of this text.

Sampling Methodology

Soil sampling will be carried out at 10 locations in Port Colborne which coincide with areas of high concentrations of nickel as reported by the MOE from their 1998 and 1999 phytotoxicology soils investigations. Nickel is the comparative indicator to other CoCs because of its relative high abundance found by the MOE todate in Port Colborne soil in comparison to other chemicals.

Soil samples will be recovered from open space properties (ie. excluding woodlot areas for now until the MOE documents their findings) where the tenant and/or property owner has given prior permission for the sampling.

Soil samples will be collected at each of the 10 locations from the 0 to 5 cm depth interval. Soil samples will be recovered as per the MOE's Laboratory Services Branch document entitled: *Guide to the Collection and Submission of Samples for Laboratory Analyses* dated December 1993.

At each sampling location, 40 subsamples will be collected within a sample area of 2 m x 2 m utilizing the shape of an "X" or "W". Each subsample or "plug" will be placed into a stainless-steel bowl and composited to constitute a sample. The exception to this procedure of collecting composite samples will be the collection of discrete samples for Volatile Organic Compounds (VOCs) analysis to avoid loss of VOCs. This methodology follows the MOE's Phytotoxicology Section's document entitled: *Field Investigation Manual – Part I – General Methodology* dated May 1993 and the MOE document *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario* dated May 1996.

To avoid cross contamination, the soil sampling equipment and the stainless-steel bowl will be cleaned after each sample set. Cleaning will involve a detergent solution wash, followed by rinses with distilled water, followed by rinses with acetone, followed by rinses with hexane and then allowed to air-dry before the next sampling. JWEL personnel will wear latex gloves during sampling and equipment cleaning.

JWEL will take replicates of all soil samples collected and place them into clean, labelled sample jars. One set of replicate samples will be sent to the laboratory for chemical analysis. The second set will be archived by JWEL and kept for storage should additional analyses at a later date become required.

As part of an overall quality assurance/quality control (QA/QC) program to monitor and evaluate the accuracy of the JWEL data, 20% of the total number of soil samples collected by JWEL will be submitted to Beak for their submittal for chemical analyses.

In addition to the 10 sample locations, JWEL will collect a 0 to 5 cm depth sample at two (2) background locations, north and west of Port Colborne in areas with known, low concentrations of measured nickel in soil.

Analytical Program

Once collected, all 12 JWEL samples will be submitted to the Philip Analytical Services Corporation (Philip) for analysis. Philip is accredited by the Standards Council of Canada/Canadian Association Environmental Analytical Laboratories (CAEAL) program. Twelve (12) samples will be analysed for metal and inorganic parameters and 3 samples will be analyzed for organic parameters. Metal and inorganic parameters will include all those identifed in the MOE (1997) "*Guideline for Use at Contaminated Sites in Ontario*" (Guideline), in particular:

1) by ICP-MS - Ni, Co, Cu, Fe, Pb, Zn, Cr, Al, Ag, B, Bi, Ba, Mn, S
2) by AAS - Sb, As, Se, Te, Hg
3) Sulphate, Chloride

Organic parameters will include the species of PAHs, VOCs and PCBs as identified in the MOE (1997) Guideline.

The results will be tabulated by JWEL and submitted to the TSC/PLC for examination.

Analysis of Tellurium

Tellurium was included in the original list of analytes because of its suspected presence in the ore material. However, JWEL excluded tellurium from the original analytical list as 1) there is no MOE generic guideline for tellurium in soil and hence there is no way of evaluating its Condition No. 2 requirements to be a potential CoC and 2) after discovering from various analytical laboratories (Maxxam, Philip and XRAL) that there are no soil tellurium standard reference materials (SRM) nor any standard analytical methodology for tellurium analysis in soils.

Interpretation of Data

Analytical data will be compared to the MOE (1997) Guideline. Any exceedance of an inorganic or organic compound will be evaluated as a potential CoC according to the criteria or conditions given in the CBRA Technical Scope of Work document (November 30, 2000). This document states that a chemical can only be considered as a CoC for this CBRA if all of the following conditions are found, as follows:

- Chemicals that were historically used or generated in the Inco Refinery or its processes, and
- Chemicals that are present at a community level at concentrations greater than MOE generic effects-based guidelines, and
- Chemicals whose presence in soil shows a scientific link to Inco's operations.

APPENDIX C5

JWEL'S JULY 9, 2001 PROTOCOL ENTITLED

"SAMPLING AND ANALYSIS: QUALITY ASSURANCE AND QUALITY CONTROL"

SAMPLING AND ANALYSIS: QUALITY ASSURANCE AND QUALITY CONTROL

PORT COLBORNE CBRA

July 9, 2001

1. INTRODUCTION

As part of the Port Colborne Community Based Risk Assessment (CBRA), JWEL has carried out sampling and chemical analyses on various types of sample medium including soil, water, air and garden/orchard produce. Details of sampling methodology and analytical procedures for each sample medium is provided in separate written protocols.

JWEL has developed a protocol for determination of analytical parameters, sample standards, and laboratory quality assurance and quality control (QA/QC). The protocol has been designed for Philip Analytical Services (Philip) of Mississauga, Ontario, the designated laboratory carrying out the chemical analyses on the Port Colborne samples. This protocol delineates JWEL's policies for Philip with respect to field QA/QC, laboratory standardization, data management and laboratory QA/QC.

As outlined in the MOE *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario* (MOE 1996), laboratories accredited by the Canadian Association of Environmental Analytical Laboratories (CAEAL) are recommended for use for analytical purposes. Philip is such a CAEAL accredited analytical laboratory for most of the required analytes.

2. SAMPLING METHODS QA/QC

As outlined in Section 5 of the MOE (1996) guidance document, all samples will be collected by JWEL in MOE-recommended containers. Philip will provide JWEL with all the required sample containers.

The following field sampling QA/QC procedures will be followed:

- Clean latex gloves will be worn by the JWEL technician during sampling and will be changed before each new sample is collected;
- The sampling equipment will be cleaned after collection of each sample set. Cleaning will involve a detergent solution wash, followed by rinses with distilled water and then allowed to air-dry before the next sampling;

- Samples will be stored in a cooler (provided by Philip) at 4^0C in the field and will be delivered to Philip after collection as soon as possible.

The field procedures for collecting soil and water samples are basically the same except that different types of containers and preservatives are used for water sampling.

3. REQUIRED CONTAINERS

As outlined in Section 5 of the MOE (1996) guidance document all samples, including field samples, field blanks and travelling blanks will be collected by JWEL in MOE recommended containers. Philip will provide JWEL with the required sample containers. The following procedures in Table 1 describe container and preservative requirements during sampling and transportation of samples from the field to the analytical laboratory.

TABLE 1

APPROPRIATE CONTAINERS, PRESERVATIVES AND STORAGE FOR SOIL AND WATER SAMPLES INCO, PORT COLBORNE, ONTARIO

PARAMETER	CONTAINER	PRESERVATIVE	MAXIMUM HOLDING TIME
Soil Samples			
Total Metals	Plastic or glass	None	180 days
Water Samples			
Total Metals (excluding mercury and hexavalent chromium)	Polyethyleneterephthalate (PET) or glass with plastic-lined cap	HNO_3 (containing <1mg/L of total metals) to pH between 1.5 and 2.0	60 days

From: *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario,* Sections 5.1 and 5.2, (MOE, 1996).

- Prior to the onset of field program, JWEL's technician will inform Philip of the sample medium, analytes of interest and required sample containers and coolers.

- Philip will provide JWEL with the required number of containers with appropriate preservatives, whenever needed.

4. FIELD QA/QC

As outlined in Section 7 of the MOE (1996) guidance document, all sampling and sample handling will be conducted with utmost care, to prevent cross contamination of samples. The following procedures describe field QA/QC requirements during sampling and transportation of samples from the field to the analytical laboratory.

a) Blanks

Blanks are analytical quality control samples analyzed in the same manner as site samples. They are used to determine whether contamination has been introduced into a sample either in the field while the samples were being collected, or in the laboratory during sample preparation or analysis.

Travelling Blank:

A travelling blank is a sample of uncontaminated water free of the analytes of interest that is prepared by the laboratory performing the chemical analysis. Travelling blanks are used to determine whether sample contamination occurred in the sample containers and/or as a result of sample cross contamination during sample transport and storage.

- Philip will provide adequate travelling blank(s) to JWEL prior to the onset of field investigation;
- The travelling blank will accompany the sample containers to the sampling location. JWEL will carry the travelling blank to the field and return it, unopened, to the Philip laboratory for chemical analysis.

Travelling Spiked Blank:

A travelling spiked blank is a sample of uncontaminated matrix (water, soil, sediment, air absorbent) free of any interfering substances to which a known amount of standard solution containing known amounts of the analytes of interest and appropriate preservatives have been added by the laboratory performing the chemical analysis.

- Philip will prepare and provide samples of travelling spiked blanks to JWEL prior to the onset of any field investigation;
- Philip will spike the travelling spiked blank with solutions containing all the target parameters required to be analyzed at a level of five-to-ten times the concentrations of each analyte of interest at the specific site.

- The travelling spiked blank will be prepared within 24 hours of accompanying the containers required for sampling at the site. JWEL will carry the travelling spiked blank to the field and return it, unopened, to the Philip laboratory for chemical analysis.

Field Blank:

A field blank is a sample of uncontaminated water free of the analytes of interest that is prepared by the laboratory performing the chemical analysis. Field blanks are used to determine whether sample contamination occurred in the sample containers and/or as a result of sample cross contamination during sample collection procedures in the field.

- Philip will provide samples of a field blank to JWEL prior to the onset of field investigation;

- The field blank will accompany the sample containers to the sampling location. At the sampling location JWEL will open the field blank container at least as long as the filling of other sample bottles is required, close it, and return it to the laboratory with the samples for analysis.

b) Replicates

Replicate samples are any number of additional samples collected in the same place and at the same time as the original sample. Replicates are collected and analyzed to provide an estimate of sample variability.

- As outlined in Section 7.2 of the MOE (1996) guidance document, JWEL will collect replicate samples for all test groups.

- As part of an overall QA/QC program to determine the reproducibility or variability related to sampling procedures and sample homogeneity, JWEL will calculate the percentage differences between analyzed values for the original and replicate samples.

5. DOCUMENTATION

Documentation and Shipping

Proper documentation by JWEL in the field will be important for ensuring the integrity of samples shipped from the field to the laboratory. Proper documentation includes: field observations, station sampling summaries, chain of custody forms, correct shipping conditions for samples and Transportation of Dangerous Goods (TDG) compliance, when required.

Chain of Custody Records

- Philip will provide the Chain of Custody Forms. A sample copy is provided in Appendix A.
- A JWEL technician will complete all relevant sections of the Chain of Custody Form during sampling and JWEL's Project Manager (PM) or a person designated by the PM will ensure that the requested analytical testing is clearly outlined on the Chain of Custody.

Shipping

- Philip will provide required sample coolers with ice or cold packs. JWEL will ensure proper packaging to prevent spillage and breaking of glass bottles.
- JWEL will ensure that the samples are preserved at optimum temperature at 4^0C until the laboratory receives the samples.

If possible, the samples will be delivered by a JWEL technician in person. However, if this is not possible, Philip's courier will be used. Once the samples are delivered to the laboratory, the Chain of Custody form will be signed by both parties to ensure the tracking of sample movement. Both JWEL and Philip will retain their own copies of these forms.

All analytical methods by Philip will include details of sample pretreatment/preparation, clean-up (if required), instrumental measurement method, and data reporting procedures. All must be accompanied by references.

6. LABORATORY TESTING GUIDELINES

Philip will perform chemical analysis of the samples after they are submitted by a JWEL representative. A properly completed and signed Chain of Custody form will be included with all sample batches. Instructions for analyses of specific chemical parameters with previously agreed upon method detection limits (MDL) appropriate for the regulatory criteria to which the results will be compared, will also be included.

Sample Preparation and Digestion

As outlined in Section 5.1 of the MOE (1996) guidance document, Philip will prepare all samples prior to analysis conducted by instrument. Sample preparation and digestion procedures that will be followed by Philip for inorganic analyses are as follows:

a) **Soils**

- Soil samples will be spread out on drying trays in a dust free environment and dried at 30-35^{0}C to constant weight (overnight). A drying blank will be prepared and analyzed. Philip will retain this moisture data and report it as part of the Certificate of Analysis.

- The sample will then be disaggregated with a mortar and pestle and screened through a 2 mm sieve. The fraction greater than 2 mm will be discarded. The fraction less than 2 mm will then be ground to pass a 355 um sieve.

- The samples will then be digested using concentrated nitric acid and hydrochloric acids. The digestion involves the following procedure.

  - One (1) g of soil sample is weighed into a beaker.

  - 2mls of concentrated HNO_3 is added and the mixture is allowed to sit at room temperature for 1 hour.

  - 6mls of concentrated HCl is added and the mixture is sample is left at room temperature for 30 minutes.

  - The sample is refluxed at 90^{o}C for 1 hour and then evaporated to incipient dryness.

  - 1.5mls of concentrated HNO_3 is added and the volume is diluted to 25mls with de-ionized water.

- After addition of de-ionized water, the sample is allowed to settle before analysis. If the sample still contains floatable particles it is centrifuged.

b) **Water**

- No digestion is required for surface water samples.

- Groundwater samples are digested using concentrated nitric acid and hydrochloric acid same as soil samples.

- Groundwater samples are field filtered and preserved. A filter blank will be analyzed for each sample set to determine whether sample contamination occurred during sample collection procedures in the field or not.

c) **Vegetation/Garden/Orchard Produce**

- Once received, Philip will wash the samples with distilled water and the samples will be digested using hot nitric acid at 90°C until the biomass is dissolved. Time required to dissolve biomass varies depending on the type of sample.

- Once the biomass is dissolved completely, the sample is allowed to settle before analysis, if the sample still contains floatable particles it is centrifuged.

d) **Maple Sap**

- Maple sap samples will be collected by JWEL in accordance with the University of Toronto, Faculty of Forestry collection protocol (MOE 1992);

- Prior to chemical analysis, the sap samples will be digested using hot nitric acid.

e) **Air**

- Once collected, the air filters will be submitted to Philip for chemical analysis. Prior to chemical analysis, the samples (air filters) will be digested using hot nitric acid. Digest is centrifuged and the supernatant is analyzed.

- A filter blank will be analyzed with each sample set.

Sample Analysis

Analytical procedures and instruments have been pre-selected by JWEL and Philip in accordance with the MOE (1996) guidance document. This selection was based on sample matrix, detection limits to be reached, comparability to guidelines, parameters analyzed, availability and suitability of techniques and instrumentation.

Analytical methods and QA/QC protocols will be referenced by Philip to recognized standard setting organizations such as US EPA, CSA, and ASTM. If alternate equivalent methods are used, then these must be demonstrated to meet acceptable precision, accuracy and sensitivity requirements. Table 2 shows the analytical guidelines for metal parameters.

TABLE 2

ANALYTICAL METHODS AND INSTRUMENTATION
INCO, PORT COLBORNE, ONTARIO

PARAMETER	ANALYTICAL METHOD	INSTRUMENT
Soil, Water, Air (Particulate)* Samples		
Metals (17 including, Al, Ba, Be, Ca, Cd, Cu, Co, Cr, Fe, Mg, Mn, Mo, Ni, Pb, Sr, V and Zn)	US EPA Method 6010, Rev. 0	Inductively Coupled Plasma-Atomic Emission Spectrometer
Metals (As, Sb and Se)	US EPA Method 7061 and 7741 (Modified)	Hydride Generation Atomic Absorption Spectrophotometer
Garden Produce and Maple Sap Samples		
Metals (17including, Al, Ba, Be, Ca, Cd, Cu, Co, Cr, Fe, Mg, Mn, Mo, Ni, Pb, Sr, V and Zn)	U.S.EPA Method 200.8 (Modified)	Inductively Coupled Plasma-Mass Spectrometer
Metals (As, Sb and Se)	U.S. EPA Method 7061 and 7741 (Modified)	Hydride Generation Atomic Absorption Spectrophotometer

Note

* For Air Particulate Sampling (Filter): US EPA, 40 CFR, Part 53- Ambient Air Monitoring Reference and Equivalent Methods

Table 3 shows the sample matrix and pre-selected MDLs for all seventeen (17) ICP metal parameters as well as for arsenic, selenium and antimony for the Port Colborne samples.

TABLE 3
METHOD DETECTION LIMIT (MDL) CRITERIA AND SAMPLE MATRIX
INCO, PORT COLBORNE, ONTARIO

PARAMETER	SOIL[a] (ug/g)	VEGETATION (ug/g)	GROUNDWATER[a] (ug/L)	SURFACE WATER[b] (ug/L)	AIR[c] (ug/filter)
Aluminum	20	0.6	5.0	5.0	5.0
Antimony	0.2	0.05	0.5	0.5	0.2
Arsenic	0.2	0.2	2.0	2.0	1.0
Barium	5.0	0.5	5.0	5.0	2.0
Calcium	50	50	500	500	200
Cadmium	0.3	0.01	0.1	0.1	0.05
Cobalt	2.0	0.01	0.1	0.1	0.05
Copper	1.0	0.05	0.5	0.5	0.5
Chromium	1.0	0.5	5.0	5.0	2.0
Iron	50	5.0	30	30	20
Magnesium	20	20	50	50	20
Manganese	1.0	0.5	5.0	5.0	2.0
Molybdenum	3.0	0.1	5.0	5.0	0.5
Nickel	2.0	0.1	1.0	1.0	0.5
Lead	5.0	0.05	0.5	0.5	0.2
Selenium	0.2	0.2	2.0	2.0	1.0
Strontium	0.3	0.1	1.0	1.0	0.5
Vanadium	1.0	0.05	0.5	0.5	0.5
Zinc	5.0	0.5	5.0	5.0	5.0

Notes:
a Meet MOE Table A Residential/Parkland Land Use Criteria
b Meet MOE's Provincial Water Quality Objective (PWQO) Criteria
c Meet MOE's Ambient Air Quality Criteria (AAQC)

7. STANDARD REFERENCE MATERIALS (SRM)

Philip uses commercial, purchased standard reference materials (SRMs) from Canmet called Lake Sediment (LKsd-3). JWEL will also submit additional SRM samples for other media, such as food stuffs, as an added check on the variability related to an analytical procedure. JWEL will compare data from Philip's results on the SRM samples to those referenced by the originating authority.

Philip will provide a QA/QC page of the Certificates of Analysis. It will contain data on the SRM as well as the Process Blank data.

JWEL will calculate percentage differences to determine the accuracy of each analytical determination.

8. LABORATORY QA/QC

As outlined in the MOE (1996) guidance document, Philip will observe the following QA/QC procedures to perform the chemical analyses.

- Pre-run* QC:
  - labware and reagent blanks;
  - instrument setup standard;
  - reference standard to validate in-house standards; and
  - instrument detection limits (IDLs) and detector linearity curves (minimum of 5-point calibration).

- In-run* QC:
  - baseline drift blanks;
  - standards; and
  - instrument checks.

- Run* QC:
  - method recovery blanks;
  - method blanks;
  - in-house matrix check material;
  - duplicates (minimum of one set per run* of 30 samples). As mentioned in the MOE (1996) guidance document, a duplicate sample is defined as a second aliquot from the same sample container;

- surrogates (added prior to organic extraction). The surrogates should be selected to cover the whole range of the particular scan. It is recommended to use a minimum of three surrogates per organic type scan, except PCBs, where one surrogate can be used. Surrogates are not used in inorganic analyses and thus will not be used in these analyses of the Port Colborne samples;
- spiked samples, if applicable;
- certified standard reference materials (SRMs) to validate method recovery; and
- Method Detection Limits (MDLs) for each parameter.

* *"run" refers to a group of samples submitted as one group, and consisting of 30 or fewer samples*

9. DATA MANAGEMENT: QA/QC

The quality of data depends upon planning, sampling, analysis and reporting. As a means of determining the reproducibility or variability related to analytical procedures of the sample homogeneity, JWEL will calculate the percentage differences between analyzed values for the original and duplicate samples.

Further, as a means of determining sample accuracy, JWEL will calculate the percentage differences between the analytical results of the SRM samples and the referenced SRM correlation data.

For sample reproducibility calculations, percentage differences will be calculated for those chemical parameters with analytical values greater than 3 X LOQ (LOQ is the limit of quantification, i.e., the lowest level of a parameter that can be identified with confidence by an analytical laboratory).

Percentage differences will be determined using the following formula:

$$\text{Percentage difference of Analyte A} = \frac{(\text{Analyte A in test 1} - \text{Analyte A in test 2}) \times 100}{(\text{Analyte A in test 1} + \text{Analyte A in test 2}) / 2}$$

10. REPORT OF ANALYSIS

The Laboratory Report of Analysis as provided by Philip will include the sample results as well as all run quality QC, recovery data and MDL data. The acceptability of the laboratory data will include the following considerations:

- The analytical method performance should meet the requirement criteria as outlined in Section 8.3, 8.4 and 8.5 of the MOE (1996) guidance document.

- The results of laboratory QC samples that are applicable to the matrix and contaminant groups of interest (method blank, spiked blank, spiked sample) will be within the statistically determined control limits of 30%. Philip will be responsible for any QC results that exceed the control limits.

- Recoveries of all surrogates (for organic analyses) where applicable will be monitored and reported.

- A table of the precision and accuracy estimates associated with the reported results will be provided based on duplicate/replicate analyses of Port Colborne samples, and through periodic analysis of standard or certified reference materials as available for each analyte selected at appropriate concentrations.

- Analytical data will be reported without correction, unless correction is clearly identified and described.

11. REFERENCES

Ontario Ministry of the Environment, June 1996, *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario.*

Canadian Council of Ministers of the Environment, December 1993, *Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites, Volumes I and II.*

University of Toronto, Faculty of Forestry, November 1992, *Relationship of Sugar Maple Acer Saccharum Decline and Corresponding Chemical Changes in the Sap Composition (Carbohydrates and Trace Elements).*

APPENDIX A

SAMPLE CHAIN OF CUSTODY RECORD

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order: _____

Comments: _____

CHAIN OF CUSTODY RECORD

Client: _____

Contact: _____

Phone: _____ Fax: _____

PAS Quote # : _____

Client P.O. # : _____

Client Project # : _____

Sampled by: _____

Page _____ of _____

Please specify Guideline (if applicable) _____

Invoice to (if other than above):

_____

_____

_____

_____

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by:	Date:	Time:	Condition of samples upon receipt at lab:

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 01 8262

WATER

Sample Bottle and Preservation Information-

Analytical Parameter	Volume (ml) Preferred	Minimum	Sample Container	Preservative	Holding Time (1)
Alkalinity / pH	100	50	125 ml HDPE	4°C	4 days
Anions - (Br^-, Cl^-, F^-, $NO3^-$, $NO2^-$, $PO4^{3-}$, $SO4^{2-}$)	100	50	125 ml HDPE	4°C	5/28 days
Biochemical Oxygen Demand (BOD)	500	250	500 ml HDPE	4°C	4 days
Carbon - (DOC, TOC)	100	50	125 ml HDPE	H_2SO_4 < pH 2***	10 days
Chemical Oxygen Demand (COD)	100	50	125 ml HDPE	H_2SO_4 < pH 2***	30 days
Chlorine, residual (Cl)	40	40	40 ml clear glass septum vial*	4°C	immediately
Chromium VI	100	50	125 ml HDPE	4°C	5 days
Conductivity	100	50	125 ml HDPE	4°C	28 days
Cyanide (CN^-)	250	100	250 ml HDPE	NaOH >12***	7 days
HGAAS Metals (Sb, As, Bi, Se, Te)	100	50	125 ml HDPE	HNO_3 < pH 2***	6 months
ICP Metals	100	50	125 ml HDPE	HNO_3 < pH 2***	6 months
Mercury	100	50	125 ml clear glass	$K_2Cr_2O_7$ / HNO_3 < pH 2***	7 days
Nitrogen - Ammonia (NH_3- N) / Total Kjedahl Nitrogen (TKN)	100	50	125 ml HDPE	H_2SO_4 < pH 2***	10 days
Phenolics - Total	100	50	125 ml clear glass	$CuSO_4$ / H_3PO_4 < pH 2***	28 days
Solids - (TS, TSS, TDS)	200	100	250 ml HDPE	4°C	7 days
Sulphide (S^{2-})	100	250	250 ml HDPE	NaOH / ZnOAc > pH 12***	7 days
Total Phosphorus	100	50	125 ml HDPE	H_2SO_4 < pH 2***	28 days
Microbiological	250	250	250 ml HDPE - Sterilized	$Na_2S_2O_3$	24 hours
Acid & Base Neutral Extractables	2 x 1000	1000	1000 ml amber glass**	4°C	7 days
Fatty and Resin Acids	250	100	250 ml amber glass**	4°C	28 days
Herbicides	2 x 1000	1000	1000 ml amber glass**	4°C	7 days
PCDD / PCDF	2 x 1000	1000	2 x 1000 ml amber glass**	4°C	28 days
PAH's	2 x 1000	1000	1000 ml amber glass**	4°C	7 days
Pesticides / PCB's	2 x 1000	1000	1000 ml amber glass**	4°C	7 days
Oil & Grease / Heavy Oils	2 x 1000	1000	1000 ml amber glass**	HCl < pH 2***	28 days
Total Extractable Hydrocarbons (TEH) - Diesel	500	250	2 x 250 ml or 500 ml amber glass**	HCl < pH 2***	14 days
Volatiles / BTEX / Total Volatile Hydrocarbons (TVH) - Gas	3 x 40	40	3 x 40 ml clear glass septum vial*	$NaHSO_4$ < pH 2***	14 days

HDPE = High Density Polyethylene

Note: Samples with more than one test with similar container / preservative requirements, may share a sample container as long as there is sufficient sample to cover minimum requirements for all tests requested. *Please use a sample container which will provide sufficient sample when multiple tests are required.

* No headspace or air bubbles in the container.

** Containers must have a teflon liner in cap.

*** Corrosive - Wear protective gloves.

(1) Based upon EPA / MISA protocols.

Please ensure samples are transported as quickly as possible to ensure hold times can be met.

Hold times may differ depending on required protocol.

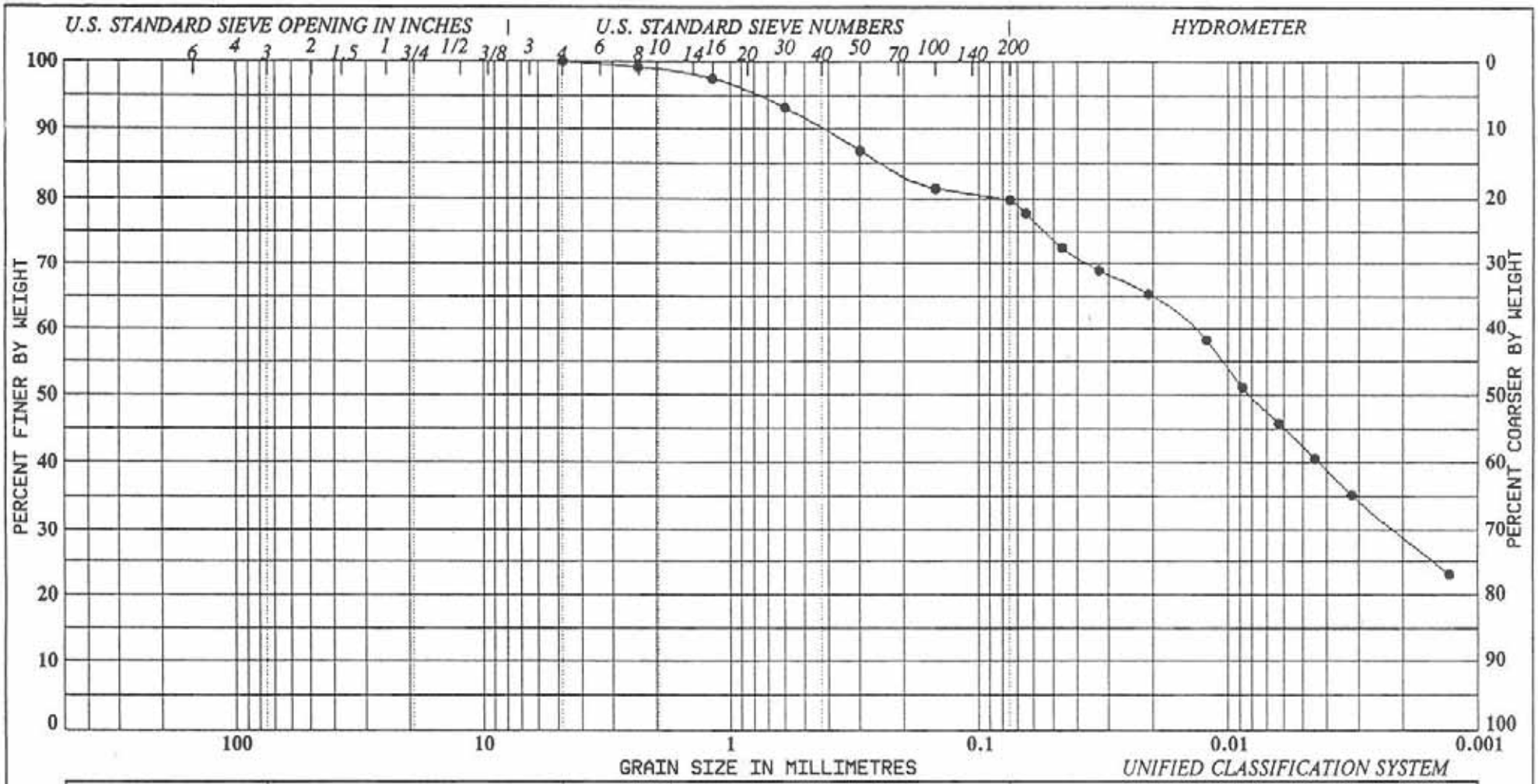
SOIL

Sample Bottle and Preservation Information-

Analytical Parameter	Mass (g) Preferred	Minimum	Sample Container	Preservation	Holding Time (1)
pH	100	50	250 ml glass jar	4°C	N/A
Anions - (Br^-, Cl^-, F^-, $NO3^-$, $NO2^-$, $PO4^{3-}$, $SO4^{2-}$)	100	50	250 ml glass jar	4°C	N/A
Carbon - (DOC, TOC)	100	50	250 ml glass jar	4°C	N/A
Chromium VI	100	50	250 ml glass jar	4°C	N/A
Conductivity	100	50	250 ml glass jar	4°C	N/A
Cyanide (CN^-)	100	50	250 ml glass jar	4°C	N/A
HGAAS Metals (Sb, As, Bi, Se, Te)	100	50	250 ml glass jar	4°C	N/A
ICP Metals	100	50	250 ml glass jar	4°C	N/A
Mercury	100	50	250 ml glass jar	4°C	N/A
Nitrogen - Ammonia (NH_3-N) / Total Kjedahl Nitrogen (TKN)	100	50	250 ml glass jar	4°C	N/A
Phenolics - Total	100	50	250 ml glass jar	4°C	N/A
Contaminated Sites Guidelines	250	100	250 ml glass jar	4°C	N/A
Regulation 347	250	100	250 ml glass jar	4°C	N/A
Acid & Base Neutral Extractables	100	50	120 ml or 250 ml glass jar	4°C	14 days
Fatty and Resin Acids	100	50	120 ml or 250 ml glass jar	4°C	14 days
Herbicides	100	50	120 ml or 250 ml glass jar	4°C	14 days
PCDD / PCDF	100	50	120 ml or 250 ml glass jar	4°C	14 days
PAH's	100	50	120 ml or 250 ml glass jar	4°C	14 days
Pesticides / PCB's	100	50	120 ml or 250 ml glass jar	4°C	14 days
Oil & Grease / Heavy Oils	100	50	120 ml or 250 ml glass jar	4°C	14 days
Total Extractable Hydrocarbons (TEH) - Diesel	100	50	120 ml or 250 ml glass jar	4°C	14 days
Volatiles / BTEX / Total Volatile Hydrocarbons (TVH) - Gas	60	30	60 ml or 120 ml glass jar*	4°C	14 days

APPENDIX D

PARTICLE SIZE DISTRIBUTION CURVES OF SELECTED SOIL SAMPLES TAKEN FROM JWEL JANUARY 2001 SOIL INVESTIGATION



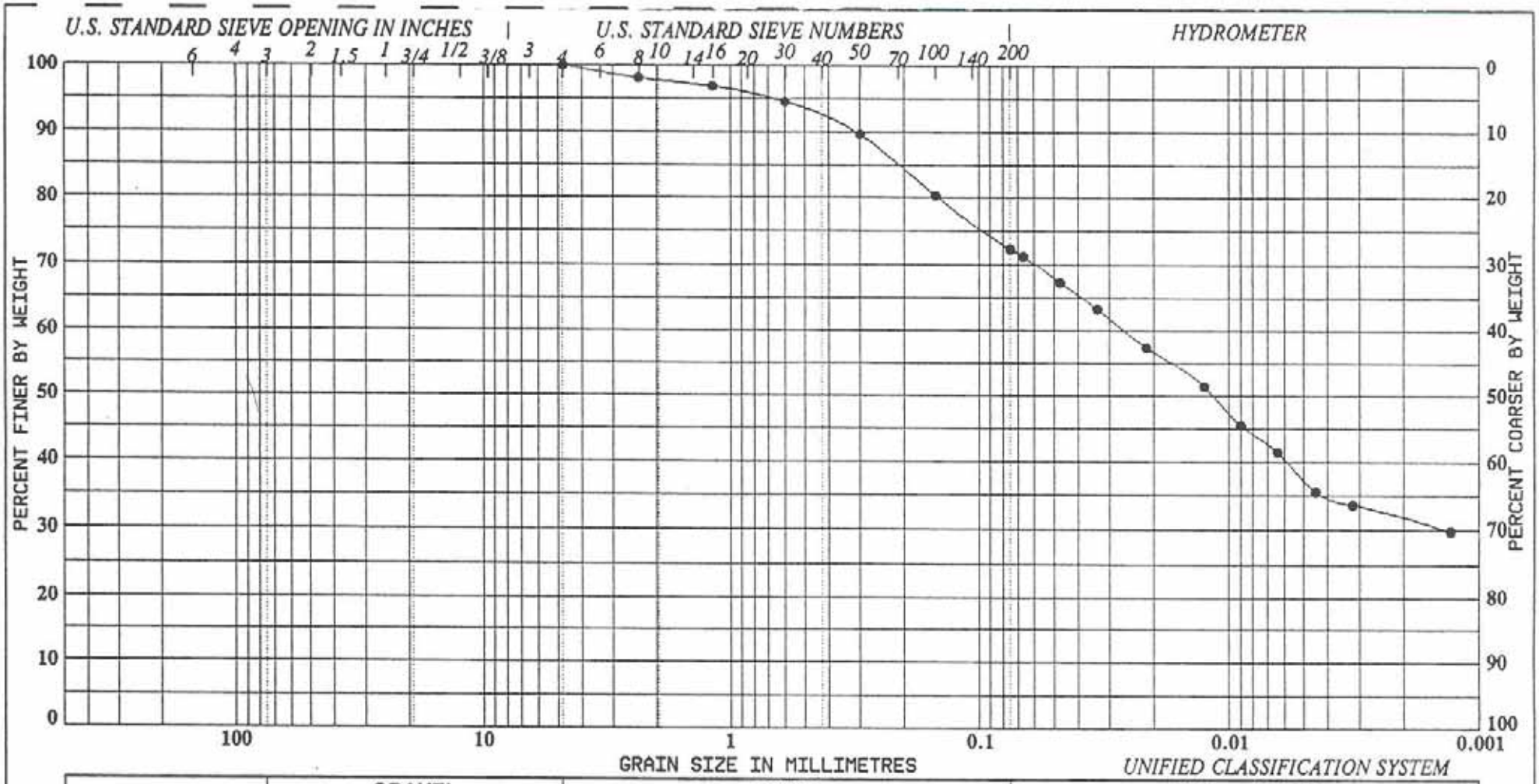
COBBLES	GRAVEL		SAND			SILT and CLAY	
	coarse	fine	coarse	medium	fine	SILT	CLAY

	Source	Depth (m)	Description	W%	W_L	W_P	IP	%Gravel	%Sand	%Silt	%Clay
●	SS4	0.1	Clayey SILT, sandy					0.0	20.3	50.9	28.8

Project: Portculburne, Ontario
Job No.: ONT33827
Date: 2001-04-02

Figure: 2
Notes: Tested in accordance to ASTM D422-63 (1998)

GRADATION CURVES



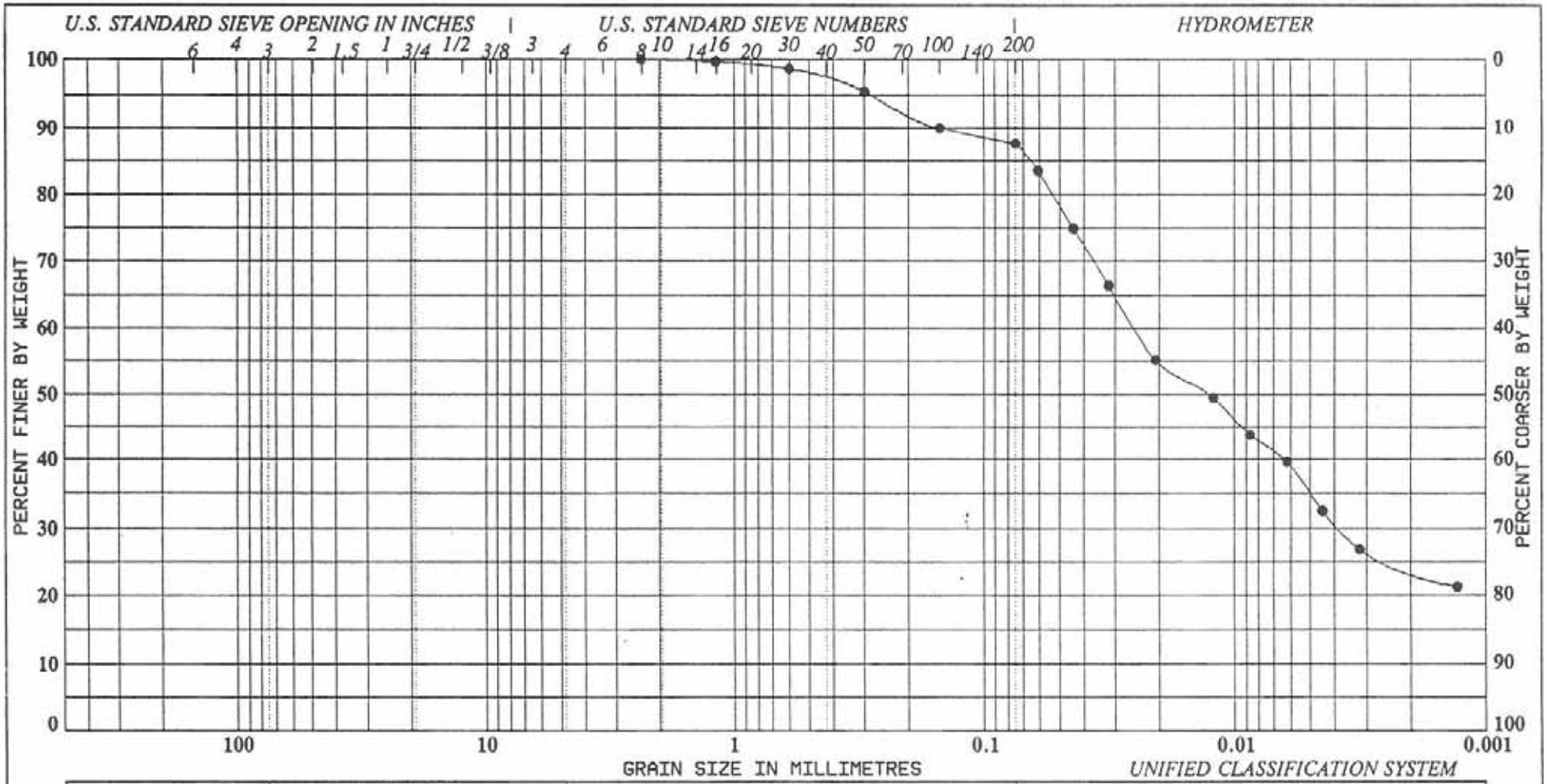
COBBLES	GRAVEL		SAND			SILT and CLAY	
	coarse	fine	coarse	medium	fine	SILT	CLAY

	Source	Depth (m)	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
●	SS8	0.1	Clayey SILT, sandy					0.0	27.7	40.7	31.6

Project: Portculburne, Ontario
Job No.: ONT33827
Date: 2001-04-02

Figure: 5
Notes: Tested in accordance to ASTM D422-63 (1998)

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT and CLAY	
	coarse	fine	coarse	medium	fine	SILT	CLAY

Source	Depth (m)	Description	W%	W_L	Wp	Ip	%Gravel	%Sand	%Silt	%Clay
● SS12	0.1	Clayey SILT, some sand					0.0	12.5	63.6	23.9

Project: *Portculburne, Ontario*
Job No.: *ONT33827*
Date: *2001-04-02*

Figure: *9*
Notes: *Tested in accordance to ASTM D422-63 (1998)*

GRADATION CURVES

APPENDIX E

LABORATORY CERTIFICATES OF CHEMICAL ANALYSES:

JWEL JANUARY 2001 SOIL SAMPLES

Client:	Jacques Whitford Environment Ltd. 1200 Denison Street Markham, ON, CANADA L3R 8G6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	January 16/2001 January 22/2001 G210157 EG009-0811
Fax:	905-479-9326	Client Ref#: Sampled By:	33828 INCO D. Dolby
Attn:	D. Dolby		

Attached are your results for VOC's

If you have any questions, please call Elaine Grant,
your Service Manager at Philip Analytical Services Corp.

"ent: Jacques Whitford Environment Ltd.
oject Reference: 33828 INCO
Work Order: G210157
*latrix: Soil

VOLATILE ORGANIC COMPOUNDS

Units: micrograms/gram (ug/g) dry weight

Date: 22-Jan-01

Compound	EQL ug/g	SAMPLE 5B	SAMPLE 5B Dup.	SAMPLE 7B	SAMPLE 10B	SAMPLE 11B
C..loromethane	0.005	nd	nd	nd	nd	nd
Vinyl Chloride	0.002	nd	nd	nd	nd	nd
omomethane	0.005	nd	nd	nd	nd	nd
loroethane	0.005	nd	nd	nd	nd	nd
Trichlorofluoromethane	0.005	nd	nd	nd	nd	nd
cetone	1.00	nd	nd	nd	nd	nd
-Dichloroethene	0.002	nd	nd	nd	nd	nd
L..hloromethane (Methylene Chloride)	0.010	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.002	nd	nd	nd	nd	nd
thyl-t-Butyl Ether	0.002	nd	nd	nd	nd	nd
-Dichloroethane	0.002	nd	nd	nd	nd	nd
Methyl Ethyl Ketone (MEK)	0.025	nd	nd	nd	nd	nd
s-1,2-Dichloroethene	0.002	nd	nd	nd	nd	nd
loroform	0.002	nd	nd	nd	nd	nd
1,_-Dichloroethane	0.002	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	0.002	nd	nd	nd	nd	nd
rbon Tetrachloride	0.002	nd	nd	nd	nd	nd
nzene	0.002	*0.001	0.002	nd	0.003	0.003
1,2-Dichloropropane	0.002	nd	nd	nd	nd	nd
richloroethene (Trichloroethylene)	0.002	nd	nd	nd	nd	nd
omodichloromethane	0.002	nd	nd	nd	nd	nd
-1,3-Dichloropropene	0.002	nd	nd	nd	nd	nd
Methyl Isobutyl Ketone (MIBK)	0.025	nd	nd	nd	nd	nd
s-1,3-Dichloropropene	0.002	nd	nd	nd	nd	nd
,2-Trichloroethane	0.002	nd	nd	nd	nd	nd
Toluene	0.002	0.002	0.004	nd	0.007	0.004
Hexanone	0.025	nd	nd	nd	nd	nd
romochloromethane	0.002	nd	nd	nd	nd	nd
1,_-Dibromoethane (Ethylene dibromide)	0.002	nd	nd	nd	nd	nd
Tetrachloroethene (Perchloroethylene)	0.002	nd	nd	nd	nd	nd
1,2-Tetrachloroethane	0.002	nd	nd	nd	nd	nd
orobenzene	0.002	nd	nd	nd	nd	nd
Ethylbenzene	0.002	nd	nd	nd	nd	nd
-Xylene & p-Xylene	0.002	*0.001	0.002	nd	0.004	0.002
moform	0.002	nd	nd	nd	nd	nd
ene	0.002	nd	nd	nd	nd	nd
.1,2,2-Tetrachloroethane	0.002	nd	nd	nd	nd	nd
ylene	0.002	nd	nd	nd	nd	nd
Dichlorobenzene	0.002	nd	nd	nd	nd	nd
,4-Dichlorobenzene	0.002	nd	nd	nd	nd	nd
2-Dichlorobenzene	0.002	nd	nd	nd	nd	nd
rogate Standard Recoveries	(Control Limits)					
romofluoromethane (70-130%)		100%	102%	99%	99%	101%
oluene-d8 (70-130%)		108%	113%	104%	109%	110%
romofluorobenzene (70-130%)		89%	85%	94%	88%	86%

ent: Jacques Whitford Environment Ltd.
ject Reference: 33828 INCO
Work Order: G210157
trix: Soil

VOLATILE ORGANIC COMPOUNDS

Units: micrograms/gram (ug/g) dry weight

Date: 22-Jan-01

		Method Blank			Spiked Method Blank			
mpound	EQL ug/g	Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
oromethane	0.005	nd	0.005	yes	110	60	140	yes
inyl Chloride	0.002	nd	0.002	yes	105	60	140	yes
omomethane	0.005	nd	0.005	yes	108	60	140	yes
oroethane	0.005	nd	0.005	yes	122	60	140	yes
hlorofluoromethane	0.005	nd	0.005	yes	103	60	140	yes
cetone	1.00	nd	1.00	yes	94	60	140	yes
Dichloroethene	0.002	nd	0.002	yes	104	70	130	yes
loromethane (Methylene Chloride)	0.010	nd	0.010	yes	117	70	130	yes
ans-1,2-Dichloroethene	0.002	nd	0.002	yes	105	70	130	yes
thyl-t-Butyl Ether	0.002	nd	0.002	yes	103	70	130	yes
Dichloroethane	0.002	nd	0.002	yes	104	70	130	yes
hyl Ethyl Ketone (MEK)	0.025	nd	0.025	yes	99	60	140	yes
s-1,2-Dichloroethene	0.002	nd	0.002	yes	104	70	130	yes
oroform	0.002	nd	0.002	yes	102	70	130	yes
Dichloroethane	0.002	nd	0.002	yes	98	70	130	yes
,1,1-Trichloroethane	0.002	nd	0.002	yes	100	70	130	yes
rbon Tetrachloride	0.002	nd	0.002	yes	100	70	130	yes
zene	0.002	nd	0.002	yes	106	70	130	yes
Dichloropropane	0.002	nd	0.002	yes	106	70	130	yes
richloroethene (Trichloroethylene)	0.002	nd	0.002	yes	98	70	130	yes
modichloromethane	0.002	nd	0.002	yes	101	70	130	yes
1,3-Dichloropropene	0.002	nd	0.002	yes	107	70	130	yes
ethyl Isobutyl Ketone (MIBK)	0.025	nd	0.025	yes	105	60	140	yes
ns-1,3-Dichloropropene	0.002	nd	0.002	yes	106	70	130	yes
2-Trichloroethane	0.002	nd	0.002	yes	103	70	130	yes
ene	0.002	nd	0.002	yes	101	70	130	yes
Hexanone	0.025	nd	0.025	yes	104	60	140	yes
romochloromethane	0.002	nd	0.002	yes	101	70	130	yes
Dibromoethane (Ethylene dibromide)	0.002	nd	0.002	yes	102	70	130	yes
trachloroethene (Perchloroethylene)	0.002	nd	0.002	yes	103	70	130	yes
,1,2-Tetrachloroethane	0.002	nd	0.002	yes	103	70	130	yes
robenzene	0.002	nd	0.002	yes	105	70	130	yes
lbenzene	0.002	nd	0.002	yes	106	70	130	yes
-Xylene & p-Xylene	0.002	nd	0.002	yes	102	70	130	yes
moform	0.002	nd	0.002	yes	100	70	130	yes
ene	0.002	nd	0.002	yes	109	70	130	yes
1,2,2-Tetrachloroethane	0.002	nd	0.002	yes	108	70	130	yes
Xylene	0.002	nd	0.002	yes	105	70	130	yes
Dichlorobenzene	0.002	nd	0.002	yes	109	70	130	yes
Dichlorobenzene	0.002	nd	0.002	yes	108	70	130	yes
2-Dichlorobenzene	0.002	nd	0.002	yes	107	70	130	yes
ogate Standard Recoveries	(Control Limits)							
omofluoromethane		97%	70-130%	yes	96	70	130	yes
luene-d8		101%	70-130%	yes	100	70	130	yes
romofluorobenzene		98%	70-130%	yes	97	70	130	yes

Client: Jacques Whitford Environment Ltd.
Project Reference: 33828 INCO
Work Order: G210157
Matrix: Soil

VOLATILE ORGANIC COMPOUNDS

Date: 22-Jan-01

Legend: EQL = Estimated Quantitation Limit for undiluted samples
nd = Not Detected Above EQL
Dup. = Duplicate
* = Detected below EQL but passed compound identification criteria

Date of sample receipt: January 16, 2001
Date of sample analysis: January 17, 2001

Analytical Method:

The soil samples were analysed by low level purge & trap (US EPA Method 5035) gas chromatography/ mass spectrometry using US EPA Method 8260B (modified).

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PAS for a period of 30 days following reporting or as per specific contractual arrangement.

Job Approved By:

Yuan Zhou, B.Sc
Chemist

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order:

Comments:

CHAIN OF CUSTODY RECORD

Client:

PAS Quote # :

Page ___ of ___

Client P.O. # :

Client Project # :

Contact:

Sampled by:

Phone:

Fax:

Please specify Guideline (if applicable)

Invoice to (if other than above):

Analysis Required:

VOC

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	VOC	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	Sample 55	11/10/01		X		1	
2	Sample 75	11/10/01		X		1	
3	Sample 100	11/10/01		X		1	
4	Sample 115	11/10/01		X		1	
5							
6							
7							
8							
9							
10							
11							
12							

Samples Relinquished to PAS by (Client Signature)

Date: 11/16/01 Time:

Samples Received in lab by:

Date: 11/16/01 Time: 13:25

Method of Shipment

Condition of samples upon receipt at lab:

Rev. COC03-10-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 00-

Client:	Jacques Whitford Environment Ltd. 1200 Denison Street Markham, ON, CANADA L3R 8G6	Date Received:	January 5/2001
		Date Reported:	January 11/2001
		Lab Ref#:	G210039
		Lab Quote#:	EG009-0811
		Client PO#:	33827
Fax:	905-479-9326	Client Ref#:	33827
		Sampled By:	KW/DD
Attn:	Mahaboob Alam		

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,
your Service Manager at Philip Analytical Services Corp.

nt: Jacques Whitford Environment Ltd.
r ,ect Reference: 33827
Work Order Number: G210039B
ix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 11-Jan-01

ompound	EQL µg/g	SOIL 5-1 DF=5	SOIL 7-1	SOIL 10-1	SOIL 11-1
aphthalene	0.05	nd	nd	nd	nd
Methylnaphthalene	0.05	nd	nd	nd	nd
ethylnaphthalene	0.05	nd	nd	nd	nd
naphthylene	0.05	nd	nd	nd	nd
cenaphthene	0.05	nd	nd	nd	nd
rene	0.05	nd	nd	nd	nd
anthrene	0.05	0.11	0.09	0.07	0.18
nthracene	0.05	nd	nd	0.06	0.05
oranthene	0.05	0.31	0.25	nd	0.34
ne	0.05	0.24	0.18	0.06	0.28
enzo(a)anthracene	0.05	0.12	0.09	0.05	0.20
rysene	0.05	0.17	0.16	nd	0.25
zo(b)fluoranthene	0.05	0.14	0.14	nd	0.21
zo(k)fluoranthene	0.05	0.13	0.10	nd	0.17
enzo(a)pyrene	0.05	0.12	nd	nd	0.18
no(1,2,3-cd)pyrene	0.05	0.12	0.10	nd	0.14
nzo(a,h)anthracene	0.05	nd	nd	nd	nd
enzo(ghi)perylene	0.05	0.11	0.08	nd	0.14
ogate Standard Recoveries (Control Limits)					
cenaphthene-d10 (19-114%)		61%	66%	71%	65%
thracene-d10 (15-126%)		55%	57%	59%	56%
o(a)pyrene-d12 (33-127%)		77%	80%	78%	76%

Client: Jacques Whitford Environment Ltd.
Project Reference: 33827
Work Order Number: G210039B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 11-Jan-01

		Method Blank			Spiked Method Blank			
Compound	EQL µg/g	Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	nd	0.05	yes	67	29	107	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	73	32	111	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	76	29	116	yes
Acenaphthylene	0.05	nd	0.05	yes	73	34	115	yes
Acenaphthene	0.05	nd	0.05	yes	67	35	113	yes
Fluorene	0.05	nd	0.05	yes	70	42	116	yes
Phenanthrene	0.05	nd	0.05	yes	71	50	119	yes
Anthracene	0.05	nd	0.05	yes	74	53	123	yes
Fluoranthene	0.05	nd	0.05	yes	73	58	129	yes
Pyrene	0.05	nd	0.05	yes	72	58	129	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	84	57	134	yes
Chrysene	0.05	nd	0.05	yes	85	57	136	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	83	53	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	76	52	133	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	80	54	131	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	85	45	134	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	83	46	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	80	45	134	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		71%			64	19	114	yes
Anthracene-d10		62%			56	15	126	yes
Benzo(a)pyrene-d12		85%			78	33	127	yes

Client: Jacques Whitford Environment Ltd.
oject Reference: 33827
ork Order Number: G210039B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 11-Jan-01

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL

Date received: January 5, 2001
Date extracted: January 9, 2001
Date analysed: January 9-10, 2001

ALYTICAL METHOD:

he soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of
tone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was
formed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

e: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified
ts of precision and accuracy during routine laboratory operating conditions.

*TE: All work recorded herein has been done in accordance with normal professional standards using
epted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost
t the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following
porting or as per specific contractual arrangement.*

OB APPROVED BY:

Kathy Horvat

Kathy Horvat, B.Sc.
Chemist

Client:	Jacques Whitford Environment Ltd. 1200 Denison Street Markham, ON, CANADA L3R 8G6	Date Received:	January 5/2001
		Date Reported:	January 10/2001
		Lab Ref#:	G210039
		Lab Quote#:	EG009-0811
		Client PO#:	33827
Fax:	905-479-9326	Client Ref#:	33827
		Sampled By:	KW/DD
Attn:	Eric Veska/Kevin Wong		

Attached are your results for Polychlorinated Biphenyls (PCB's)

Instrumentation:

If you have any questions, please call Elaine Grant,
your Service Manager at Philip Analytical Services Corp.

Client : Jacques Whitford.Environment Ltd.
1200 Denison Street
Markham ON, L3R 8G6
Contact : Eric Veska/ Kevin Wong
Client project# : 33827
PASC job # : G210039
Matrix : Soil

Date: January 10, 2001

Certificate of Analysis

Analysis Performed:	Polychlorinated Biphenyls (PCB's)
Methodology:	Determination of total PCB's in soil by solvent extraction, followed by florisil cleanup and analysis by capillary GC/ECD with external standard quantitation. U.S. EPA Method No. 8082
Instrumentation:	Hewlett Packard 5890 II with autosampler and Chemstation
Sample Description:	Soil
Results:	Refer to Report of Analysis attached.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

M. Riskallah

Certified By
Medhat Riskallah, Ph.D., C.Chem.
Manager, Gas Chromatography Section

Client : Jacques Whitford Environment Ltd.
1200 Denison Street
Markham ON, L3R 8G6
Contact : Eric Veska/ Kevin Wong
Client project# : 33827
PASC job # : G210039
Matrix : Soil

Date: January 10, 2001

Report of Analysis

		Total PCB's ug/g	DCBP % Recovery
	L.O.Q.	0.05	
1	Reagent Blank	ND	99%
2	Spiked Reagent Blank	114%	97%
3	SOIL 5-1	ND	111%
4	SOIL 5-1(Repeat)	ND	114%
5	SOIL 7-1	ND	128%
6	SOIL 10-1	ND	124%
7	SOIL 11-1	0.13	129%

Comment: The PCBs detected in sample; SOIL 11-1, is Aroclor 1254.

L.O.Q. = Limit of Quantitation
N.D = Not Detected
ug/g= micrograms per gram
DCBP= Decachlorobiphenyl (surrogate standard)

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	January 5/2001
Date Reported:	January 11/2001
Lab Ref#:	G210039
Lab Quote#:	EG009-0811
Client PO#:	33827
Client Ref#:	33827
Sampled By:	KW/DD

Certificate of Analysis

Analysis Performed:

Mercury, Cold Vapour AA
Thallium, Graphite Furnace, Digestion Required
Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
Anions,IC(F,Cl,Br,NO2,NO3,o-PO4 & SO4), Extraction Req'd
17 Element ICP Scan

Methodology:

1) Determination of mercury in soils/sediment by cold vapour atomic absorption spectrophotometry.
U.S. EPA SW846 Methods No. 7471A & 7470A
2) Analysis of thallium in soil by Graphite Furnace Atomic Absorption.
U.S. EPA Method No. 7841
3) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
4) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	January 5/2001
Date Reported:	January 11/2001
Lab Ref#:	G210039
Lab Quote#:	EG009-0811
Client PO#:	33827
Client Ref#:	33827
Sampled By:	KW/DD

Certificate of Analysis

Methodology: (Cont'd)

5) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
6) Analysis of anions in soil by Ion Chromatography.
U.S. EPA Method No. 300.0
Standard Methods(1985) No. 429.0
7) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)

Instrumentation:

1) Thermo Separation Products Mercury Analyzer
2) Varian Spectro AA 400/Zeeman Graphite Tube Atomizer
3) Varian VGA 76
4, 5) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
6) Dionex Ion Chromatograph, Series 4500i
7) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received: June 20/2001
Date Reported: July 18/2001
Lab Ref#: G212613
Lab Quote#: EG009-0811

Client Ref#: ONT33826

Certificate of Analysis

Analysis Performed:

Mercury, Cold Vapour AA
Arsenic, Hydride Generation AA
Bismuth, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
Chloride, Ion Chromatography, Extraction Required
Sulfate, Ion Chromatography, Extraction Required
Boron(hot water soluble) by ICP
17 Element ICP Scan
Sulphur by LECO Induction Furnace
pH, Hydrogen Ion Activity, Extraction Required

Methodology:

1) Determination of mercury in soils/sediment by cold vapour atomic absorption spectrophotometry.
U.S. EPA SW846 Methods No. 7471A & 7470A
2) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
3) Analysis of Bismuth in soil by Hydride Generation Atomic Absorption.
Standard Methods 3114C (Modified)

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received: June 20/2001
Date Reported: July 18/2001
Lab Ref#: G212613
Lab Quote#: EG009-0811

Client Ref#: ONT33826

Certificate of Analysis

Methodology: (Cont'd)

4) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
5) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
6) Analysis of chloride in soil by Ion Chromatography.
U.S. EPA Method No. 300.0
7) Analysis of sulfate in soil by aqueous extraction followed by Ion Chromatography.
U.S. EPA Method No. 300.0
8) Analysis of hot water soluble boron in soil by performing a hot aqueous extraction prior to the analysis using ICPAES.
U.S. EPA Method No. 6010
Canadian Council Min.Environ. Criteria
9) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
10) Analysis of sulphur in soil by LECO Combustion.
MOEE Method E3096A

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received: June 20/2001
Date Reported: July 18/2001
Lab Ref#: G212613
Lab Quote#: EG009-0811

Client Ref#: ONT33826

Certificate of Analysis

Methodology: (Cont'd)

11) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

Instrumentation:

1) Thermo Separation Products Mercury Analyzer
2) Varian VGA 76
3, 4, 5) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
6, 7) Dionex Ion Chromatograph, Series 4500i
8, 9) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
10) LECO Induction Furnace
11) Orion Research Expandable Ion Analyzer EA940

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: July 18/2001
Lab Ref # : G212613
Lab Quote#: EG009-0811

Client Ref#: ONT33826

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Mercury	SS2-1	0.01	mg/kg	nd	0.02	yes	110	73	127	yes	0.06	0.05	0.02	0.08	yes	yes
Arsenic	SS2-1	0.2	mg/kg	nd	0.5	yes	116	84	120	yes	4.1	5.0	3.5	6.5	yes	yes
Bismuth	SS2-1	0.2	mg/kg	nd	6.5	yes	100	60	140	yes	4.7	5.0	3.5	6.5	yes	yes
Antimony	na	0.2	mg/kg	nd	0.5	yes	100	29	157	yes	na	na	na	na	na	yes
Selenium	SS2-1	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	4.3	5.0	3.5	6.5	yes	yes
Chloride	na	0.5	mg/kg	nd	1.0	yes	97	80	120	yes	na	na	na	na	na	yes
Sulphate	na	5	mg/kg	nd	10	yes	95	80	227	yes	na	na	na	na	na	yes
Boron(Hot water soluble)	na	0.2	mg/kg	nd	0.4	yes	99	80	120	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	100	83	117	yes	na	na	na	na	na	yes
Barium	SS2-1	5	mg/kg	nd	10	yes	103	86	113	yes	103	100	70	130	yes	yes
Beryllium	SS2-1	0.2	mg/kg	0.3	0.4	yes	97	81	121	yes	8.9	10	7	13	yes	yes
Cadmium	SS2-1	0.5	mg/kg	nd	0.6	yes	12	0	179	yes	97.7	100	70	130	yes	yes
Chromium	SS2-1	1	mg/kg	nd	2	yes	103	81	117	yes	97	100	70	130	yes	yes
Cobalt	SS2-1	2	mg/kg	nd	4	yes	106	87	112	yes	95	100	70	130	yes	yes
Copper	SS2-1	1	mg/kg	1	4	yes	102	88	114	yes	98	100	70	130	yes	yes
Iron	na	50	mg/kg	nd	100	yes	100	84	116	yes	na	na	na	na	na	yes
Lead	SS2-1	5	mg/kg	nd	10	yes	104	67	133	yes	96	100	70	130	yes	yes
Manganese	SS2-1	1	mg/kg	nd	2	yes	105	87	113	yes	100	100	70	130	yes	yes
Molybdenum	SS2-1	3	mg/kg	nd	6	yes	178	0	426	yes	189	200	140	260	yes	yes
Nickel	SS2-1	2	mg/kg	nd	4	yes	105	86	114	yes	104	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: July 18/2001
Lab Ref # : G212613
Lab Quote#: EG009-0811

Client Ref#: ONT33826

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Phosphorus	na	20	mg/kg	nd	40	yes	119	77	123	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	106	61	136	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	114	51	149	yes	na	na	na	na	na	yes
Vanadium	SS2-1	1	mg/kg	nd	2	yes	104	81	119	yes	100	100	70	130	yes	yes
Zinc	SS2-1	5	mg/kg	nd	10	yes	103	87	113	yes	98	100	70	130	yes	yes
Sulphur as S	na	0.005	%	nd	0.01	yes	91	90	120	yes	na	na	na	na	na	yes
pH	na	0.01	Units	nd	0.02	yes	100	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Client:	Jacques Whitford Environment Ltd. 1200 Denison Street Markham, ON, CANADA L3R 8G6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	June 20/2001 July 18/2001 G212613 EG009-0811
Fax:	905-479-9326	Client Ref#:	ONT33826
Attn:	Mahaboob Alam		

Certificate of Analysis

Additional Comments:

Arsenic Selenium Bismuth Determination:
Sample SS2-1 was re-digested and re-run with matrix spike.

Antimony Determination:
Sample SS2-1 was re-digested on three seperate occasions with matrix spike. Recoveries were 64%, 48% and 64%.

Waters Soluble Boron Determination:
Sample SS5-1 was spiked with 1 mg/kg Boron. Recovery was 1.01 mg/kg (79%).

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: July 18/2001
Lab Ref # : G212613
Lab Quote #: EG009-0811

Analysis of Soil, expressed on a dry weight basis

Client Ref#: ONT33826

Parameter	EQL	Units	SS10-1	SS11-1	SS12-1	SS13-1	SS2-1
Mercury	0.01	mg/kg	0.06	0.11	0.06	0.04	0.05
Antimony	0.2	mg/kg	0.2	3.6	0.2	nd	nd
Arsenic	0.2	mg/kg	2.8	8.7	5.1	2.4	4.4
Bismuth	0.2	mg/kg	nd	0.3	0.2	nd	nd
Selenium	0.2	mg/kg	0.2	1.1	0.8	0.2	0.5
Chloride	0.5	mg/kg	216	133	147	104	22.2
Sulphate	5	mg/kg	180	29	320	32	56
Aluminum	20	mg/kg	8700	7420	14500	9700	5190
Barium	5	mg/kg	82	127	107	41	46
Beryllium	0.2	mg/kg	0.3	0.3	0.6	0.6	0.2
Boron(Hot water soluble)	0.2	mg/kg	nd	0.3	0.3	0.2	nd
Cadmium	0.5	mg/kg	nd	0.7	nd	nd	nd
Chromium	1	mg/kg	16	36	21	13	10
Cobalt	2	mg/kg	8	19	19	4	8
Copper	1	mg/kg	43	106	70	11	44
Iron	50	mg/kg	13300	14000	25100	11100	11900
Lead	5	mg/kg	16	256	34	13	26
Manganese	1	mg/kg	388	310	440	166	286
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	102	674	493	15	289
Phosphorus	20	mg/kg	1660	1080	1260	736	1060
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	81	103	99	42	140
Vanadium	1	mg/kg	19	19	30	20	20
Zinc	5	mg/kg	75	307	99	45	71
Sulphur as S	0.005	%	0.080	0.076	0.080	0.060	0.060
pH	0.01	Units	7.04	7.52	6.84	7.04	6.65

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: July 18/2001
Lab Ref # : G212613
Lab Quote #: EG009-0811

Analysis of Soil, expressed on a dry weight basis

Client Ref#: ONT33826

Parameter	EQL	Units	SS2-1 Replicate	SS4-1	SS5-1	SS6-1	SS8-1
Mercury	0.01	mg/kg	0.06	0.09	0.06	0.09	0.04
Antimony	0.2	mg/kg	nd	0.2	nd	nd	0.3
Arsenic	0.2	mg/kg	4.5	7.1	7.5	0.5	8.6
Bismuth	0.2	mg/kg	nd	0.4	nd	nd	nd
Selenium	0.2	mg/kg	0.5	1.5	0.3	0.8	0.4
Chloride	0.5	mg/kg	22.4	25.6	48.4	23.8	91.3
Sulphate	5	mg/kg	59	68	38	20	423
Aluminum	20	mg/kg	5510	16900	10600	4760	12900
Barium	5	mg/kg	47	133	75	57	69
Beryllium	0.2	mg/kg	0.2	0.8	0.5	nd	0.5
Boron(Hot water soluble)	0.2	mg/kg	nd	0.8	0.2	0.3	nd
Cadmium	0.5	mg/kg	nd	0.9	0.6	nd	nd
Chromium	1	mg/kg	11	23	16	8	19
Cobalt	2	mg/kg	8	20	7	8	9
Copper	1	mg/kg	48	105	25	44	37
Iron	50	mg/kg	12300	19400	12500	8170	16900
Lead	5	mg/kg	28	32	19	222	29
Manganese	1	mg/kg	295	221	235	145	422
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	303	778	27	321	185
Phosphorus	20	mg/kg	1050	917	913	777	1200
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	142	35	77	90	90
Vanadium	1	mg/kg	21	30	23	13	26
Zinc	5	mg/kg	74	125	63	98	64
Sulphur as S	0.005	%	0.062	0.088	0.076	0.042	0.076
pH	0.01	Units	-	6.00	6.94	7.14	6.63

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
- Not Requested
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: July 18/2001
Lab Ref # : G212613
Lab Quote #: EG009-0811

Analysis of Soil, expressed on a dry weight basis

Client Ref#: ONT33826

Parameter	EQL	Units	SS9-1				
Mercury	0.01	mg/kg	0.04				
Antimony	0.2	mg/kg	nd				
Arsenic	0.2	mg/kg	3.2				
Bismuth	0.2	mg/kg	nd				
Selenium	0.2	mg/kg	0.3				
Chloride	0.5	mg/kg	8.7				
Sulphate	5	mg/kg	57				
Aluminum	20	mg/kg	12800				
Barium	5	mg/kg	69				
Beryllium	0.2	mg/kg	0.5				
Boron(Hot water soluble)	0.2	mg/kg	nd				
Cadmium	0.5	mg/kg	nd				
Chromium	1	mg/kg	16				
Cobalt	2	mg/kg	8				
Copper	1	mg/kg	27				
Iron	50	mg/kg	18300				
Lead	5	mg/kg	21				
Manganese	1	mg/kg	287				
Molybdenum	3	mg/kg	nd				
Nickel	2	mg/kg	120				
Phosphorus	20	mg/kg	909				
Silver	1	mg/kg	nd				
Titanium	5	mg/kg	106				
Vanadium	1	mg/kg	26				
Zinc	5	mg/kg	59				
Sulphur as S	0.005	%	0.048				
pH	0.01	Units	7.18				

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order: G212613

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M. ALAM

Phone: _____ Fax: _____

PAS Quote # : JWEL-INCO SPECIAL

Client P.O. # : _____

Client Project # : ONT 33826

Sampled by: _____

JUN 20 '01 PM 1:57

Please specify Guideline (if applicable) RES. TABLE A,

Page _____ of _____

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH* Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP-MS: Ni, Cu, Co, Fe, Pb, Zn, Cr, Al, Ag, Ba, Be, Mn, S	Boron (Hot Extr.)	pH	SO4, Cl	AAS: As, Sb Se, Hg	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	SS2-1			✓	✓	✓	✓	✓	SOIL	1	DISCUSS WITH
2	SS4-1			✓	✓	✓	✓	✓	"	1	M. ALAM, MATRIX
3	SS5-1			✓	✓	✓	✓	✓	"	1	SPIKE NEEDS TO BE
4	SS6-1			✓	✓	✓	✓	✓	"	1	DONE ON THESE
5	SS8-1			✓	✓	✓	✓	✓	"	1	SAMPLES
6	SS9-1			✓	✓	✓	✓	✓	"	1	
7	SS10-1			✓	✓	✓	✓	✓	"	1	
8	SS11-1			✓	✓	✓	✓	✓	"	1	
9	SS12-1			✓	✓	✓	✓	✓	"	1	
10	SS13-1			✓	✓	✓	✓	✓	"	1	
11											
12											

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: K. Walton	Date: 01/06/20	Time: 13:57	Condition of samples upon receipt at lab: NOTICE

Rev. COC15-11-00

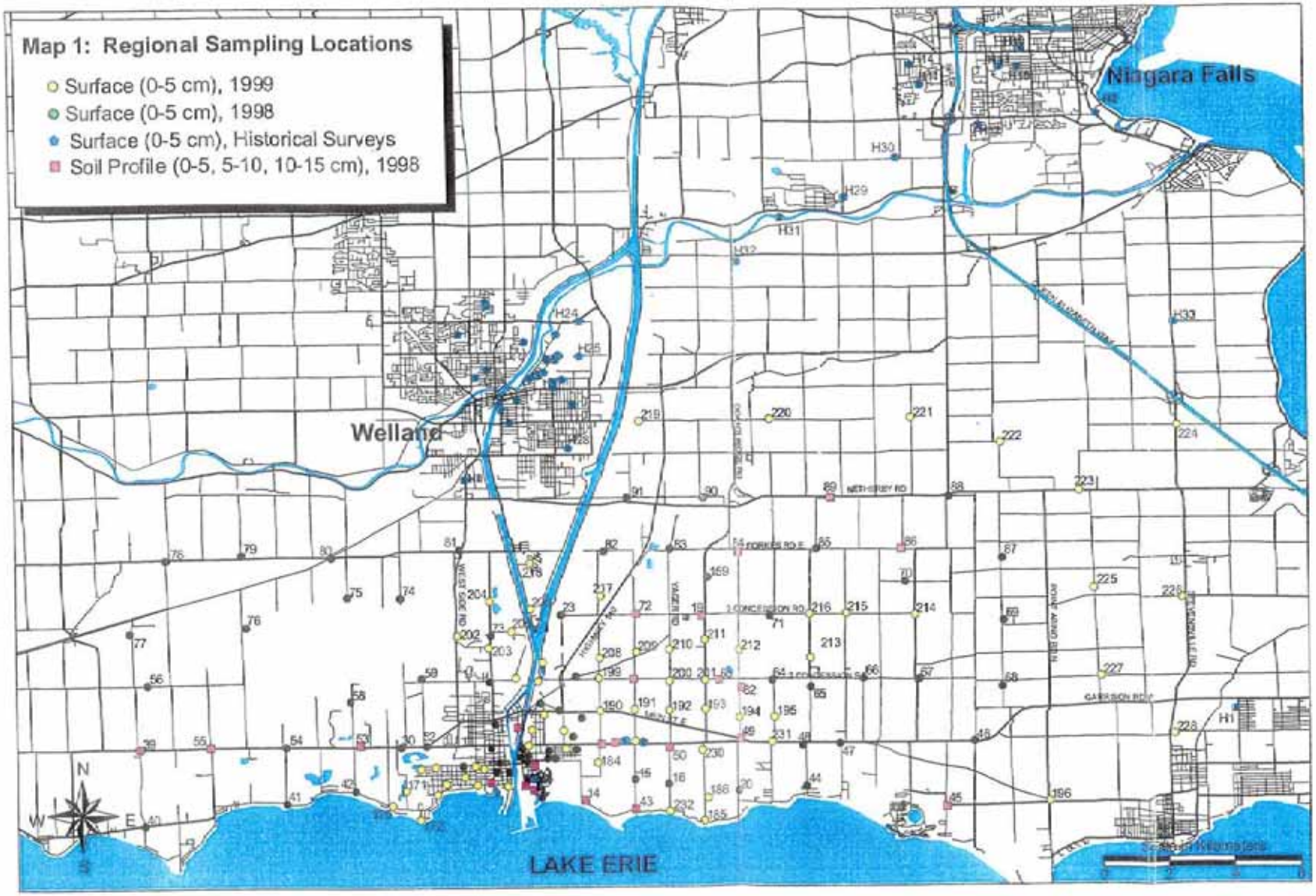
White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº [redacted] 3165

APPENDIX F

APPENDIX F1

SAMPLE LOCATION MAP MOE 1998 AND 1999 ARCHIVED SOIL SAMPLES


Map 1: Regional Sampling Locations
Surface (0-5 cm), 1999
Surface (0-5 cm), 1998
Surface (0-5 cm), Historical Surveys
Soil Profile (0-5, 5-10, 10-15 cm), 1998
Niagara Falls
Welland
LAKE ERIE
N
S
E
W


Map 2: City Sampling Locations
(Port Colborne)
Surface (0-5 cm), 1999
Surface (0-5 cm), 1998
Surface (0-5 cm), Historical Surveys
Soil Profile (0-5, 5-10, 10-15 cm), 1998
HIGHWAY 140
BARRICK RD
MAIN ST E
KILLALY ST W
WEST SIDE RD
MINOR RD
ELM ST
ELIZABETH ST
SNIDER RD
LORRAINE RD
AUGUSTINE RD
LAKE ERIE
N
S
E
W

APPENDIX F2

TABLE 1: MOE 1998 AND 1999 ARCHIVED SOIL SAMPLES:

SOIL ANALYTICAL RESULTS (ARSENIC AND SELENIUM) AND COMPARATIVE GUIDELINES

TABLE 1
SOIL ANALYTICAL RESULTS AND COMPARATIVE CRITERIA
(Arsenic and Selenium)
MOE 1998 and 1999 Archived Soil Samples
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

SAMPLE LOCATION[a] (STATION NUMBER)	LAND USE CATEGORY	ARSENIC	MOE LAND USE CRITERIA[b]	SELENIUM	MOE LAND USE CRITERIA[b]
Station # 001	Residential Property	16.1	25	3.8	10
Station # 002	Boulevard	12.2	25	2.2	10
Station # 003	Parkland (Open Space)	12.2	25	1.4	10
Station # 004	Residential Property	14.4	25	2.7	10
Station # 005	Boulevard	5.0	25	1.2	10
Station # 006	Residential Property	5.1	25	0.8	10
Station # 007	Boulevard	3.1	25	0.5	10
Station # 008	Residential Property	5.5	25	1.4	10
Station # 009	Residential Property	14.4	25	2.4	10
Station # 010	Boulevard	2.2	25	<0.2	10
Station # 011	Institutional (School Yard))	7.6	25	1.6	10
Station # 012	Boulevard (Right of Way)	3.9	25	<0.2	10
Station # 014	Residential Property	3.8	25	0.9	10
Station # 015	Boulevard (Right of Way)	8.0	25	3.4	10
Station # 016	Residential Property	3.0	25	0.8	10
Station # 017	Boulevard (Right of Way)	4.0	25	0.5	10
Station # 019	Residential Property	3.0	25	0.2	10
Station # 020	Institutional Property	2.8	25	0.5	10
Station # 023	Residential (ROW)	4.2	25	0.3	10
Station # 024	Boulevard	10.1	25	2.8	10
Station # 025	Boulevard)	3.5	25	0.6	10
Station # 026	Boulevard	3.1	25	1.0	10
Station # 027	Boulevard	1.9	25	<0.2	10
Station # 028	Boulevard (Right of Way)	7.4	25	2.3	10
Station # 029	Residential Property	5.6	25	0.8	10
Station # 030	Commercial Property	4.2	25	0.3	10
Station # 031	Boulevard (Right of Way)	2.4	25	0.8	10

Notes:

a - Sample locations are provided in Drawing 1, Appendix C.

b - Ontario Ministry of the Environment's *Guideline for Use At Contaminated Sites in Ontario*, February 1997, (Table A) Potable groundwater use at residential/parkland land use with medium and fine textured soils for all category of land uses except agricultural for which medium grained soils agricultural land use criteria were used (in italics).

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS AND COMPARATIVE CRITERIA
(Arsenic and Selenium)
MOE 1998 and 1999 Archived Soil Samples
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

SAMPLE LOCATION[a] (STATION NUMBER)	LAND USE CATEGORY	ARSENIC	MOE LAND USE CRITERIA[b]	SELENIUM	MOE LAND USE CRITERIA[b]
Station # 032	Parkland	3.0	25	0.8	10
Station # 033	Parkland	4.0	25	0.4	10
Station # 034	Boulevard	3.7	25	1.2	10
Station # 035	Parkland (Baseball Park)	7.1	25	0.5	10
Station # 036	Parkland (Athletic Field)	4.2	25	0.3	10
Station # 037	Parkland	4.9	25	1.0	10
Station # 038	Boulevard	2.4	25	0.3	10
Station # 039	Residential Property	2.0	25	<0.2	10
Station # 040	Institutional (Fire Hall)	3.6	25	0.2	10
Station # 041	Boulevard (Right of Way)	3.2	25	0.3	10
Station # 042	Residential Property	1.8	25	0.2	10
Station # 043	Boulevard (Right of Way)	5.7	25	0.8	10
Station # 044	Residential Property	1.8	25	0.3	10
Station # 045	Residential Property	3.8	25	0.3	10
Station # 046	Boulevard (Right of Way)	2.5	25	0.2	10
Station # 047	Residential Property	2.4	25	0.3	10
Station # 048	Institutional (Church)	3.4	25	0.3	10
Station # 049	Residential Property	4.0	25	0.3	10
Station # 050	Residential Property	3.3	25	0.4	10
Station # 051	Residential Property	10.7	25	2.5	10
Station # 052	Commercial Property	4.8	25	0.3	10
Station # 053	Commercial Property	3.1	25	<0.2	10
Station # 054	Boulevard (Right of Way)	4.1	25	0.3	10
Station # 055	Residential Property	2.4	25	0.3	10
Station # 056	Residential Property	2.0	25	0.2	10
Station # 058	Residential Property	3.5	25	0.3	10
Station # 059	Residential Property	3.9	25	0.4	10
Station # 060	Residential Property	2.4	25	0.2	10
Station # 061	Residential Property	4.1	25	0.4	10
Station # 062	Residential Property	4.4	25	0.8	10
Station # 063	Institutional (Cemetery)	5.1	25	0.6	10
Station # 064	Parkland (Golf Course)	10.0	25	1.1	10
Station # 065	Residential Property	4.2	25	0.4	10

Notes:

a - Sample locations are provided in Drawing 1, Appendix C.

b - Ontario Ministry of the Environment's *Guideline for Use At Contaminated Sites in Ontario*, February 1997, (Table A) Potable groundwater use at residential/parkland land use with medium and fine textured soils for all category of land uses except agricultural for which medium grained soils agricultural land use criteria were used (in italics).

Potential CoC Identification In Accordance With TSOW Condition No. 2
Project No. ONT34645

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS AND COMPARATIVE CRITERIA
(Arsenic and Selenium)
MOE 1998 and 1999 Archived Soil Samples
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

SAMPLE LOCATION[a] (STATION NUMBER)	LAND USE CATEGORY	ARSENIC	MOE LAND USE CRITERIA[b]	SELENIUM	MOE LAND USE CRITERIA[b]
Station # 066	Residential Property	2.1	25	<0.2	10
Station # 067	Residential Property	4.2	25	0.3	10
Station # 068	Residential Property	4.0	25	0.3	10
Station # 069	Residential Property	4.2	25	<0.2	10
Station # 070	Residential Property	4.0	25	0.4	10
Station # 071	Residential Property	1.3	25	<0.2	10
Station # 072	Residential Property	4.2	25	0.3	10
Station # 073	Commercial Property	2.9	25	0.2	10
Station # 074	Residential Property	3.1	25	0.3	10
Station # 075	Residential Property	4.3	25	0.6	10
Station # 076	Residential Property	2.2	25	<0.2	10
Station # 077	Residential Property	3.0	25	0.3	10
Station # 078	Boulevard (Right of Way)	2.7	25	<0.2	10
Station # 079	Boulevard (Right of Way)	3.5	25	<0.2	10
Station # 080	Residential Property	3.3	25	<0.2	10
Station # 081	Residential Property	3.3	25	<0.2	10
Station # 082	Residential Property	3.8	25	0.2	10
Station # 083	Residential Property	4.0	25	0.2	10
Station # 084	Commercial Property	4.0	25	0.2	10
Station # 085	Residential Property	4.0	25	0.2	10
Station # 086	Residential Property	4.4	25	0.2	10
Station # 087	Residential Property	3.9	25	0.3	10
Station # 088	Boulevard (Right of Way)	2.8	25	0.2	10
Station # 090	Residential Property	3.9	25	0.2	10
Station # 091	Residential Property	3.1	25	0.2	10
Station # 170	Right of Way	2.5	25	0.3	10
Station # 171	Right of Way	5.2	25	0.7	10
Station # 172	Agricultural (Vacant Lot)	1.3	*25*	0.2	*2*
Station # 173	Agricultural (Vacant lot)	1.5	*25*	<0.2	*2*
Station # 174	Residential Property	3.1	25	0.4	10
Station # 175	Residential Property	4.2	25	0.5	10
Station # 176	Parkland	1.9	25	<0.2	10
Station # 177	Residential (Lawn)	5.8	25	1.0	10
Station # 178	Woodlot	5.8	25	0.8	10
Station # 179	Residential Property	3.0	25	0.4	10
Station # 180	Institutional (School Yard)	3.8	25	0.2	10
Station # 181	Boulevard	2.9	25	0.6	10
Station # 182	Residential (Lawn)	6.9	25	0.8	10

Notes:

a - Sample locations are provided in Drawing 1, Appendix C.

b - Ontario Ministry of the Environment's *Guideline for Use At Contaminated Sites in Ontario*, February 1997, (Table A) Potable groundwater use at residential/parkland land use with medium and fine textured soils for all category of land uses except agricultural for which medium grained soils agricultural land use criteria were used (in italics).

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS AND COMPARATIVE CRITERIA
(Arsenic and Selenium)
MOE 1998 and 1999 Archived Soil Samples
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

SAMPLE LOCATION[a] (STATION NUMBER)	LAND USE CATEGORY	ARSENIC	MOE LAND USE CRITERIA[b]	SELENIUM	MOE LAND USE CRITERIA[b]
Station # 183	Boulevard	5.9	25	1.2	10
Station # 184	Right of Way	9.0	25	2.4	10
Station # 185	Woodlot	1.9	25	0.4	10
Station # 186	Woodlot	3.2	25	1.6	10
Station # 187	Residential Property	4.7	25	0.8	10
Station # 188	Woodlot	4.9	25	1.0	10
Station # 189	Residential Property	4.7	25	0.8	10
Station # 190	Boulevard	5.1	25	0.9	10
Station # 191	Residential Property	4.3	25	0.4	10
Station # 192	Field	4.6	*25*	1.0	*2*
Station # 193	Field	4.2	*25*	0.7	*2*
Station # 194	Woodlot	5.3	25	1.4	10
Station # 195	Woodlot	5.3	25	0.8	10
Station # 196	Woodlot	3.5	25	0.3	10
Station # 197	Boulevard	3.3	25	0.6	10
Station # 198	Right of Way	4.0	25	0.4	10
Station # 199	Right of Way	3.7	25	0.4	10
Station # 200	Woodlot	5.3	25	1.6	10
Station # 201	Residential (Lawn)	4.1	25	0.7	10
Station # 202	Residential (Lawn)	3.1	25	0.3	10
Station # 203	Residential (Lawn)	2.9	25	<0.2	10
Station # 204	Residential property	4.2	25	0.8	10
Station # 205	Right of Way	2.6	25	<0.2	10
Station # 206	Parkland	4.2	25	0.7	10
Station # 207	Boulevard	4.0	25	0.6	10
Station # 208	Right of Way	4.3	25	<0.2	10
Station # 209	Right of Way	5.6	25	0.4	10
Station # 210	Field	4.6	*25*	1.0	*2*
Station # 211	Field	4.1	*25*	0.5	*2*
Station # 212	Field	5.3	*25*	0.6	*2*
Station # 213	Woodlot	4.1	25	0.8	10
Station # 214	Woodlot	4.9	25	1.6	10
Station # 215	Woodlot	3.5	25	0.5	10
Station # 216	Field	4.5	*25*	1.3	*2*
Station # 217	Residential Property	3.1	25	0.3	10
Station # 218	Residential Property	3.3	25	0.3	10
Station # 219	Field	5.3	*25*	0.2	*2*

Notes:

a - Sample locations are provided in Drawing 1, Appendix C.

b - Ontario Ministry of the Environment's *Guideline for Use At Contaminated Sites in Ontario*, February 1997, (Table A) Potable groundwater use at residential/parkland land use with medium and fine textured soils for all category of land uses except agricultural for which medium grained soils agricultural land use criteria were used (in italics).

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS AND COMPARATIVE CRITERIA
(Arsenic and Selenium)
MOE 1998 and 1999 Archived Soil Samples
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

SAMPLE LOCATION[a] (STATION NUMBER)	LAND USE CATEGORY	ARSENIC	MOE LAND USE CRITERIA[b]	SELENIUM	MOE LAND USE CRITERIA[b]
Station # 220	Woodlot	6.1	25	0.7	10
Station # 221	Woodlot	3.1	25	1.1	10
Station # 222	Woodlot	3.9	25	0.8	10
Station # 223	Woodlot	5.1	25	0.4	10
Station # 224	Woodlot	4.7	25	0.4	10
Station # 225	Woodlot	4.9	25	0.5	10
Station # 226	Field	6.4	*25*	0.4	*2*
Station # 227	Woodlot	3.8	25	0.3	10
Station # 228	Residential (Lawn)	4.2	25	0.3	10
Station # 229	Residential Property	4.2	25	0.8	10
Station # 230	Woodlot	9.4	25	2.5	10
Station # 231	Institutional (School Yard)	3.7	25	0.3	10
Station # 232	Woodlot	3.0	25	0.3	10
Station # 233	Right of Way	4.3	25	0.5	10

Notes:

a - Sample locations are provided in Drawing 1, Appendix C.

b - Ontario Ministry of the Environment's *Guideline for Use At Contaminated Sites in Ontario*, February 1997, (Table A) Potable groundwater use at residential/parkland land use with medium and fine textured soils for all category of land uses except agricultural for which medium grained soils agricultural land use criteria were used (in italics).

APPENDIX F3

LABORATORY CERTIFICATES OF CHEMICAL ANALYSES: MOE 1998 AND 1999 ARCHIVED SOIL SAMPLES (ARSENIC AND SELENIUM)

PSC

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Kevin Wong/Eric Veska

Date Received:	January 18/2001
Date Reported:	February 5/2001
Lab Ref#:	G210186
Lab Quote#:	EG009-0811
Client PO#:	Port Colborne
Client Ref#:	INCO
Sampled By:	MOE

Certificate of Analysis

Analysis Performed:	Arsenic, Hydride Generation AA Selenium, Hydride Generation
Methodology:	1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption. U.S. EPA Method No. 7061(Modifications) 2) Analysis of selenium in soil by hydride generation. U.S. EPA Method No. 7741(Modification)
Instrumentation:	1) Varian VGA 76 2) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
Sample Description:	Soil
QA/QC:	Refer to CERTIFICATE OF QUALITY CONTROL report.
Results:	Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Service Manager

Certified By
for N. Boulton, B.Sc., C.Chem.
Customer Service Manager

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Date Reported: February 5/2001
Lab Ref # : G210186
Lab Quote#: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	na	0.2	mg/kg	nd	0.5	yes	106	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	117	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	117	84	120	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8287 2292076	8287 2292076 Replicate	8289 2292077	8291 2292075	8293 2292080
Arsenic	0.2	mg/kg	2.2	2.2	3.0	4.3	3.3
Selenium	0.2	mg/kg	nd	nd	0.3	0.6	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8295 2292078	8297 2292079	8299 2292081	8301 2292074	8305 2292060
Arsenic	0.2	mg/kg	2.7	3.5	3.3	3.1	2.4
Selenium	0.2	mg/kg	nd	nd	nd	0.3	0.2

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8307 2292059	8309 2292058	8311 2292044	8313 2292048	8315 2292047
Arsenic	0.2	mg/kg	3.9	3.5	1.8	3.4	2.4
Selenium	0.2	mg/kg	0.4	0.3	0.3	0.3	0.3

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8317 2292046	8319 2292068	8319 2292068 Replicate	8321 2292069	8324 2292087
Arsenic	0.2	mg/kg	2.5	4.0	4.0	4.2	3.9
Selenium	0.2	mg/kg	0.2	0.3	0.3	nd	0.3

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8326 2292088	8327 2292067	8329 2292066	8331 2292065	8333 2292061
Arsenic	0.2	mg/kg	2.8	4.2	2.1	4.2	4.1
Selenium	0.2	mg/kg	0.2	0.3	nd	0.4	0.4

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8337 2292070	8339 2292085	8341 2292071	8343 2292083	8345 2292082
Arsenic	0.2	mg/kg	4.0	4.0	1.3	4.0	3.8
Selenium	0.2	mg/kg	0.4	0.2	nd	0.2	0.2

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8348 2292091	8350 2292090	8351 2292029	8351 2292029 Replicate	8353 2292003
Arsenic	0.2	mg/kg	3.1	3.9	5.6	5.6	12.2
Selenium	0.2	mg/kg	0.2	0.2	0.8	0.8	1.4

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8355 2292064	8359 2292004	8365 2292017	8371 2292014	8377 2292011
Arsenic	0.2	mg/kg	10.0	14.4	4.0	3.8	7.6
Selenium	0.2	mg/kg	1.1	2.7	0.5	0.9	1.6

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8383 2292012	8427 2292039	8433 2292055	8439 2292053	8445 2292037
Arsenic	0.2	mg/kg	3.9	2.0	2.4	3.1	4.9
Selenium	0.2	mg/kg	nd	nd	0.3	nd	1.0

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8451 2292033	8457 2292051	8463 2292043	8469 2292050	8469 2292050 Replicate
Arsenic	0.2	mg/kg	4.0	10.7	5.7	3.3	3.3
Selenium	0.2	mg/kg	0.4	2.5	0.8	0.4	0.4

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8475 2292049	8481 2292045	8487 2292063	8493 2292062	8499 2292019
Arsenic	0.2	mg/kg	4.0	3.8	5.1	4.4	3.0
Selenium	0.2	mg/kg	0.3	0.3	0.6	0.8	0.2

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210186
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8503 2292073	8505 2292072	8511 2292084	8517 2292086	
Arsenic	0.2	mg/kg	2.9	4.2	4.0	4.4	
Selenium	0.2	mg/kg	0.2	0.3	0.2	0.2	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Eric Veska/Kevin Wong

Date Received:	January 17/2001
Date Reported:	February 5/2001
Lab Ref#:	G210182
Lab Quote#:	EG009-0811
Client PO#:	Port Colborne
Client Ref#:	INCO
Sampled By:	MOE

Certificate of Analysis

Analysis Performed:	Arsenic, Hydride Generation AA Selenium, Hydride Generation
Methodology:	1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption. U.S. EPA Method No. 7061(Modifications) 2) Analysis of selenium in soil by hydride generation. U.S. EPA Method No. 7741(Modification)
Instrumentation:	1) Varian VGA 76 2) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
Sample Description:	Soil
QA/QC:	Refer to CERTIFICATE OF QUALITY CONTROL report.
Results:	Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Date Reported: February 5/2001
Lab Ref # : G210182
Lab Quote#: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	na	0.2	mg/kg	nd	0.5	yes	100	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	102	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	1360 2000	1369 2000	1372 2000	3344 2000	3356 2000
Arsenic	0.2	mg/kg	37.7	26.6	4.8	7.4	2.5
Selenium	0.2	mg/kg	5.9	5.3	1.0	0.6	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	5203 2000	5254 2000	5287 2000	5290 2000	5293 2000
Arsenic	0.2	mg/kg	9.3	6.7	6.7	7.8	5.1
Selenium	0.2	mg/kg	1.8	1.2	1.2	1.4	1.2

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6278 2292171	6280 2292170	6282 2292172	6284 2292173	6286 2292179
Arsenic	0.2	mg/kg	5.2	2.5	1.3	1.5	3.0
Selenium	0.2	mg/kg	0.7	0.3	0.2	nd	0.4

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6286 2292179 Replicate	6288 2292178	6290 2292181	6292 2292180	6294 2292176
Arsenic	0.2	mg/kg	3.0	5.8	2.9	3.8	1.9
Selenium	0.2	mg/kg	0.4	0.8	0.6	0.2	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6296 2292174	6298 2292175	6300 2292177	6302 2292182	6304 2292187
Arsenic	0.2	mg/kg	3.1	4.2	5.8	6.9	4.7
Selenium	0.2	mg/kg	0.4	0.5	1.0	0.8	0.8

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6306 2292189	6308 2292188	6310 2292183	6312 2292184	6314 2292190
Arsenic	0.2	mg/kg	4.7	4.9	5.9	9.0	5.1
Selenium	0.2	mg/kg	0.8	1.0	1.2	2.4	0.9

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6316 2292229	6316 2292229 Replicate	6318 2292191	6320 2292209	6322 2292199
Arsenic	0.2	mg/kg	4.2	4.2	4.3	5.6	3.7
Selenium	0.2	mg/kg	0.8	0.8	0.4	0.4	0.4

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6324 2292208	6326 2292217	6328 2292198	6330 2292207	6332 2292197
Arsenic	0.2	mg/kg	4.3	3.1	4.0	4.0	3.3
Selenium	0.2	mg/kg	nd	0.3	0.4	0.6	0.6

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6334 2292203	6336 2292202	6338 2292233	6340 2292205	6342 2292204
Arsenic	0.2	mg/kg	2.9	3.1	4.3	2.6	4.2
Selenium	0.2	mg/kg	nd	0.3	0.5	nd	0.8

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected I = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6344 2292206	6346 2292218	6346 2292218 Replicate	6362 2292219	6364 2292220
Arsenic	0.2	mg/kg	4.2	3.3	3.3	5.3	6.1
Selenium	0.2	mg/kg	0.7	0.3	0.3	0.2	0.7

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Eric Veska/Kevin Wong

Report Date: February 5/2001
Lab Ref # : G210182
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6366 2292221	6368 2292222	PE SAMPLE PB2	PE SAMPLE PB2 Replicate	
Arsenic	0.2	mg/kg	3.1	3.9	6.6	6.6	
Selenium	0.2	mg/kg	1.1	0.8	2.4	2.4	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order: 33826.
Comments: 6210182

CHAIN OF CUSTODY RECORD

Client: JACQUES WHITFORD ENV. LTD.
1200 DENISON ST.
MARKHAM ONT.
Contact: ERIC VESKA / KEVIN WONG
Phone: 416 (495) 8614 Fax: (905) 479-9326

PAS Quote #: INCO - Port Colborne Page ___ of ___
Client P.O. #:
Client Project #:
Sampled by: MOE.
Please specify Guideline (if applicable) TABLE A OR LOWER.

Invoice to (if other than above):

Analysis Required: AAP - incl As Se; aqua rega method

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab
(STD) 5-7 Business Days
RUSH Specify Date ___
Time ___

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	AAP - incl As Se	aqua rega method	Sample Matrix	No. of Containers	Comments/Contamination/Site History
1	Total 160 samples					soil	160.	samples have
2	see attached letter							been dried /
3								sieved by
4								MOEE.
5								
6								
7								
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature): [signature] Date: 17/01/01 Time: 3:55 Method of Shipment: client dropped off
Samples Received in lab by: [signature] Date: 17/01/01 Time: 3:55 Condition of samples upon receipt at lab: 19°C

Rev. COC03-10-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 00 - [illegible]

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Kevin Wong/Eric Veska

Date Received:	January 18/2001
Date Reported:	February 5/2001
Lab Ref#:	G210187
Lab Quote#:	EG009-0811
Client PO#:	Port Colborne
Client Ref#:	INCO
Sampled By:	MOE

Certificate of Analysis

Analysis Performed:	Arsenic, Hydride Generation AA Selenium, Hydride Generation
Methodology:	1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption. U.S. EPA Method No. 7061(Modifications) 2) Analysis of selenium in soil by hydride generation. U.S. EPA Method No. 7741(Modification)
Instrumentation:	1) Varian VGA 76 2) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
Sample Description:	Soil
A/QC:	Refer to CERTIFICATE OF QUALITY CONTROL report.
Results:	Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Date Reported: February 5/2001
Lab Ref # : G210187
Lab Quote#: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	na	0.2	mg/kg	nd	0.5	yes	109	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	115	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	115	84	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	nd	0.5	yes	120	84	120	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	na	na	na	na	na	yes
Selenium	na	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6370 2292224	6370 2292224 Replicate	6372 2292223	6374 2292225	6376 2292226
Arsenic	0.2	mg/kg	4.7	4.7	5.1	4.9	6.4
Selenium	0.2	mg/kg	0.4	0.4	0.4	0.5	0.4

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6378 2292196	6380 2292228	6382 2292227	6384 2292214	6386 2292215
Arsenic	0.2	mg/kg	3.5	4.2	3.8	4.9	3.5
Selenium	0.2	mg/kg	0.3	0.3	0.3	1.6	0.5

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6388 2292216	6390 2292213	6392 2292195	6394 2292231	6396 2292210
Arsenic	0.2	mg/kg	4.5	4.1	5.3	3.7	4.6
Selenium	0.2	mg/kg	1.3	0.8	0.8	0.3	1.0

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6398 2292200	6400 2292192	6402 2292232	6404 2292185	6406 2292186
Arsenic	0.2	mg/kg	5.3	4.6	3.0	1.9	3.2
Selenium	0.2	mg/kg	1.6	1.0	0.3	0.4	1.6

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6408 2292230	6410 2292193	6412 2292201	6412 2292201 Replicate	6414 2292211
Arsenic	0.2	mg/kg	9.4	4.2	4.1	4.2	4.1
Selenium	0.2	mg/kg	2.5	0.7	0.7	0.7	0.5

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	6416 2292212	6418 2292194	8227 2292026	8229 2292034	8231 2292027
Arsenic	0.2	mg/kg	5.3	5.3	3.1	3.7	1.9
Selenium	0.2	mg/kg	0.6	1.4	1.0	1.2	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8233 2292038	8235 2292036	8237 2292030	8239 2292035	8241 2292032
Arsenic	0.2	mg/kg	2.4	4.2	4.2	7.1	3.0
Selenium	0.2	mg/kg	0.3	0.3	0.3	0.5	0.8

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8243 2292031	8245 2292010	8247 2292008	8249 2292007	8249 2292007 Replicate
Arsenic	0.2	mg/kg	2.4	2.2	5.5	3.1	3.1
Selenium	0.2	mg/kg	0.3	nd	1.4	0.5	0.5

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
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Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8251 2292009	8253 2292025	8255 2292001	8257 2292002	8259 2292005
Arsenic	0.2	mg/kg	14.4	3.5	16.1	12.2	5.0
Selenium	0.2	mg/kg	2.4	0.6	3.8	2.2	1.2

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8261 2292006	8263 2292028	8265 2292015	8267 2292016	8269 2292020
Arsenic	0.2	mg/kg	5.1	7.4	8.0	3.0	2.8
Selenium	0.2	mg/kg	0.8	2.3	3.4	0.8	0.5

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
Lab Quote #: EG009-0811
Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8271 2292023	8273 2292024	8275 2292052	8277 2292054	8279 2292041
Arsenic	0.2	mg/kg	4.2	10.1	4.8	4.1	3.2
Selenium	0.2	mg/kg	0.3	2.8	0.3	0.3	0.3

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Kevin Wong/Eric Veska

Report Date: February 5/2001
Lab Ref # : G210187
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Client PO#: Port Colborne
Client Ref#: INCO

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	8279 2292041 Replicate	8281 2292042	8283 2292040	8285 2292056	
Arsenic	0.2	mg/kg	3.2	1.8	3.6	2.0	
Selenium	0.2	mg/kg	0.3	0.2	0.2	0.2	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

APPENDIX G

TEST PIT LOGS: JWEL AUGUST 2001 SOIL INVESTIGATION

SYMBOLS AND TERMS USED ON THE BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil	-	mixture of soil and humus capable of supporting good vegetative growth
Peat	-	fibrous fragments of visible and invisible decayed organic matter
Till	-	unstratified and unsorted glacial deposit which may include particle sizes from clay to boulders
Fill	-	materials not identified as deposited by natural geological processes

Terminology describing soil structure:

Desiccated	-	having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	-	material breaks along plane of fracture
Varved	-	composed of regular alternating layers of silt and clay
Stratified	-	alternating layers or beds greater than 6mm (¼") thick
Laminated	-	alternating layers or beds less than 6mm (¼") thick
Blocky	-	material can be broken into small and hard angular lumps
Lensed	-	irregular shaped pockets of soil with differing textures
Seam	-	a thin, confined layer of soil having different particle size, texture, or color from materials above and below
Well Graded	-	having wide range in grain sizes and substantial amounts of all intermediate particles sizes
Uniformly Graded	-	predominantly one grain size

Soil descriptions and classification are based on the Unified Soil Classification System (USCS) (ASTM D-2488), which classifies soils on the basis of engineering properties. The system divides soils into three major categories: (1) coarse grained, (2) fine-grained, and (3) highly organic. The soil is then subdivided based on either gradation or plasticity characteristics. This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification. The classification excludes particles larger than 76 mm.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

Trace or occasional	Less than 10%
Some	10-20%
With	20-30%

The standard terminology to describe cohesionless soils includes the compactness as determined by the Standard Penetration Test 'N'-value*.

Compactness	'N'-value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Continued Next Page

SYMBOLS AND TERMS USED ON THE BOREHOLE AND TEST PIT RECORDS

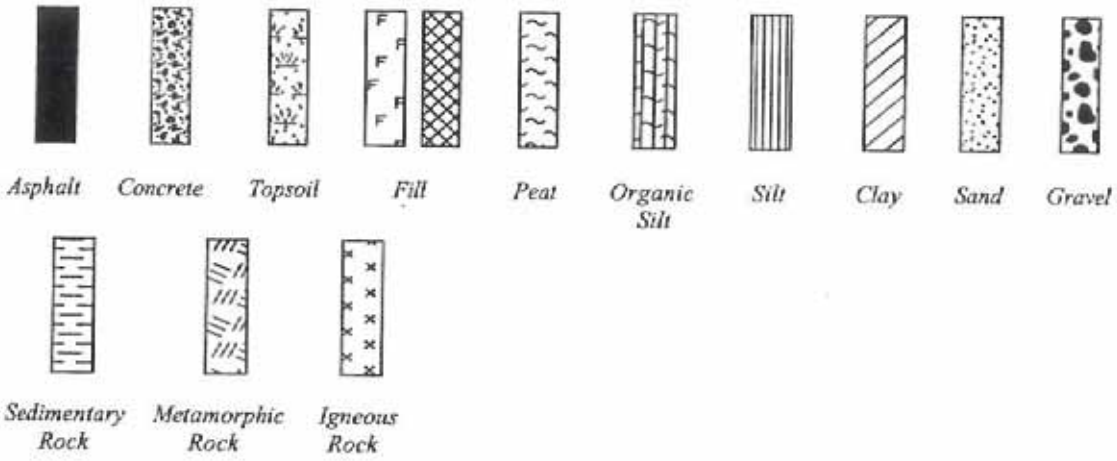
The standard terminology to describe cohesive soils includes consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests or similar field and laboratory analysis. Standard Penetration Test 'N'-values* can also be used to provide an approximate indication of the consistency and shear strength of fine grained, cohesive soils.

Consistency	Undrained Shear Strength (kPa)	'N'-Value
Very Soft	<12.5	<2
Soft	12.5-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

Note: *'N'-VALUE- The Standard Penetration Test records the number of blows of a 140 pound (64kg) hammer falling 30 inches (760mm), required to drive a 2 inch (50.8mm) O.D. split spoon sampler 1 foot (305mm). For split spoon samples where full penetration is not achieved, the number of blows is reported over the sampler penetration in millimeters (e.g. 50/75).

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



Asphalt *Concrete* *Topsoil* *Fill* *Peat* *Organic Silt* *Silt* *Clay* *Sand* *Gravel*

Sedimentary Rock *Metamorphic Rock* *Igneous Rock*

WATER LEVEL MEASUREMENT

Open Borehole or Test Pit

Monitoring Well, Piezometer or Standpipe

SAMPLE TYPE

SS	Split spoon sample (obtained from the Standard Penetration Test)
TW	Thin Wall Sample or Shelby Tube
PS	Piston sample
GS	Grab sample
AS	Auger sample
BS	Bulk sample
WS	Wash sample
HQ, NQ, BQ,etc.	Rock core samples obtained with the use of standard size diamond drilling bits.

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP1

CLIENT INCO

PROJECT No. ONT34646

LOCATION Northwest corner of Inco Refinery, South of Railway Tracks

DATUM ---

DATES: BORING 01/08/16

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm ● 20 40 60 80 ▲ 100 200 300 400	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		FILL: Yellowish brown, silty clay with rock fragments, occasional brick pieces, trace sand and rootlets	F				GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
		TOPSOIL: Dark brown to black, silty clay with rootlets and organics					GS	16		
		CLAY: Grey brown, silty clay, hard and compact, mottled, oxidized			2					
							GS	17		
		BEDROCK: Light grey, very hard carbonate bedrock					GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP2

CLIENT INCO

PROJECT No. ONT34646

LOCATION Northwest corner of Inco Refinery, South of Railway Tracks

DATUM ---

DATES: BORING 01/08/16

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark grey to brown silty clay with rootlets and organics, occasional yellowish red granules, oxidized and reworked, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
		CLAY: Grey silty clay, plastic, mottled yellow brown, oxidized, rootlets present, occasional yellowish red granules in the upper layers, become hard with depth					GS	13		
							GS	14		
							GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP3

CLIENT INCO

PROJECT No. ONT34646

LOCATION Northeast corner of Inco Refinery, South of Railway Tracks

DATUM ---

DATES: BORING 01/08/16

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 / ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark grey to black silty clay with rootlets and organics, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
		REWORKED CLAY: Grey clay, mottled with rootlets and organics, oxidized					GS	8		
							GS	9		
							GS	10		
							GS	11		
		CLAY: Grey to light grey silty clay, mottled yellow with rootlets.					GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP4

CLIENT INCO

PROJECT No. ONT34646

LOCATION Northeast corner of Louis Street and Davis Street

DATUM ---

DATES: BORING 01/08/21

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm ● 20 40 60 80 ▲ 100 200 300 400	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		FILL: Yellowish brown sand, medium grained, occasional rootlets with gravel, becoming clay mixed with gravel with depth, dark grey to black silty clay at depth, plastic					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
		END OF TEST PIT at 0.51 m			2					
1										

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP5

CLIENT INCO

PROJECT No. ONT34646

LOCATION Northeast corner of Inco Refinery, South of Railway Tracks

DATUM ---

DATES: BORING 01/08/16

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 / ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark grey to black silty clay with rootlets and organics, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
		CLAY: Grey to light grey silty clay, plastic, mottled yellow, oxidized, occasional yellowish red granules in the upper layer, becoming hard with depth			2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP6

CLIENT INCO

PROJECT No. ONT34646

LOCATION Northeast corner of Inco Refinery, South of Railway Tracks

DATUM ---

DATES: BORING 01/08/16

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm ● 20 40 60 80 ▲ 100 200 300 400	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark grey decomposed organic matter with silty clay, abundant rootlets, very moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP7

CLIENT INCO

PROJECT No. ONT34646

LOCATION Northern Part of Inco Refinery, South of Railway Tracks

DATUM ---

DATES: BORING 01/08/16

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm ● 20 40 60 80 ▲ 100 200 300 400	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark grey silty clay with rootlets and organics, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
		CLAY: Grey to light grey silty clay, plastic, mottled yellow, occasional rootlets, yellowish red granules in the upper layers, oxidized					GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP8

CLIENT INCO — PROJECT No. ONT34646

LOCATION Vacant Lot at Rodney Street, West of Fares Street — DATUM ---

DATES: BORING 01/08/15 — WATER LEVEL --- — TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 / ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark brown silty sand, medium grained with rootlets and organics, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
		FILL: Grey to yellow grey silty sand, medium grained with rootlets and occasional organics, moist					GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
		PEAT: Dark brown to black well decomposed organic matter, trace sand, occasional rootlets, very moist					GS	15		
							GS	16		
					2					
							GS	17		
1							GS	18		
		END OF TEST PIT at 1.1 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP9

CLIENT INCO — PROJECT No. ONT34646

LOCATION Rodney Street, (Front Yard) — DATUM ---

DATES: BORING 01/08/17 — WATER LEVEL --- — TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 / ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark brown sandy silt with rootlets and organics, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
		FILL: Brown to dark brown silty clay mixed with decomposed organic matter and sand lenses, occasional pieces of slag in the upper layer, moist					GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
		SAND: Grey to light grey silty sand with abundant organics, moist					GS	16		
		CLAY: Grey, Sandy clay, mottled yellow brown, oxidized with occasional sand lenses, moist			2					
							GS	17		
		SAND: Grey silty sand, very moist to wet								
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP10

CLIENT INCO

PROJECT No. ONT34646

LOCATION Vacant Lot South Rodney Street

DATUM ---

DATES: BORING 01/08/15

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 / ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark grey to brown silty clay with organics and rootlets, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
		FILL: Grey to light grey silty clay, rootlets, brick fragments, asphalt pieces and occasional sand, moist					GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
		SAND: Yellow to brown silty sand, medium grained, occasional rootlets, moist					GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP11

CLIENT INCO

PROJECT No. ONT34646

LOCATION South of Lake Road at the approach road of Hamilton Marine

DATUM ---

DATES: BORING 01/08/15

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 / ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		FILL: Grey, light grey to yellow brown silty sand, loose, occasional organics and rootlets in the upper layer, assorted mixture of glass, brick fragments, asphalt pieces, concrete and construction debris, ceramic tile, moist at the bottom			2		GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP12

CLIENT INCO

PROJECT No. ONT34646

LOCATION Central Part of former Algoma Plant

DATUM ---

DATES: BORING 01/08/15

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 / ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		FILL: Light brown to grey brown slag, loose at upper 5 cm then becoming very hard and solid	F				GS	1		Soil samples collected at 0-2.5 cm, 2.5-5 cm and 5-10 cm depth
							GS	2		
							GS	3		
		END OF TEST PIT at 0.10 m			2					
1										

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP13

CLIENT INCO

PROJECT No. ONT34646

LOCATION Former Coal Yard of Algoma Plant

DATUM ---

DATES: BORING 01/08/15

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm ● 20 40 60 80 ▲ 100 200 300 400	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		FILL: Grey to light grey sand and gravel, loose mixed with rock fragments, coal pieces, occasional slag, coarse sand, increasing large rock fragments with depth, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP14

CLIENT INCO

PROJECT No. ONT34646

LOCATION Former Algoma Plant, South of Coal Yard

DATUM ---

DATES: BORING 01/08/15

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm ● 20 40 60 80 ▲ 100 200 300 400	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		FILL: Brown to dark brown sand and gravel, loose mixed with black coal fragments, rock and sandy clay, increasing rock fragments with depth, moist	F				GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP15

CLIENT INCO

PROJECT No. ONT34646

LOCATION Vacant Inco Property, North of Lake Road

DATUM ---

DATES: BORING 01/08/15

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm ● 20 40 60 80 ▲ 100 200 300 400	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		FILL: Light grey to grey silty clay mixed with asphalt pieces, brick fragments, plastic pieces, concrete and wooden debris, moist, becoming dark brown and increasing clay content with depth					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP16

CLIENT INCO

PROJECT No. ONT34646

LOCATION Inco Refinery, East of Parking Lot

DATUM ---

DATES: BORING 01/08/17

WATER LEVEL ---

TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm ● 20 40 60 80 ▲ 100 200 300 400	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		FILL: Yellowish brown mixed clay, gravel and sand, black waste material, wooden debris, concrete pieces, brick fragments, frequent reddish brown mottled clay fragments, moist to very moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
							GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
							GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
							GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

JACQUES WHITFORD
ENVIRONMENT LIMITED

TEST PIT RECORD

TP17

CLIENT INCO — PROJECT No. ONT34646

LOCATION Rodney Street (Front Yard) — DATUM ---

DATES: BORING 01/08/17 — WATER LEVEL --- — TPC ELEV. ---

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppm (● 20 40 60 80 / ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
0		TOPSOIL: Dark grey to black sandy silt with rootlets and organics, moist					GS	1		Soil samples collected at every 2.5 cm interval to a depth of 30 cm and then at every 5 cm interval to a depth of 50 cm and then at 70 cm and 95 cm
							GS	2		
							GS	3		
							GS	4		
		FILL: Grey brown sandy silt with occasional yellow and brown mottled clay clasts, occasional slag, brick fragments and rootlets, moist					GS	5		
							GS	6		
							GS	7		
							GS	8		
							GS	9		
		PEAT/ORGANICS: Dark brown to black well decomposed organic matter with fine sand, rootlets, moist					GS	10		
							GS	11		
							GS	12		
							GS	13		
							GS	14		
		SAND: Grey brown silty sand, medium grained, weathers to yellow brown, oxidized, moist					GS	15		
							GS	16		
					2					
							GS	17		
							GS	18		
1		END OF TEST PIT at 1.0 m								

LABORATORY ANALYSES:

APPENDIX H

APPENDIX H1

TABLE 1 TO TABLE 18: SOIL ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: JWEL AUGUST 2001 AND OCTOBER 2001 SOIL SAMPLES

TABLE 1
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP1
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP1 (0-2.5 cm)	TP1 (2.5-5.0 cm)	TP1 (5.0-7.5 cm)	TP1 (10-12.5 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.4	0.3	0.4	0.5	13
Arsenic	9.3	10.9	7.8	6.7	25
Selenium	2.4	1.5	0.9	1.6	10
Aluminum	11800	15100	20300	20000	NV
Barium	107	120	144	140	1000
Beryllium	0.5	0.6	0.9	0.9	1.2
Cadmium	0.6	<0.5	<0.5	<0.5	12
Chromium	19	23	27	27	1000
Cobalt	**61**	43	20	21	50
Copper	241	190	89	121	300
Iron	21400	24900	31200	32400	NV
Lead	50	32	23	20	200
Manganese	389	493	537	532	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	**2460**	**1920**	**920**	**1020**	200
Phosphorous	842	661	694	591	NV
Silver	<1.0	<1.0	<1.0	<1.0	25
Titanium	39	70	306	308	NV
Vanadium	24	29	39	39	250
Zinc	129	100	78	74	800
PH (Unitless)	7.38	7.46	7.78	7.75	5 to 9

Notes:
a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.
NV No Value
Bold Exceeds Table A Guideline Value

TABLE 1 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP1
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP1 (25-27.5 cm)	TP1 (45-50 cm)	TP1 (70-75 cm)	TP1 (Bedrock >95 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.4	0.3	0.2	<0.2	13
Arsenic	6.7	5.3	2.0	2.0	25
Selenium	1.7	1.2	0.9	<0.2	10
Aluminum	18200	19400	18600	1830	NV
Barium	115	133	72	11	1000
Beryllium	0.8	0.8	0.8	<0.2	1.2
Cadmium	<0.5	<0.5	<0.5	<0.2	12
Chromium	29	26	22	7.0	1000
Cobalt	24	13	7.0	2.0	50
Copper	177	62	41	11	300
Iron	29300	28700	13100	3450	NV
Lead	26	12	32	<5.0	200
Manganese	449	524	95	129	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	1970	582	81	45	200
Phosphorous	582	584	735	128	NV
Silver	<1.0	<1.0	<1.0	<1.0	25
Titanium	349	330	162	24	NV
Vanadium	38	37	30	6.0	250
Zinc	74	74	69	8.0	800
PH (Unitless)	7.80	7.76	7.23	8.46	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 2
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP2
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP2 (0-2.5 cm)	TP2 (2.5-5.0 cm)	TP2 (5.0-7.5 cm)	TP2 (10-12.5 cm)	TP2 (15-17.5 cm)	TP2 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.4	1.1	1.2	1.6	1.2	0.2	13
Arsenic	**37.8**	**35.7**	**45.4**	**54.8**	**34.3**	4.8	25
Selenium	7.4	6.9	8.2	7.9	8.7	<0.2	10
Aluminum	17100	21200	22200	19200	21900	21000	NV
Barium	191	164	183	160	165	141	1000
Beryllium	0.7	0.9	1.0	0.9	0.9	0.9	1.2
Cadmium	2.0	2.4	1.3	2.0	1.0	<0.5	12
Chromium	42	35	33	32	32	27	1000
Cobalt	**213**	**154**	**153**	**192**	**131**	12	50
Copper	**1330**	**1290**	**1860**	**2050**	**1240**	32	300
Iron	17900	20300	20600	19900	19400	30800	NV
Lead	85	47	48	50	38	13	200
Manganese	280	225	227	202	205	441	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**10100**	**10400**	**11500**	**14900**	**9550**	103	200
Phosphorous	830	540	720	684	646	583	NV
Silver	4.0	3.0	2.0	4.0	2.0	<1.0	25
Titanium	77	94	144	145	143	263	NV
Vanadium	45	47	44	42	41	39	250
Zinc	159	149	157	173	140	72	800
PH (Unitless)	6.81	6.56	6.79	6.59	6.57	7.94	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 3
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP3
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP3 (0-2.5 cm)	TP3 (2.5-5.0 cm)	TP3 (5.0-7.5 cm)	TP3 (7.5-10 cm)	TP3 (10-12.5 cm)	TP3 (12.5-15 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.6	0.7	0.7	0.6	0.6	0.6	13
Arsenic	15.8	24.8	**37.9**	**41.1**	**37.9**	**36.8**	25
Selenium	4.6	5.0	7.8	8.1	7.5	7.0	10
Aluminum	10600	15000	16100	16500	15900	16000	NV
Barium	123	154	164	169	164	159	1000
Beryllium	0.7	1.1	1.2	1.2	1.2	1.1	1.2
Cadmium	1.1	1.4	1.8	1.9	1.5	1.5	12
Chromium	21	25	27	29	27	28	1000
Cobalt	**62**	**62**	**80**	**86**	**71**	**71**	50
Copper	**462**	**597**	**838**	**841**	**739**	**705**	300
Iron	13700	17900	20200	21400	20100	19800	NV
Lead	46	48	52	59	53	47	200
Manganese	250	222	178	185	156	167	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**2690**	**3890**	**5720**	**5910**	**4830**	**4610**	200
Phosphorous	1100	1100	1100	1110	1050	1020	NV
Silver	2.0	2.0	3.0	3.0	3.0	3.0	25
Titanium	80	81	89	89	86	88	NV
Vanadium	21	27	31	32	31	32	250
Zinc	124	135	162	161	149	146	800
PH (Unitless)	6.73	6.71	6.59	6.52	6.55	6.55	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 3 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP3
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP3 (15-17.5 cm)	TP3 (17.5-20 cm)	TP3 (20-22.5 cm)	TP3 (22.5-25 cm)	TP3 (25-27.5 cm)	TP3 (27.5-30 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.6	0.6	0.6	0.6	<0.2	<0.2	13
Arsenic	**34.7**	**36.8**	**33.7**	**29.5**	2.5	3.0	25
Selenium	8.0	7.5	7.9	6.3	<0.2	0.2	10
Aluminum	17200	15100	14700	14300	11600	12400	NV
Barium	174	150	145	138	96	108	1000
Beryllium	**1.3**	1.1	1.1	1.0	0.6	0.6	1.2
Cadmium	2.3	1.3	1.7	1.2	<0.5	<0.5	12
Chromium	30	26	25	24	19	21	1000
Cobalt	**75**	**65**	**67**	**52**	11	10	50
Copper	**806**	**685**	**773**	**584**	15	18	300
Iron	20500	19000	17800	17200	19300	20400	NV
Lead	55	50	52	44	11	11	200
Manganese	155	142	138	132	115	111	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**5100**	**4370**	**4770**	**3510**	44	36	200
Phosphorous	1140	970	932	815	162	170	NV
Silver	3.0	2.0	3.0	2.0	<1.0	<1.0	25
Titanium	92	83	82	76	121	109	NV
Vanadium	34	30	29	28	33	33	250
Zinc	154	137	134	118	57	58	800
PH (Unitless)	6.45	6.50	6.36	6.38	6.68	6.69	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 3 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP3
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP3 (30-35 cm)	TP3 (35-40 cm)	TP3 (40-45 cm)	TP3 (45-50 cm)	TP3 (70-75 cm)	TP3 (95-100 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.2	0.2	0.2	0.3	0.4	0.3	13
Arsenic	2.8	3.6	3.8	4.2	8.3	7.1	25
Selenium	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	10
Aluminum	17700	20500	21400	20800	17800	18200	NV
Barium	121	147	154	157	144	159	1000
Beryllium	0.9	1.0	1.0	0.9	0.8	0.8	1.2
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	12
Chromium	26	29	31	30	26	27	1000
Cobalt	16	14	13	14	13	13	50
Copper	24	25	30	31	27	26	300
Iron	24800	30900	31700	41400	32000	32300	NV
Lead	10	10	15	16	11	12	200
Manganese	207	231	261	1210	474	422	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	47	42	40	49	32	32	200
Phosphorous	268	500	568	612	553	578	NV
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	192	218	223	255	275	295	NV
Vanadium	35	39	41	40	35	37	250
Zinc	68	70	71	71	62	65	800
PH (Unitless)	6.83	7.14	7.14	7.43	7.88	7.93	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 4
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP4
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP4 (0-2.5 cm)	TP4 (2.5-5.0 cm)	TP4 (5.0-7.5 cm)	TP4 (10-12.5 cm)	MOE TABLE A CRITERIA [a]
Antimony	<0.2	0.2	0.3	0.3	13
Arsenic	3.4	3.6	3.5	3.9	25
Selenium	0.6	0.7	0.4	0.6	10
Aluminum	5960	10500	19100	18700	NV
Barium	46	69	105	106	1000
Beryllium	0.3	0.5	0.8	0.9	1.2
Cadmium	<0.5	<0.5	<0.5	<0.5	12
Chromium	12	17	27	27	1000
Cobalt	14	17	14	13	50
Copper	73	75	34	38	300
Iron	12900	15900	22200	21700	NV
Lead	29	43	29	32	200
Manganese	430	426	317	356	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	**503**	**518**	153	189	200
Phosphorous	782	719	504	529	NV
Silver	<1.0	<1.0	<1.0	<1.0	25
Titanium	40	32	268	278	NV
Vanadium	19	25	41	41	250
Zinc	90	89	76	75	800
PH (Unitless)	7.07	7.33	7.69	7.78	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 4 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP4
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP4 (15-17.5 cm)	TP4 (25-27.5 cm)	TP4 (45-50 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.9	0.8	0.6	13
Arsenic	13.9	19.5	17.1	25
Selenium	2.2	3.5	4.3	10
Aluminum	9140	12300	13900	NV
Barium	79	96	85	1000
Beryllium	0.7	0.6	0.7	1.2
Cadmium	<0.5	0.9	1.2	12
Chromium	38	24	26	1000
Cobalt	47	67	39	50
Copper	236	477	274	300
Iron	19900	22500	24500	NV
Lead	107	133	70	200
Manganese	478	438	258	NV
Molybdenum	<3.0	<3.0	<3.0	40
Nickel	2630	5690	3528	200
Phosphorous	659	609	688	NV
Silver	<1.0	1.0	<1.0	25
Titanium	272	268	334	NV
Vanadium	32	33	40	250
Zinc	195	187	282	800
PH (Unitless)	7.78	7.60	7.34	5 to 9

Notes:
a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.
NV No Value
Bold Exceeds Table A Guideline Value

TABLE 5
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP5
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP5 (0-2.5 cm)	TP5 (2.5-5.0 cm)	TP5 (5.0-7.5 cm)	TP5 (7.5-10 cm)	TP5 (10-12.5 cm)	TP5 (12.5-15 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.7	0.6	0.7	0.6	0.2	0.4	13
Arsenic	**47.5**	**45.6**	**64.0**	**65.0**	5.5	18.0	25
Selenium	7.1	7.4	9.4	10.0	1.2	3.1	10
Aluminum	29000	29100	33200	33300	22600	23900	NV
Barium	203	204	238	242	132	146	1000
Beryllium	**1.6**	**1.6**	**1.9**	**1.9**	1.0	1.2	1.2
Cadmium	2.2	2.5	3.1	3.3	0.8	1.1	12
Chromium	37	38	43	43	30	31	1000
Cobalt	**108**	**112**	**155**	**160**	21	48	50
Copper	**818**	**848**	**1280**	**1340**	92	**324**	300
Iron	28100	28800	33800	34500	22600	23500	NV
Lead	50	57	68	71	17	27	200
Manganese	346	329	356	361	175	199	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**7400**	**7920**	**11800**	**12100**	**814**	**3010**	200
Phosphorous	1370	1390	1800	1850	262	575	NV
Silver	2	2	4	4	<1.0	<1.0	25
Titanium	157	166	180	181	160	156	NV
Vanadium	51	52	59	59	43	44	250
Zinc	192	195	252	257	92	122	800
PH (Unitless)	6.40	6.33	6.23	6.19	6.33	6.27	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 5 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP5
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP5 (15-17.5 cm)	TP5 (17.5-20 cm)	TP5 (20-22.5 cm)	TP5 (22.5-25 cm)	TP5 (25-27.5 cm)	TP5 (27.5-30 cm)	MOE TABLE A CRITERIA [a]
Antimony	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	13
Arsenic	2.2	2.5	2.7	2.1	2.0	2.7	25
Selenium	0.6	0.8	0.7	0.6	0.5	1.0	10
Aluminum	22100	22000	24400	23000	21700	22900	NV
Barium	129	126	155	144	130	137	1000
Beryllium	1.0	1.0	1.2	1.1	1.1	1.1	1.2
Cadmium	<0.5	<0.5	0.5	0.5	<0.5	<0.5	12
Chromium	29	29	32	30	28	30	1000
Cobalt	15	14	16	17	16	17	50
Copper	21	20	23	21	21	34	300
Iron	24400	23500	27600	26700	25100	27100	NV
Lead	15	14	15	16	13	16	200
Manganese	180	171	187	190	179	187	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	60	71	44	38	46	67	200
Phosphorous	172	162	189	208	227	226	NV
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	179	160	197	207	207	233	NV
Vanadium	45	44	47	46	43	46	250
Zinc	86	83	88	87	86	90	800
PH (Unitless)	6.35	6.33	6.44	6.47	6.51	6.49	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 5 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP5
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP5 (30-35 cm)	TP5 (35-40 cm)	TP5 (40-45 cm)	TP5 (45-50 cm)	TP5 (70-75 cm)	TP5 (95-100 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.2	0.2	0.2	<0.2	0.4	0.3	13
Arsenic	2.7	4.0	4.4	3.8	5.1	5.7	25
Selenium	0.6	0.6	0.3	0.6	<0.2	<0.2	10
Aluminum	24300	26300	27200	27200	19200	17900	NV
Barium	152	167	190	203	153	156	1000
Beryllium	1.2	1.2	1.3	1.2	0.9	0.8	1.2
Cadmium	0.6	<0.5	<0.5	0.6	0.6	<0.5	12
Chromium	32	34	36	36	26	25	1000
Cobalt	17	17	17	19	12	12	50
Copper	30	35	35	40	25	26	300
Iron	29800	36800	39500	69400	33100	31900	NV
Lead	15	16	14	14	9.0	11	200
Manganese	203	239	358	2140	723	552	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	70	80	82	111	34	30	200
Phosphorous	362	628	695	788	632	600	NV
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	215	232	275	353	298	320	NV
Vanadium	45	46	47	47	35	34	250
Zinc	119	199	219	118	72	69	800
PH (Unitless)	6.71	6.94	7.18	7.67	7.87	7.94	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 6
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP6
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP6 (0-2.5 cm)	TP6 (2.5-5.0 cm)	TP6 (5.0-7.5 cm)	TP6 (10-12.5 cm)	TP6 (15-17.5 cm)	TP6 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.6	1.1	1.7	1.1	0.6	0.2	13
Arsenic	**45**	**51.2**	**62.8**	**46.2**	23.7	3.5	25
Selenium	7.9	8.9	**12.0**	**11.0**	5.3	<0.2	10
Aluminum	24500	31700	42000	39000	34000	24600	NV
Barium	198	233	280	243	203	152	1000
Beryllium	**1.4**	**1.8**	**2.2**	**1.9**	**1.4**	1.1	1.2
Cadmium	2.2	3.3	3.0	2.9	0.8	0.6	12
Chromium	37	44	54	52	44	34	1000
Cobalt	**137**	**168**	**164**	**140**	**66**	14	50
Copper	**1400**	**1400**	**1350**	**1280**	**547**	34	300
Iron	19300	26100	31700	30200	22500	37300	NV
Lead	85	86	85	78	51	17	200
Manganese	163	179	237	267	180	745	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**9350**	**11700**	**11300**	**9590**	**4350**	66	200
Phosphorous	2010	2090	2070	1460	804	644	NV
Silver	5.0	4.0	3.0	4.0	<1.0	<1.0	25
Titanium	25	25	222	175	188	319	NV
Vanadium	56	61	87	80	63	49	250
Zinc	192	243	241	235	157	73	800
PH (Unitless)	5.95	5.90	6.44	6.65	6.92	7.58	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 7
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP7
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP7 (0-2.5 cm)	TP7 (2.5-5.0 cm)	TP7 (5.0-7.5 cm)	TP7 (10-12.5 cm)	TP7 (15-17.5 cm)	TP7 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.8	0.6	1.7	0.5	<0.2	0.3	13
Arsenic	**48.4**	**42.1**	**51.6**	17.6	2.9	5.7	25
Selenium	5.4	5.6	9.2	3.3	0.2	<0.2	10
Aluminum	21100	24200	29600	26700	22100	22400	NV
Barium	184	192	203	153	116	138	1000
Beryllium	1.0	1.1	**1.3**	1.0	0.9	1.0	1.2
Cadmium	1.8	1.7	1.9	0.7	<0.5	<0.5	12
Chromium	50	36	59	42	32	31	1000
Cobalt	**163**	**147**	**184**	**80**	20	13	50
Copper	**1400**	**1240**	**1400**	**453**	20	26	300
Iron	22800	22600	26100	24000	23700	30800	NV
Lead	59	51	70	44	33	23	200
Manganese	181	182	241	206	155	640	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**11400**	**10200**	**12600**	**4160**	**350**	43	200
Phosphorous	1020	1010	1130	530	266	585	NV
Silver	1	2	3	<1.0	<1.0	<1.0	25
Titanium	12	15	174	164	282	307	NV
Vanadium	36	39	60	63	58	45	250
Zinc	197	194	208	125	68	71	800
PH (Unitless)	5.92	5.91	6.46	6.26	6.23	7.95	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 8
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP8
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP8 (0-2.5 cm)	TP8 (2.5-5.0 cm)	TP8 (5.0-7.5 cm)	TP8 (10-12.5 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.8	0.7	0.5	0.7	13
Arsenic	12.4	11.5	9.9	14.4	25
Selenium	2.7	2.0	0.7	0.9	10
Aluminum	2410	2140	1830	1620	NV
Barium	68	37	20	26	1000
Beryllium	0.2	<0.2	<0.2	<0.2	1.2
Cadmium	1.3	0.9	<0.5	<0.5	12
Chromium	11	11	8.0	6.0	1000
Cobalt	48	27	11	13	50
Copper	165	121	64	75	300
Iron	23900	23000	15700	14300	NV
Lead	78	61	33	27	200
Manganese	1080	446	160	292	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	**1730**	**1250**	**689**	**735**	200
Phosphorous	1010	672	556	459	NV
Silver	1.0	<1.0	<1.0	<1.0	25
Titanium	94	180	248	184	NV
Vanadium	18	16	12	9.0	250
Zinc	224	205	119	113	800
PH (Unitless)	6.56	7.29	7.84	7.83	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 8 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP8
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP8 (15-17.5 cm)	TP8 (30-35 cm)	TP8 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.3	0.5	<0.2	13
Arsenic	27	11.7	2.3	25
Selenium	2.5	0.7	<0.2	10
Aluminum	2660	1900	1210	NV
Barium	62	31	23	1000
Beryllium	0.3	<0.2	<0.2	1.2
Cadmium	<0.5	0.6	<0.5	12
Chromium	25	6.0	3.0	1000
Cobalt	48	12	2.0	50
Copper	274	96	15	300
Iron	44800	17000	3670	NV
Lead	105	54	<5.0	200
Manganese	636	171	119	NV
Molybdenum	<3.0	<3.0	<3.0	40
Nickel	2940	954	60	200
Phosphorous	767	681	302	NV
Silver	1.0	<1.0	<1.0	25
Titanium	214	182	115	NV
Vanadium	18	12	7.0	250
Zinc	406	120	12	800
PH (Unitless)	7.60	7.47	6.10	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 9
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP9
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP9 (0-2.5 cm)	TP9 (2.5-5.0 cm)	TP9 (5.0-7.5 cm)	TP9 (7.5-10 cm)	TP9 (10-12.5 cm)	TP9 (12.5-15 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.2	2.0	2.4	2.9	1.0	1.2	13
Arsenic	**61**	**42.7**	**64.9**	**95**	**41.8**	**55.2**	25
Selenium	5.9	6.8	8.8	**13.1**	4.3	6.7	10
Aluminum	5820	6550	7480	7550	11100	11000	NV
Barium	128	161	199	203	157	211	1000
Beryllium	0.5	0.6	0.8	0.7	0.7	0.8	1.2
Cadmium	3.3	4.0	6.5	8.2	2.0	4.2	12
Chromium	26	33	47	71	25	31	1000
Cobalt	**79**	**111**	**171**	**185**	**58**	**92**	50
Copper	**367**	**608**	**950**	**1200**	**407**	**738**	300
Iron	38200	52600	84200	119000	39800	56100	NV
Lead	**260**	**421**	**548**	**421**	173	**307**	200
Manganese	544	870	1380	1550	540	790	NV
Molybdenum	<3.0	<3.0	6.0	8.0	<3.0	<3.0	40
Nickel	**3590**	**5950**	**8690**	**11800**	**4500**	**6920**	200
Phosphorous	1320	1350	1430	1320	653	894	NV
Silver	2.0	3.0	6.0	7.0	3.0	3.0	25
Titanium	120	132	158	175	153	177	NV
Vanadium	23	29	38	37	28	31	250
Zinc	513	706	1060	1380	465	794	800
PH (Unitless)	7.07	7.03	7.04	7.20	7.46	7.40	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 9 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP9
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP9 (15-17.5 cm)	TP9 (17.5-20 cm)	TP9 (20-22.5 cm)	TP9 (22.5-25 cm)	TP9 (25-27.5 cm)	TP9 (27.5-30 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.5	1.0	1.0	0.9	0.7	0.7	13
Arsenic	**59.1**	22.8	17.1	18.1	14.3	15.2	25
Selenium	4.2	2.4	2.0	2.0	1.8	2.0	10
Aluminum	3850	4980	5060	5730	4220	3770	NV
Barium	110	149	147	185	115	103	1000
Beryllium	0.4	0.5	0.5	0.5	0.4	0.3	1.2
Cadmium	4.4	2.4	1.7	2.2	1.0	0.8	12
Chromium	15	11	11	13	9.0	8.0	1000
Cobalt	**94**	25	20	19	12	11	50
Copper	**1610**	**622**	**386**	**452**	241	176	300
Iron	58100	30000	28300	26200	20100	17900	NV
Lead	**216**	**263**	**228**	**293**	180	127	200
Manganese	984	639	485	530	339	326	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**11300**	**4780**	**2900**	**2210**	**1270**	**1020**	200
Phosphorous	1010	1160	990	1080	793	799	NV
Silver	4.0	1.0	<1.0	1.0	<1.0	<1.0	25
Titanium	182	171	152	151	126	119	NV
Vanadium	23	21	20	20	15	15	250
Zinc	726	449	343	382	236	203	800
PH (Unitless)	7.21	7.34	7.28	7.29	7.36	7.36	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 9 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP9
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP9 (30-35 cm)	TP9 (35-40 cm)	TP9 (40-45 cm)	TP9 (45-50 cm)	TP9 (70-75 cm)	TP9 (95-100 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.7	0.5	0.3	0.2	<0.2	<0.2	13
Arsenic	15.2	12.8	7.6	3.2	0.5	2.4	25
Selenium	2.1	2.5	2.0	0.5	<0.2	<0.2	10
Aluminum	3230	2440	2260	2110	3780	5690	NV
Barium	84	64	42	24	22	30	1000
Beryllium	0.3	<0.2	<0.2	<0.2	<0.2	<0.2	1.2
Cadmium	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	12
Chromium	7	5	5	4	7	10	1000
Cobalt	9	8	6	2	2	3	50
Copper	123	86	44	16	3	5	300
Iron	15600	9570	6450	3990	4570	7810	NV
Lead	165	45	28	8	9	5	200
Manganese	283	170	99	43	39	71	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	756	583	318	128	6	14	200
Phosphorous	748	619	475	395	283	350	NV
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	106	89	87	124	154	284	NV
Vanadium	13	9	9	6	12	20	250
Zinc	155	87	49	21	19	27	800
PH (Unitless)	7.25	7.03	6.97	6.99	6.96	6.80	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 10
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP10
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP10 (0-2.5 cm)	TP10 (2.5-5.0 cm)	TP10 (5.0-7.5 cm)	TP10 (10-12.5 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.3	1.3	1.0	1.0	13
Arsenic	7.9	8.7	8.7	6.8	25
Selenium	1.9	1.8	1.3	0.8	10
Aluminum	15100	16900	18600	22800	NV
Barium	154	167	159	180	1000
Beryllium	0.9	1.1	1.0	1.2	1.2
Cadmium	1.3	1.6	<0.5	<0.5	12
Chromium	21	22	23	28	1000
Cobalt	41	47	26	20	50
Copper	153	166	104	75	300
Iron	22300	23800	26900	32300	NV
Lead	133	149	105	85	200
Manganese	434	499	677	728	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	**1170**	**1310**	**684**	**410**	200
Phosphorous	928	929	754	718	NV
Silver	1.0	<1.0	<1.0	<1.0	25
Titanium	191	177	232	266	NV
Vanadium	31	34	35	41	250
Zinc	215	214	153	138	800
PH (Unitless)	7.24	7.25	7.42	7.53	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 10 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP10
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP10 (20-22.5 cm)	TP10 (30-35 cm)	TP10 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.0	0.9	<0.2	13
Arsenic	8.7	8.2	<0.2	25
Selenium	1.2	1.2	<0.2	10
Aluminum	17500	14900	2010	NV
Barium	162	136	<5.0	1000
Beryllium	1.3	1.1	<0.2	1.2
Cadmium	0.8	<0.5	<0.5	12
Chromium	19	15	3.0	1000
Cobalt	18	14	<2.0	50
Copper	119	94	2.0	300
Iron	21000	18100	2090	NV
Lead	105	74	<5.0	200
Manganese	493	430	25	NV
Molybdenum	<3.0	<3.0	<3.0	40
Nickel	760	614	9.0	200
Phosphorous	544	481	230	NV
Silver	<1.0	<1.0	<1.0	25
Titanium	269	222	160	NV
Vanadium	30	24	5.0	250
Zinc	163	130	11	800
PH (Unitless)	7.73	7.75	7.55	5 to 9

Notes:
a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.
NV No Value
Bold Exceeds Table A Guideline Value

TABLE 11
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP11
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP11 (0-2.5 cm)	TP11 (2.5-5.0 cm)	TP11 (5.0-7.5 cm)	TP11 (10-12.5 cm)	TP11 (30-35 cm)	TP11 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.6	1.2	1.0	1.3	<0.2	<0.2	13
Arsenic	11.9	11.1	10.8	**25.2**	1.9	1.3	25
Selenium	2.5	1.8	2.6	3.5	<0.2	<0.2	10
Aluminum	9040	7980	11100	12200	1650	1350	NV
Barium	138	123	185	206	8.0	8.0	1000
Beryllium	1.2	0.9	**1.5**	**1.7**	<0.2	<0.2	1.2
Cadmium	1.3	1.4	1.1	1.1	<0.5	<0.5	12
Chromium	22	20	26	26	8.0	4.0	1000
Cobalt	46	41	46	**74**	<2.0	<2.0	50
Copper	225	257	249	294	10	3.0	300
Iron	47700	39600	46600	72700	17000	4760	NV
Lead	138	147	137	132	8.0	<5.0	200
Manganese	1040	881	1280	1550	157	120	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**1610**	**1500**	**1560**	**2470**	32	5.0	200
Phosphorous	685	566	490	579	439	289	NV
Silver	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	288	300	328	346	574	187	NV
Vanadium	22	21	24	28	35	8.0	250
Zinc	311	264	270	460	34	17	800
PH (Unitless)	7.59	7.75	7.69	7.62	8.00	8.07	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 12
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP12
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP12 (0 to 2.5 cm)	TP12 (2.5 to 5 cm)	TP12 (5 to 10 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.9	0.3	0.2	13
Arsenic	15.2	5.9	4.9	25
Selenium	7.5	9.1	9.1	10
Aluminum	42100	41200	36600	NV
Barium	691	201	160	1000
Beryllium	**6.1**	**7.5**	**7.4**	1.2
Cadmium	1.6	1.0	1.0	12
Chromium	39	23	21	1000
Cobalt	7.0	3.0	<2.0	50
Copper	73	27	20	300
Iron	73100	30300	18300	NV
Lead	11	<5.0	<5.0	200
Manganese	3980	3480	2960	NV
Molybdenum	6.0	<3.0	<3.0	40
Nickel	77	33	22	200
Phosphorous	804	271	226	NV
Silver	<1.0	1.0	2.0	25
Titanium	885	864	841	NV
Vanadium	13	7.0	6.0	250
Zinc	153	42	21	800
PH (Unitless)	9.0	**10.3**	**10.5**	5-9 (Unitless)

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 13
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP13
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP13 (0-2.5 cm)	TP13 (2.5-5.0 cm)	TP13 (5.0-7.5 cm)	TP13 (7.5-10 cm)	TP13 (10-12.5 cm)	TP13 (12.5-15 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.3	1.0	0.7	0.7	0.7	0.8	13
Arsenic	**34.2**	**46.4**	**57.8**	**73.2**	**57.8**	**67.4**	25
Selenium	1.7	2.0	0.8	0.7	1.1	1.1	10
Aluminum	8220	10300	5350	5560	6130	6510	NV
Barium	124	160	66	67	73	78	1000
Beryllium	0.7	1.1	0.5	0.5	0.7	0.8	1.2
Cadmium	0.9	1.1	2.0	1.7	2.1	1.1	12
Chromium	45	47	32	31	49	54	1000
Cobalt	17	15	9.0	8.0	12	13	50
Copper	99	91	140	129	158	160	300
Iron	51300	75000	87600	99700	91100	97300	NV
Lead	101	103	71	54	63	70	200
Manganese	1850	3070	3930	4740	3550	3850	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**248**	**249**	180	158	**238**	**257**	200
Phosphorous	586	440	350	329	297	274	NV
Silver	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	25
Titanium	193	238	175	176	214	231	NV
Vanadium	39	41	22	21	20	20	250
Zinc	337	350	379	330	377	375	800
PH (Unitless)	7.80	7.81	7.92	7.95	7.98	8.19	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 13 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP13
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP13 (15-17.5 cm)	TP13 (17.5-20 cm)	TP13 (20-22.5 cm)	TP13 (22.5-25 cm)	TP13 (25-27.5 cm)	TP13 (27.5-30 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.9	1.2	1.2	0.9	0.4	0.9	13
Arsenic	**55**	**52.1**	**46.4**	**38.9**	12.9	14.2	25
Selenium	2.7	3.0	3.0	2.8	1.7	2.0	10
Aluminum	9200	9200	5280	6120	1990	2300	NV
Barium	148	144	101	113	42	43	1000
Beryllium	1.2	1.2	0.7	0.8	0.4	0.4	1.2
Cadmium	1.8	1.1	0.6	2.5	<0.5	<0.5	12
Chromium	49	44	39	43	12	15	1000
Cobalt	20	19	17	15	5.0	6.0	50
Copper	137	131	107	113	30	36	300
Iron	78200	74500	66700	65900	18000	22000	NV
Lead	73	87	63	55	15	31	200
Manganese	2860	2770	3470	3660	647	942	NV
Molybdenum	3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	**517**	**495**	**468**	**452**	64	86	200
Phosphorous	407	364	362	444	164	168	NV
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	385	354	344	366	107	125	NV
Vanadium	33	29	38	40	9.0	12	250
Zinc	274	250	175	171	59	71	800
PH (Unitless)	**9.16**	8.77	7.79	7.85	7.60	7.60	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 13 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP13
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP13 (30-35 cm)	TP13 (35-40 cm)	TP13 (40-45 cm)	TP13 (45-50 cm)	TP13 (70-75 cm)	TP13 (95-100 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.2	0.3	0.3	0.2	<0.2	0.4	13
Arsenic	11.1	14.7	**33.3**	10.3	6.9	10.6	25
Selenium	1.8	1.9	1.5	1.6	0.3	1.6	10
Aluminum	1680	2720	1980	2280	5290	9920	NV
Barium	31	58	36	33	17	150	1000
Beryllium	0.3	0.4	0.3	0.3	0.4	**1.3**	1.2
Cadmium	<0.5	<0.5	0.5	0.6	0.7	1.8	12
Chromium	8.0	10	12	8.0	14	21	1000
Cobalt	4.0	5.0	4.0	5.0	8.0	11	50
Copper	26	28	34	26	20	76	300
Iron	12900	12400	15500	11300	11300	50200	NV
Lead	11	16	9.0	10	5.0	186	200
Manganese	204	868	961	504	293	1120	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	38	53	51	47	25	**209**	200
Phosphorous	151	166	202	325	919	502	NV
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	75	99	87	82	105	340	NV
Vanadium	6.0	8.0	9.0	8.0	22	19	250
Zinc	53	54	51	56	29	279	800
PH (Unitless)	7.52	7.82	7.64	7.81	8.41	8.40	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 14
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP14
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP14 (0-2.5 cm)	TP14 (2.5-5.0 cm)	TP14 (5.0-7.5 cm)	TP14 (10-12.5 cm)	MOE TABLE A CRITERIA [a]
Antimony	2.6	2.5	1.0	0.9	13
Arsenic	17.9	18.8	16.2	14.4	25
Selenium	4.6	4.5	4.4	4.5	10
Aluminum	32000	33900	40400	43200	NV
Barium	408	488	451	550	1000
Beryllium	4.1	4.2	5.1	5.4	1.2
Cadmium	2.2	2.1	0.6	<0.5	12
Chromium	90	103	29	27	1000
Cobalt	11	11	8.0	7.0	50
Copper	131	173	58	61	300
Iron	175000	185000	81900	81800	NV
Lead	623	665	78	48	200
Manganese	5140	5880	5870	6120	NV
Molybdenum	16	13	3.0	<3.0	40
Nickel	187	188	189	183	200
Phosphorous	368	372	338	344	NV
Silver	<1.0	<1.0	<1.0	<1.0	25
Titanium	617	658	620	695	NV
Vanadium	28	34	27	27	250
Zinc	382	388	154	147	800
PH (Unitless)	8.46	8.35	8.40	8.03	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 14 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP14
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP14 (15-17.5 cm)	TP14 (30-35 cm)	TP14 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	1.0	0.8	1.0	13
Arsenic	16.2	14.4	14.9	25
Selenium	4.9	4.5	1.7	10
Aluminum	47200	44100	10900	NV
Barium	340	291	142	1000
Beryllium	**5.9**	**5.5**	**1.4**	1.2
Cadmium	<0.5	<0.5	<0.5	12
Chromium	26	23	26	1000
Cobalt	7.0	6.0	9.0	50
Copper	53	45	72	300
Iron	71800	59400	64800	NV
Lead	21	16	**300**	200
Manganese	5920	5740	1210	NV
Molybdenum	<3.0	<3.0	<3.0	40
Nickel	166	152	146	200
Phosphorous	348	293	372	NV
Silver	<1.0	<1.0	<1.0	25
Titanium	733	655	332	NV
Vanadium	27	22	16	250
Zinc	121	108	252	800
PH (Unitless)	8.71	8.33	7.86	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 15
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP15
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP15 (0-2.5 cm)	TP15 (2.5-5.0 cm)	TP15 (5.0-7.5 cm)	TP15 (10-12.5 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.4	1.3	0.6	0.5	13
Arsenic	3.3	6.6	5.8	5.3	25
Selenium	0.3	0.9	0.7	0.6	10
Aluminum	10900	16700	11900	11100	NV
Barium	95	120	92	90	1000
Beryllium	0.5	0.7	0.6	0.5	1.2
Cadmium	1.2	1.2	<0.5	<0.5	12
Chromium	17	24	17	19	1000
Cobalt	8.0	23	11	7.0	50
Copper	71	122	55	38	300
Iron	18700	26900	18400	17900	NV
Lead	44	103	82	197	200
Manganese	425	490	345	302	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	185	**1310**	**444**	155	200
Phosphorous	1210	757	717	609	NV
Silver	<1.0	<1.0	<1.0	<1.0	25
Titanium	164	260	211	179	NV
Vanadium	22	34	25	24	250
Zinc	146	156	125	107	800
PH (Unitless)	7.32	7.63	7.40	8.72	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 15 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP15
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP15 (15-17.5 cm)	TP15 (30-35 cm)	TP15 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.5	0.5	<0.2	13
Arsenic	5.8	4.2	3.6	25
Selenium	0.7	0.5	<0.2	10
Aluminum	9950	18600	23800	NV
Barium	94	126	145	1000
Beryllium	0.5	0.9	1.0	1.2
Cadmium	0.8	<0.5	<0.5	12
Chromium	18	24	30	1000
Cobalt	8.0	12	15	50
Copper	42	39	34	300
Iron	14600	22700	31300	NV
Lead	91	**562**	18	200
Manganese	301	406	415	NV
Molybdenum	<3.0	<3.0	<3.0	40
Nickel	**250**	164	**220**	200
Phosphorous	719	617	756	NV
Silver	<1.0	<1.0	<1.0	25
Titanium	188	227	230	NV
Vanadium	23	35	43	250
Zinc	150	97	81	800
PH (Unitless)	7.41	7.43	7.54	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 16
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP16
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP16 (0-2.5 cm)	TP16 (2.5-5.0 cm)	TP16 (5.0-7.5 cm)	TP16 (10-12.5 cm)	MOE TABLE A CRITERIA [a]
Antimony	<0.2	<0.2	<0.2	9.4	13
Arsenic	4.2	3.8	8.2	**333**	25
Selenium	0.8	0.6	1.4	**19.2**	10
Aluminum	18000	15900	16700	8350	NV
Barium	123	107	116	162	1000
Beryllium	0.7	0.6	0.7	0.5	1.2
Cadmium	<0.5	<0.5	<0.5	2.9	12
Chromium	26	23	29	47	1000
Cobalt	16	12	31	**909**	50
Copper	56	43	142	**7190**	300
Iron	26400	24600	24900	34700	NV
Lead	9.0	11	19	147	200
Manganese	515	467	489	304	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	195	141	**855**	**48400**	200
Phosphorous	586	567	571	326	NV
Silver	<1.0	<1.0	<1.0	9.0	25
Titanium	165	171	322	396	NV
Vanadium	31	30	37	33	250
Zinc	75	74	69	111	800
PH (Unitless)	7.82	7.95	7.77	7.59	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 16 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP16
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP16 (15-17.5 cm)	TP16 (25-27.5 cm)	TP16 (45-50 cm)	TP16 (70-75 cm)	MOE TABLE A CRITERIA [a]
Antimony	10.4	0.8	<2.0	0.5	13
Arsenic	**361**	18.6	7.5	5.2	25
Selenium	7.8	<2.0	<2.0	<2.0	10
Aluminum	10900	17600	9240	5920	NV
Barium	211	63	69	47	1000
Beryllium	0.7	0.7	0.4	0.2	1.2
Cadmium	<0.5	1.6	2.0	1.3	12
Chromium	52	43	17	13	1000
Cobalt	**874**	**294**	**478**	**209**	50
Copper	**7390**	**11300**	**15700**	**7670**	300
Iron	94900	57800	17700	11500	NV
Lead	**373**	119	45	40	200
Manganese	283	112	317	182	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	**58300**	**27600**	**39300**	**18300**	200
Phosphorous	235	347	176	346	NV
Silver	10	6	5	2	25
Titanium	760	1700	403	342	NV
Vanadium	39	62	28	36	250
Zinc	163	78	133	56	800
PH (Unitless)	7.53	7.14	8.46	**9.56**	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 17
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP17
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP17 (0-2.5 cm)	TP17 (2.5-5.0 cm)	TP17 (5.0-7.5 cm)	TP17 (7.5-10 cm)	TP17 (10-12.5 cm)	TP17 (12.5-15 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.8	1.7	1.7	1.6	0.6	0.6	13
Arsenic	23.7	**47.9**	**71.2**	**79**	**111**	12.2	25
Selenium	2.9	4.6	4.5	4.8	2.1	1.0	10
Aluminum	3220	4300	4050	4040	6650	3770	NV
Barium	76	112	113	108	109	64	1000
Beryllium	0.3	0.5	0.4	0.4	0.5	0.3	1.2
Cadmium	1.6	3.9	5.0	4.3	2.7	0.8	12
Chromium	21	46	51	37	16	8.0	1000
Cobalt	48	**107**	**100**	**97**	25	9.0	50
Copper	262	**589**	**764**	**989**	**548**	152	300
Iron	27700	62400	82900	79900	25100	11500	NV
Lead	**216**	**398**	**448**	**476**	170	87	200
Manganese	541	1040	1290	1140	487	232	NV
Molybdenum	<3.0	3.0	5.0	3.0	<3.0	<3.0	40
Nickel	**2200**	**5310**	**6660**	**8390**	**2790**	**810**	200
Phosphorous	945	1390	1100	883	802	528	NV
Silver	1.0	3.0	4.0	4.0	2.0	<1.0	25
Titanium	75	86	105	125	147	98	NV
Vanadium	15	26	24	19	18	11	250
Zinc	403	**825**	**1120**	**1030**	349	139	800
PH (Unitless)	6.85	6.81	6.86	7.03	7.06	7.17	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 17 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP17
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP17 (15-17.5 cm)	TP17 (17.5-20 cm)	TP17 (20-22.5 cm)	TP17 (22.5-25 cm)	TP17 (25-27.5 cm)	TP17 (27.5-30 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.5	0.5	0.5	0.5	0.5	0.4	13
Arsenic	6.6	6.4	5.7	5.1	4.4	3.7	25
Selenium	0.6	0.8	1.0	0.6	0.7	0.6	10
Aluminum	2380	4490	9710	4370	3380	2570	NV
Barium	53	71	102	67	58	48	1000
Beryllium	<0.2	0.5	1.3	0.5	0.4	0.3	1.2
Cadmium	<0.5	<0.5	0.9	1.0	0.5	<0.5	12
Chromium	6.0	5.0	4.0	6.0	5.0	5.0	1000
Cobalt	4.0	3.0	2.0	4.0	4.0	3.0	50
Copper	58	45	47	56	39	26	300
Iron	7210	8840	12300	13400	11000	7390	NV
Lead	54	43	36	53	46	43	200
Manganese	130	227	423	282	231	169	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	333	208	177	249	179	116	200
Phosphorous	530	519	610	717	664	574	NV
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	77	134	244	159	121	95	NV
Vanadium	9.0	11	12	13	10	7.0	250
Zinc	100	117	105	124	104	78	800
PH (Unitless)	7.11	7.28	7.42	7.38	7.39	7.33	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 17 (Continued)
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES: TP17
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP17 (30-35 cm)	TP17 (35-40 cm)	TP17 (40-45 cm)	TP17 (45-50 cm)	TP17 (70-75 cm)	TP17 (95-100 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.3	0.4	0.4	0.2	<0.2	<0.2	13
Arsenic	3.7	4.5	6.3	4.5	0.7	0.5	25
Selenium	0.5	0.4	<0.2	<0.2	<0.2	<0.2	10
Aluminum	1770	1530	1190	1200	1980	1450	NV
Barium	35	28	14	10	8.0	5.0	1000
Beryllium	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.2
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	12
Chromium	4.0	4.0	4.0	4.0	4.0	3.0	1000
Cobalt	<2.0	2.0	<2.0	<2.0	<2.0	<2.0	50
Copper	13	16	6.0	4.0	4.0	2.0	300
Iron	6690	4630	1850	1640	3050	2290	NV
Lead	83	23	5.0	<5.0	5.0	<5.0	200
Manganese	122	78	18	17	25	17	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	40
Nickel	47	87	33	22	11	4.0	200
Phosphorous	534	459	261	168	319	246	NV
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	25
Titanium	92	113	143	132	124	97	NV
Vanadium	7.0	6.0	5.0	6.0	9.0	5.0	250
Zinc	57	44	10	8.0	13	11	800
PH (Unitless)	7.33	7.34	7.39	7.58	7.61	7.44	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

TABLE 18
ANALYTICAL RESULTS AND COMPARATIVE GUIDELINES
TP A, TP C, TP D AND TP E
(Selected Metal Parameters)
(mg/kg or ppm except as noted)
INCO, Port Colborne, Ontario

Parameter	TP A (0-5.0 cm)	TP C (0-5.0 cm)	TP D (0-5.0 cm)	TP E (0-5.0 cm)	MOE TABLE A CRITERIA [a]
Antimony	0.3	0.6	0.4	0.3	13
Arsenic	5.4	16.8	9.6	6.7	25
Selenium	1.0	3.6	2.3	1.6	10
Aluminum	12500	11300	10800	13900	NV
Barium	100	113	93	118	1000
Beryllium	0.7	0.7	0.6	0.8	1.2
Cadmium	0.6	0.8	1.0	0.8	12
Chromium	18	22	22	21	1000
Cobalt	11	37	34	20	50
Copper	51	211	193	93	300
Iron	21300	22800	19100	25300	NV
Lead	104	89	45	30	200
Manganese	303	548	395	341	NV
Molybdenum	<3.0	<3.0	<3.0	<3.0	40
Nickel	**241**	**1840**	**1290**	549	200
Phosphorous	790	961	1440	1350	NV
Silver	<1.0	<1.0	<1.0	<1.0	25
Titanium	100	118	99	109	NV
Vanadium	28	28	26	28	250
Zinc	120	169	133	103	800
PH (Unitless)	7.19	7.02	6.84	7.24	5 to 9

Notes:

a - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with medium and fine textured soils.

NV No Value

Bold Exceeds Table A Guideline Value

APPENDIX H2

LABORATORY CERTIFICATES OF CHEMICAL ANALYSES: JWEL AUGUST 2001 AND OCTOBER 2001 SOIL SAMPLES

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
Date Reported:	September 21/2001
Lab Ref#:	G214056
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M.Alam

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Acid Digestion
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
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Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M.Alam

Certificate of Analysis

Methodology: (Cont'd)

5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045
6) Acid digestion of soils for metals determination by inductively coupled plasma atomic emission spectrometry and/or flame or furnace atomic absorption spectroscopy.
U.S. EPA Method No. 3050(Modification)
7) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Thermolyne Hotplate/Hot Block
7) Precision Mechanical Convention Oven/Sartorius Basic Balance

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
Date Reported:	September 21/2001
Lab Ref#:	G214056
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M.Alam

Certificate of Analysis

Instrumentation: (Cont'd)

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 21/2001
Lab Ref # : G214056
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP 13 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	86	84	120	yes	*	*	*	*	*	yes
Arsenic	TP 13 (45-50CM)	0.2	mg/kg	nd	0.5	yes	112	84	120	yes	5.3	5.0	3.5	6.5	yes	yes
Antimony	TP 13 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	4.4	5.0	3.5	6.5	yes	yes
Antimony	TP 13 (45-50CM)	0.2	mg/kg	nd	0.5	yes	100	29	157	yes	4.0	5.0	3.5	6.5	yes	yes
Selenium	TP 13 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	4.6	5.0	3.5	6.5	yes	yes
Selenium	TP 13 (45-50CM)	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	1.3	5.0	3.5	6.5	no	yes
Aluminum	na	20	mg/kg	nd	40	yes	100	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	95	74	125	yes	na	na	na	na	na	yes
Barium	na	5	mg/kg	nd	10	yes	100	82	113	yes	na	na	na	na	na	yes
Barium	TP 13 (0-2.5CM)	5	mg/kg	nd	10	yes	96	82	113	yes	101	100	70	130	yes	yes
Beryllium	na	0.2	mg/kg	nd	0.4	yes	84	72	124	yes	na	na	na	na	na	yes
Beryllium	TP 13 (0-2.5CM)	0.2	mg/kg	nd	0.4	yes	80	72	124	yes	8.8	10	7	13	yes	yes
Cadmium	na	0.5	mg/kg	nd	0.6	yes	88	0	180	yes	na	na	na	na	na	yes
Cadmium	TP 13 (0-2.5CM)	0.5	mg/kg	nd	0.6	yes	97	0	180	yes	93.7	100	70	130	yes	yes
Chromium	na	1	mg/kg	nd	2	yes	109	72	124	yes	na	na	na	na	na	yes
Chromium	TP 13 (0-2.5CM)	1	mg/kg	nd	2	yes	103	72	124	yes	91	100	70	130	yes	yes
Cobalt	na	2	mg/kg	nd	4	yes	102	85	123	yes	na	na	na	na	na	yes
Cobalt	TP 13 (0-2.5CM)	2	mg/kg	nd	4	yes	97	85	123	yes	87	100	70	130	yes	yes
Copper	na	1	mg/kg	nd	4	yes	105	78	122	yes	na	na	na	na	na	yes
Copper	TP 13 (0-2.5CM)	1	mg/kg	1	4	yes	98	78	122	yes	96	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 21/2001
Lab Ref # : G214056
Lab Quote#: EG009-0811
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Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	91	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	94	85	119	yes	na	na	na	na	na	yes
Lead	na	5	mg/kg	nd	10	yes	105	48	152	yes	na	na	na	na	na	yes
Lead	TP 13 (0-2.5CM)	5	mg/kg	nd	10	yes	99	48	152	yes	86	100	70	130	yes	yes
Manganese	na	1	mg/kg	nd	2	yes	102	85	115	yes	na	na	na	na	na	yes
Manganese	TP 13 (0-2.5CM)	1	mg/kg	nd	2	yes	98	85	115	yes	*	*	*	*	*	yes
Molybdenum	na	3	mg/kg	nd	6	yes	147	0	210	yes	na	na	na	na	na	yes
Molybdenum	TP 13 (0-2.5CM)	3	mg/kg	nd	6	yes	120	0	210	yes	175	200	140	260	yes	yes
Nickel	na	2	mg/kg	nd	4	yes	98	86	116	yes	na	na	na	na	na	yes
Nickel	TP 13 (0-2.5CM)	2	mg/kg	nd	4	yes	94	86	116	yes	84	100	70	130	yes	yes
Phosphorus	na	20	mg/kg	nd	40	yes	113	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	119	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	106	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	113	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	125	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	132	37	174	yes	na	na	na	na	na	yes
Vanadium	na	1	mg/kg	nd	2	yes	107	81	119	yes	na	na	na	na	na	yes
Vanadium	TP 13 (0-2.5CM)	1	mg/kg	nd	2	yes	101	81	119	yes	90	100	70	130	yes	yes
Zinc	na	5	mg/kg	nd	10	yes	97	85	112	yes	na	na	na	na	na	yes
Zinc	TP 13 (0-2.5CM)	5	mg/kg	nd	10	yes	94	85	112	yes	105	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
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ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 21/2001
Lab Ref # : G214056
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	nd	0.02	yes	100	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	nd	0.02	yes	100	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: September 21/2001
Lab Ref # : G214056
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP 13 (0-2.5CM)	TP 13 (0-2.5CM) Replicate	TP 13 (10-12.5CM	TP 13 (12.5-15CM	TP 13 (15-17.5CM
Antimony	0.2	mg/kg	1.3	1.2	0.7	0.8	0.9
Arsenic	0.2	mg/kg	34.2	34.2	57.8	67.4	55.0
Selenium	0.2	mg/kg	1.7	1.7	1.1	1.1	2.7
Aluminum	20	mg/kg	8220	8970	6130	6510	9200
Barium	5	mg/kg	124	134	73	78	148
Beryllium	0.2	mg/kg	0.7	0.8	0.7	0.8	1.2
Cadmium	0.5	mg/kg	0.9	1.6	2.1	1.1	1.8
Chromium	1	mg/kg	45	49	49	54	49
Cobalt	2	mg/kg	17	18	12	13	20
Copper	1	mg/kg	99	107	158	160	137
Iron	50	mg/kg	51300	53800	91100	97300	78200
Lead	5	mg/kg	101	101	63	70	73
Manganese	1	mg/kg	1850	1980	3550	3850	2860
Molybdenum	3	mg/kg	nd	nd	nd	nd	3
Nickel	2	mg/kg	248	281	238	257	517
Phosphorus	20	mg/kg	586	668	297	274	407
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	193	210	214	231	385
Vanadium	1	mg/kg	39	42	20	20	33
Zinc	5	mg/kg	337	362	377	375	274
pH	0.01	Units	7.80	7.81	7.98	8.19	9.16
Moisture Content	0.01	%	10.0	10.3	3.07	4.30	8.22

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: September 21/2001
Lab Ref # : G214056
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP 13 (17.5-20CM	TP 13 (2.5-5CM)	TP 13 (20-22.5CM	TP 13 (22.5-25CM	TP 13 (25-27.5CM
Antimony	0.2	mg/kg	1.2	1.0	1.2	0.9	0.4
Arsenic	0.2	mg/kg	52.1	46.4	46.4	38.9	12.9
Selenium	0.2	mg/kg	3.0	2.0	3.0	2.8	1.7
Aluminum	20	mg/kg	9200	10300	5280	6120	1990
Barium	5	mg/kg	144	160	101	113	42
Beryllium	0.2	mg/kg	1.2	1.1	0.7	0.8	0.4
Cadmium	0.5	mg/kg	1.1	1.1	0.6	2.5	nd
Chromium	1	mg/kg	44	47	39	43	12
Cobalt	2	mg/kg	19	15	17	15	5
Copper	1	mg/kg	131	91	107	113	30
Iron	50	mg/kg	74500	75000	66700	65900	18000
Lead	5	mg/kg	87	103	63	55	15
Manganese	1	mg/kg	2770	3070	3470	3660	647
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	495	249	468	452	64
Phosphorus	20	mg/kg	364	440	362	444	164
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	354	238	344	366	107
Vanadium	1	mg/kg	29	41	38	40	9
Zinc	5	mg/kg	250	350	175	171	59
pH	0.01	Units	8.77	7.81	7.79	7.85	7.60
Moisture Content	0.01	%	13.3	14.0	11.4	9.62	6.02

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

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Contact: Mahaboob Alam

Report Date: September 21/2001
Lab Ref # : G214056
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP 13 (27.5-30CM	TP 13 (30-35CM)	TP 13 (35-40CM)	TP 13 (40-45CM)	TP 13 (45-50CM)
Antimony	0.2	mg/kg	0.9	0.2	0.3	0.3	0.2
Arsenic	0.2	mg/kg	14.2	11.1	14.7	33.3	10.3
Selenium	0.2	mg/kg	2.0	1.8	1.9	1.5	1.6
Aluminum	20	mg/kg	2300	1680	2720	1980	2280
Barium	5	mg/kg	43	31	58	36	33
Beryllium	0.2	mg/kg	0.4	0.3	0.4	0.3	0.3
Cadmium	0.5	mg/kg	nd	nd	nd	0.5	0.6
Chromium	1	mg/kg	15	8	10	12	8
Cobalt	2	mg/kg	6	4	5	4	5
Copper	1	mg/kg	36	26	28	34	26
Iron	50	mg/kg	22000	12900	12400	15500	11300
Lead	5	mg/kg	31	11	16	9	10
Manganese	1	mg/kg	942	204	868	961	504
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	86	38	53	51	47
Phosphorus	20	mg/kg	168	151	166	202	325
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	125	75	99	87	82
Vanadium	1	mg/kg	12	6	8	9	8
Zinc	5	mg/kg	71	53	54	51	56
pH	0.01	Units	7.60	7.52	7.82	7.64	7.81
Moisture Content	0.01	%	7.04	9.69	10.5	10.5	9.06

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution () Adjusted EQL

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Contact : Mahaboob Alam

Report Date: September 21/2001
Lab Ref # : G214056
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP 13 (45-50CM) Replicate	TP 13 (5-7.5CM)	TP 13 (7.5-10CM)	TP 13 (70-75CM)	TP 13 (95-100CM)
Antimony	0.2	mg/kg	0.2	0.7	0.7	nd	0.4
Arsenic	0.2	mg/kg	9.7	57.8	73.2	6.9	10.6
Selenium	0.2	mg/kg	1.6	0.8	0.7	0.3	1.6
Aluminum	20	mg/kg	-	5350	5560	5290	9920
Barium	5	mg/kg	-	66	67	17	150
Beryllium	0.2	mg/kg	-	0.5	0.5	0.4	1.3
Cadmium	0.5	mg/kg	-	2.0	1.7	0.7	1.8
Chromium	1	mg/kg	-	32	31	14	21
Cobalt	2	mg/kg	-	9	8	8	11
Copper	1	mg/kg	-	140	129	20	76
Iron	50	mg/kg	-	87600	99700	11300	50200
Lead	5	mg/kg	-	71	54	5	186
Manganese	1	mg/kg	-	3930	4740	293	1120
Molybdenum	3	mg/kg	-	nd	nd	nd	nd
Nickel	2	mg/kg	-	180	158	25	209
Phosphorus	20	mg/kg	-	350	329	919	502
Silver	1	mg/kg	-	1	nd	nd	nd
Titanium	5	mg/kg	-	175	176	105	340
Vanadium	1	mg/kg	-	22	21	22	19
Zinc	5	mg/kg	-	379	330	29	279
pH	0.01	Units	7.81	7.92	7.95	8.41	8.40
Moisture Content	0.01	%	9.62	5.09	3.59	5.96	13.5

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
- Not Requested
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
Date Reported:	September 21/2001
Lab Ref#:	G214056
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M.Alam

Certificate of Analysis

Additional Comments:

Selenium Matrix Spike:
Please note low matrix spike recovery for sample TP 13 (45-50CM). Please view selenium results with discretion.

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order:

Comments: G2H056

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M. ALAM

Phone: _____ Fax: _____

PAS Quote # : JWEL-INCO SPECIAL

Client P.O. # :

Client Project # : ONT3465.1

Sampled by:

AUG 28 '01 PM 5:13

Page _____ of _____

Please specify Guideline (if applicable) INCO SPECIAL PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23M	pH	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	TP13 (30-35cm)			✓	✓	Soil	1	FOLLOW
2	TP13 (35-40cm)			✓	✓	"	1	PROTOCOL
3	TP13 (40-45cm)			✓	✓	"	1	
4	TP13 (45-50cm)			✓	✓	"	1	
5	TP13 (70-75cm)			✓	✓	"	1	
6	TP13 (95-100cm)			✓	✓	"	1	
7								
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: R. Walter	Date: 01/8/28	Time: 17:15	Condition of samples upon receipt at lab: NO ICE

Rev. COC15-11-00

White: Philin Yellow: Mail Pink: Receiver Goldenrod: Client

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order:
Comments: G214056

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM
Contact: M. ALAM
Phone: Fax:

PAS Quote # : INCO-JWEL SPECIAL
Client P.O. # :
Client Project # : ONT 34651.1
Sampled by: M. ALAM
Please specify Guideline (if applicable) INCO SPECIAL PROTOCOL

AUG 28 '01 PM 5:13 Page of

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date
Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 M+ME	pH	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	TP13(0-2.5cm)			✓	✓	Soil	1	FOLLOW PROTOCOL
2	TP13(2.5-5cm)			✓	✓			
3	TP13(5-7.5cm)			✓	✓			
4	TP13(7.5-10cm)			✓	✓			
5	TP13(10-12.5cm)			✓	✓			
6	TP13(12.5-15cm)			✓	✓			
7	TP13(15-17.5cm)			✓	✓			
8	TP13(17.5-20cm)			✓	✓			
9	TP13(20-22.5cm)			✓	✓			
10	TP13(22.5-25cm)			✓	✓			
11	TP13(25-27.5cm)			✓	✓			
12	TP13(27.5-30cm)			✓	✓			

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: K. Watts	Date: 01/8/28	Time: 17:15	Condition of samples upon receipt at lab: NO ICE

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 8227

ANALYTICAL SERVICES

REVISED

RECD/RECEIVED
01-10-2001

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
Date Reported:	September 25/2001
Lab Ref#:	G214052
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

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ANALYTICAL SERVICES

REVISED

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
Date Reported:	September 25/2001
Lab Ref#:	G214052
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Date Reported: September 25/2001
Lab Ref # : G214052
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP9 (45-50CM)	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	4.4	5.0	3.5	6.5	yes	yes
Arsenic	TP9 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	*	*	*	*	*	yes
Antimony	TP9 (45-50CM)	0.2	mg/kg	nd	0.5	yes	100	29	157	yes	4.1	5.0	3.5	6.5	yes	yes
Antimony	TP9 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	100	29	157	yes	3.7	5.0	3.5	6.5	yes	yes
Selenium	TP9 (45-50CM)	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.0	5.0	3.5	6.5	yes	yes
Selenium	TP9 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.0	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	nd	40	yes	84	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	85	74	125	yes	na	na	na	na	na	yes
Barium	TP9 (45-50CM)	5	mg/kg	nd	10	yes	94	82	113	yes	95	100	70	130	yes	yes
Barium	TP9 (0-2.5CM)	5	mg/kg	nd	10	yes	92	82	113	yes	93	100	70	130	yes	yes
Beryllium	TP9 (45-50CM)	0.2	mg/kg	nd	0.4	yes	73	72	124	yes	9.1	10	7	13	yes	yes
Beryllium	TP9 (0-2.5CM)	0.2	mg/kg	nd	0.4	yes	74	72	124	yes	9.3	10	7	13	yes	yes
Cadmium	TP9 (45-50CM)	0.5	mg/kg	nd	0.6	yes	101	0	180	yes	93.8	100	70	130	yes	yes
Cadmium	TP9 (0-2.5CM)	0.5	mg/kg	nd	0.6	yes	82	0	180	yes	95.0	100	70	130	yes	yes
Chromium	TP9 (45-50CM)	1	mg/kg	nd	2	yes	96	72	124	yes	95	100	70	130	yes	yes
Chromium	TP9 (0-2.5CM)	1	mg/kg	nd	2	yes	95	72	124	yes	92	100	70	130	yes	yes
Cobalt	TP9 (45-50CM)	2	mg/kg	nd	4	yes	95	85	123	yes	94	100	70	130	yes	yes
Cobalt	TP9 (0-2.5CM)	2	mg/kg	nd	4	yes	96	85	123	yes	81	100	70	130	yes	yes
Copper	TP9 (45-50CM)	1	mg/kg	nd	4	yes	96	78	122	yes	93	100	70	130	yes	yes
Copper	TP9 (0-2.5CM)	1	mg/kg	nd	4	yes	95	78	122	yes	89	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Date Reported: September 25/2001
Lab Ref # : G214052
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	86	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	90	85	119	yes	na	na	na	na	na	yes
Lead	TP9 (45-50CM)	5	mg/kg	nd	10	yes	86	48	152	yes	97	100	70	130	yes	yes
Lead	TP9 (0-2.5CM)	5	mg/kg	nd	10	yes	109	48	152	yes	84	100	70	130	yes	yes
Manganese	TP9 (45-50CM)	1	mg/kg	nd	2	yes	97	85	115	yes	92	100	70	130	yes	yes
Manganese	TP9 (0-2.5CM)	1	mg/kg	nd	2	yes	96	85	115	yes	107	100	70	130	yes	yes
Molybdenum	TP9 (45-50CM)	3	mg/kg	nd	6	yes	25	0	210	yes	184	200	140	260	yes	yes
Molybdenum	TP9 (0-2.5CM)	3	mg/kg	nd	6	yes	116	0	210	yes	188	200	140	260	yes	yes
Nickel	TP9 (45-50CM)	2	mg/kg	nd	4	yes	92	86	116	yes	78	100	70	130	yes	yes
Nickel	TP9 (0-2.5CM)	2	mg/kg	nd	4	yes	91	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	108	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	112	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	103	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	136	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	96	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	97	37	174	yes	na	na	na	na	na	yes
Vanadium	TP9 (45-50CM)	1	mg/kg	nd	2	yes	92	81	119	yes	94	100	70	130	yes	yes
Vanadium	TP9 (0-2.5CM)	1	mg/kg	nd	2	yes	91	81	119	yes	92	100	70	130	yes	yes
Zinc	TP9 (45-50CM)	5	mg/kg	nd	10	yes	92	85	112	yes	90	100	70	130	yes	yes
Zinc	TP9 (0-2.5CM)	5	mg/kg	nd	10	yes	93	85	112	yes	67	100	70	130	no	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Date Reported: September 25/2001
Lab Ref # : G214052
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	100	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	100	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214052
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP9 (0-2.5CM)	TP9 (0-2.5CM) Replicate	TP9 (2.5-5CM)	TP9 (5-7.5CM)	TP9 (10-12.5CM)
Antimony	0.2	mg/kg	1.2	1.2	2.0	2.4	1.0
Arsenic	0.2	mg/kg	61.0	62.0	42.7	64.9	41.8
Selenium	0.2	mg/kg	5.9	6.2	6.8	8.8	4.3
Aluminum	20	mg/kg	5820	6490	6550	7480	11100
Barium	5	mg/kg	128	134	161	199	157
Beryllium	0.2	mg/kg	0.5	0.5	0.6	0.8	0.7
Cadmium	0.5	mg/kg	3.3	4.1	4.0	6.5	2.0
Chromium	1	mg/kg	26	27	33	47	25
Cobalt	2	mg/kg	79	89	111	171	58
Copper	1	mg/kg	367	394	608	950	407
Iron	50	mg/kg	38200	42700	52600	84200	39800
Lead	5	mg/kg	260	278	421	548	173
Manganese	1	mg/kg	544	589	870	1380	540
Molybdenum	3	mg/kg	nd	nd	nd	6	nd
Nickel	2	mg/kg	3590	3640	5950	8690	4500
Phosphorus	20	mg/kg	1320	1480	1350	1430	653
Silver	1	mg/kg	2	3	3	6	3
Titanium	5	mg/kg	120	132	132	158	153
Vanadium	1	mg/kg	23	26	29	38	28
Zinc	5	mg/kg	513	507	706	1060	465
pH	0.01	Units	7.07	7.07	7.03	7.04	7.46
Moisture Content	0.01	%	28.4	27.8	26.0	23.9	16.9

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214052
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP9 (12.5-15CM)	TP9 (15-17.5CM)	TP9 (17.5-20CM)	TP9 (20-22.5CM)	TP9 (22.5-25CM)
Antimony	0.2	mg/kg	1.2	1.5	1.0	1.0	0.9
Arsenic	0.2	mg/kg	55.2	59.1	22.8	17.1	18.1
Selenium	0.2	mg/kg	6.7	4.2	2.4	2.0	2.0
Aluminum	20	mg/kg	11000	3850	4980	5060	5730
Barium	5	mg/kg	211	110	149	147	185
Beryllium	0.2	mg/kg	0.8	0.4	0.5	0.5	0.5
Cadmium	0.5	mg/kg	4.2	4.4	2.4	1.7	2.2
Chromium	1	mg/kg	31	15	11	11	13
Cobalt	2	mg/kg	92	94	25	20	19
Copper	1	mg/kg	738	1610	622	386	452
Iron	50	mg/kg	56100	58100	30000	28300	26200
Lead	5	mg/kg	307	216	263	228	293
Manganese	1	mg/kg	790	984	639	485	530
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	6920	11300	4780	2900	2210
Phosphorus	20	mg/kg	894	1010	1160	990	1080
Silver	1	mg/kg	3	4	1	nd	1
Titanium	5	mg/kg	177	182	171	152	151
Vanadium	1	mg/kg	31	23	21	20	20
Zinc	5	mg/kg	794	726	449	343	382
pH	0.01	Units	7.40	7.21	7.34	7.28	7.29
Moisture Content	0.01	%	18.0	15.0	22.1	25.8	27.6

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214052
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP9 (25-27.5CM)	TP9 (27.5-30CM)	TP9 (30-35CM)	TP9 (35-40CM)	TP9 (40-45CM)
Antimony	0.2	mg/kg	0.7	0.7	0.7	0.5	0.3
Arsenic	0.2	mg/kg	14.3	15.2	15.2	12.8	7.6
Selenium	0.2	mg/kg	1.8	2.0	2.1	2.5	2.0
Aluminum	20	mg/kg	4220	3770	3230	2440	2260
Barium	5	mg/kg	115	103	84	64	42
Beryllium	0.2	mg/kg	0.4	0.3	0.3	nd	nd
Cadmium	0.5	mg/kg	1.0	0.8	0.5	nd	nd
Chromium	1	mg/kg	9	8	7	5	5
Cobalt	2	mg/kg	12	11	9	8	6
Copper	1	mg/kg	241	176	123	86	44
Iron	50	mg/kg	20100	17900	15600	9570	6450
Lead	5	mg/kg	180	127	165	45	28
Manganese	1	mg/kg	339	326	283	170	99
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	1270	1020	756	583	318
Phosphorus	20	mg/kg	793	799	748	619	475
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	126	119	106	89	87
Vanadium	1	mg/kg	15	15	13	9	9
Zinc	5	mg/kg	236	203	155	87	49
pH	0.01	Units	7.36	7.36	7.25	7.03	6.97
Moisture Content	0.01	%	33.3	33.6	42.2	48.8	52.1

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

REVISED

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: September 25/2001
Lab Ref # : G214052
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP9 (45-50CM)	TP9 (45-50CM) Replicate	TP9 (7.5-10CM)	TP9 (70-75CM)	TP9 (95-100CM)
Antimony	0.2	mg/kg	0.2	0.2	2.9	nd	nd
Arsenic	0.2	mg/kg	3.2	3.1	95.0	0.5	2.4
Selenium	0.2	mg/kg	0.5	0.5	13.1	nd	nd
Aluminum	20	mg/kg	2110	2040	7550	3780	5690
Barium	5	mg/kg	24	23	203	22	30
Beryllium	0.2	mg/kg	nd	nd	0.7	nd	nd
Cadmium	0.5	mg/kg	nd	nd	8.2	nd	nd
Chromium	1	mg/kg	4	4	71	7	10
Cobalt	2	mg/kg	2	2	185	2	3
Copper	1	mg/kg	16	15	1200	3	5
Iron	50	mg/kg	3390	3120	119000	4570	7810
Lead	5	mg/kg	8	9	421	9	5
Manganese	1	mg/kg	43	41	1550	39	71
Molybdenum	3	mg/kg	nd	nd	8	nd	nd
Nickel	2	mg/kg	128	110	11800	6	14
Phosphorus	20	mg/kg	395	365	1320	283	350
Silver	1	mg/kg	nd	nd	7	nd	nd
Titanium	5	mg/kg	124	119	175	154	284
Vanadium	1	mg/kg	6	6	37	12	20
Zinc	5	mg/kg	21	20	1380	19	27
pH	0.01	Units	6.99	6.99	7.20	6.96	6.80
Moisture Content	0.01	%	23.5	25.5	17.9	18.0	23.9

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

REVISED

Date Received:	August 28/2001
Date Reported:	September 25/2001
Lab Ref#:	G214052
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1

Certificate of Analysis

Additional Comments:

ICAP Analysis of Soil:
The digestion and post digest spike recovery for Zinc for sample TP9(0-2.5CM) is below QC criteria (67% recovery, 70-130% acceptance.) This sample appears to be a charcoal like material which may be affecting the spike recoverys.

Revised Report:
Antimony added.

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214052

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M. ALAM

Phone: _____ Fax: _____

PAS Quote #: JWEL-INCO

Page _____ of _____

Client P.O. #: AUG 28 '01 PM 3:49

Client Project #: ONT34651.1

Sampled by: M. ALAM

Please specify Guideline (if applicable) INCO SPECIAL (FOLLOW JWEL/INCO PROTOCOL)

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/AA-23 METALS	~~Cyanide~~	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP9 (30-35 cm)			✓	✓	✓	SOIL	1	FOLLOW
2	TP9 (35-40 cm)			✓	✓	✓	"	1	PROTOCOL
3	TP9 (40-45 cm)			✓	✓	✓	"	1	
4	TP9 (45-50 cm)			✓	✓	✓	"	1	
5	TP9 (70-75 cm)			✓	✓	✓	"	1	
6	TP9 (95-100 cm)			✓	✓	✓	"	1	
7									
8									
9									
10									
11									
12									

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Chima	Date: 01/08/28	Time: 15:50	Condition of samples upon receipt at lab: 24°C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214052

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M. ALAM

Phone: _____ Fax: _____

PAS Quote #: JWEL-INCO

Page _____ of _____

Client P.O. #: AUG 28 '01 PM 3:49

Client Project #: ONT34651.1

Sampled by: M. ALAM

Please specify Guideline (if applicable) INCO SPECIAL (FOLLOW JWEL/INCO PROTOCOL)

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/AA-23 METALS	~~Cyanide~~	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP9 (30-35 cm)			✓	✓	✓	SOIL	1	FOLLOW
2	TP9 (35-40 cm)			✓	✓	✓	"	1	PROTOCOL
3	TP9 (40-45 cm)			✓	✓	✓	"	1	
4	TP9 (45-50 cm)			✓	✓	✓	"	1	
5	TP9 (70-75 cm)			✓	✓	✓	"	1	
6	TP9 (95-100 cm)			✓	✓	✓	"	1	
7									
8									
9									
10									
11									
12									

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Chima	Date: 01/08/28	Time: 15:50	Condition of samples upon receipt at lab: 24°C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

AT E

Work Order: G 214052
Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

PAS Quote #: JWEL-INCO

Page ___ of ___

Client P.O. #:

Client Project #: ONT 34651.1

Contact: M. ALAM

Sampled by: M. ALAM

Phone: Fax:

Please specify Guideline (if applicable) INCO SPECIAL (FOLLOW JWEL/INCO PROTOCOL)

AUG 28 '01

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD (circled) 5-7 Business Days

RUSH Specify Date ___ Time ___

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METAL	~~BORON (CLR)~~	PH	Sample Matrix	No. of Containers	Comments/Contamination/Site History
1	TP9 (0-2.5)			✓	✓	✓	SOIL	1	FOLLOW
2	TP9 (2.5-5cm)			✓	✓	✓	"	1	PROTOCOL
3	TP9 (5-7.5cm)			✓	✓	✓	"	1	
4	TP9 (7.5-10cm)			✓	✓	✓	"	1	
5	TP9 (10-12.5cm)			✓	✓	✓	"	1	
6	TP9 (12.5-15cm)			✓	✓	✓	"	1	
7	TP9 (15-17.5cm)			✓	✓	✓	"	1	
8	TP9 (17.5-20cm)			✓	✓	✓	"	1	
9	TP9 (20-22.5cm)			✓	✓	✓	"	1	
10	TP9 (22.5-25cm)			✓	✓	✓	"	1	
11	TP9 (25-27.5cm)			✓	✓	✓	"	1	
12	TP9 (27.5-30cm)			✓	✓	✓	"	1	

Samples Relinquished to PAS by (Client Signature) | Date: | Time: | Method of Shipment

Samples Received in lab by: A. Chojna | Date: 01/08/28 | Time: 15:50 | Condition of samples upon receipt at lab: 24°C

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

№ 3315

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received: September 12/2001
Date Reported: September 19/2001
Lab Ref#: G214452
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

REVISED

RECU/RECEIVED
01 -10- 2001

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received: August 28/2001
Date Reported: September 25/2001
Lab Ref#: G214050
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

REVISED

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received: August 28/2001
Date Reported: September 25/2001
Lab Ref#: G214050
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Date Reported: September 25/2001
Lab Ref # : G214050
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP17 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	4.2	5.0	3.5	6.5	yes	yes
Arsenic	TP17 (45-50CM)	0.2	mg/kg	nd	0.5	yes	117	84	120	yes	3.8	5.0	3.5	6.5	yes	yes
Arsenic	TP3 (30-35CM)	0.2	mg/kg	nd	0.5	yes	117	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Antimony	TP17 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	114	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP17 (45-50CM)	0.2	mg/kg	nd	0.5	yes	114	29	157	yes	4.0	5.0	3.5	6.5	yes	yes
Antimony	TP3 (30-35CM)	0.2	mg/kg	nd	0.5	yes	100	29	157	yes	4.7	5.0	3.5	6.5	yes	yes
Selenium	TP17 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP17 (45-50CM)	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.0	5.0	3.5	6.5	yes	yes
Selenium	TP3 (30-35CM)	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.9	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	nd	40	yes	102	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	93	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	99	74	125	yes	na	na	na	na	na	yes
Barium	TP17 (0-2.5CM)	5	mg/kg	nd	10	yes	100	82	113	yes	101	100	70	130	yes	yes
Barium	TP17 (45-50CM)	5	mg/kg	nd	10	yes	98	82	113	yes	95	100	70	130	yes	yes
Barium	TP3 (30-35CM)	5	mg/kg	nd	10	yes	96	82	113	yes	88	100	70	130	yes	yes
Beryllium	TP17 (0-2.5CM)	0.2	mg/kg	nd	0.4	yes	84	72	124	yes	9.4	10	7	13	yes	yes
Beryllium	TP17 (45-50CM)	0.2	mg/kg	nd	0.4	yes	80	72	124	yes	8.8	10	7	13	yes	yes
Beryllium	TP3 (30-35CM)	0.2	mg/kg	nd	0.4	yes	76	72	124	yes	8.4	10	7	13	yes	yes
Cadmium	TP17 (0-2.5CM)	0.5	mg/kg	nd	0.6	yes	162	0	180	yes	95.4	100	70	130	yes	yes
Cadmium	TP17 (45-50CM)	0.5	mg/kg	nd	0.6	yes	112	0	180	yes	91.1	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
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REVISED

Date Reported: September 25/2001
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Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Cadmium	TP3 (30-35CM)	0.5	mg/kg	nd	0.6	yes	145	0	180	yes	86.7	100	70	130	yes	yes
Chromium	TP17 (0-2.5CM)	1	mg/kg	nd	2	yes	108	72	124	yes	96	100	70	130	yes	yes
Chromium	TP17 (45-50CM)	1	mg/kg	nd	2	yes	104	72	124	yes	92	100	70	130	yes	yes
Chromium	TP3 (30-35CM)	1	mg/kg	nd	2	yes	104	72	124	yes	89	100	70	130	yes	yes
Cobalt	TP17 (0-2.5CM)	2	mg/kg	nd	4	yes	102	85	123	yes	94	100	70	130	yes	yes
Cobalt	TP17 (45-50CM)	2	mg/kg	nd	4	yes	97	85	123	yes	90	100	70	130	yes	yes
Cobalt	TP3 (30-35CM)	2	mg/kg	nd	4	yes	96	85	123	yes	85	100	70	130	yes	yes
Copper	TP17 (0-2.5CM)	1	mg/kg	nd	4	yes	107	78	122	yes	98	100	70	130	yes	yes
Copper	TP17 (45-50CM)	1	mg/kg	nd	4	yes	100	78	122	yes	90	100	70	130	yes	yes
Copper	TP3 (30-35CM)	1	mg/kg	nd	4	yes	97	78	122	yes	84	100	70	130	yes	yes
Iron	na	50	mg/kg	nd	100	yes	90	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	96	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	97	85	119	yes	na	na	na	na	na	yes
Lead	TP17 (0-2.5CM)	5	mg/kg	nd	10	yes	107	48	152	yes	110	100	70	130	yes	yes
Lead	TP17 (45-50CM)	5	mg/kg	nd	10	yes	100	48	152	yes	87	100	70	130	yes	yes
Lead	TP3 (30-35CM)	5	mg/kg	nd	10	yes	83	48	152	yes	85	100	70	130	yes	yes
Manganese	TP17 (0-2.5CM)	1	mg/kg	nd	2	yes	103	85	115	yes	94	100	70	130	yes	yes
Manganese	TP17 (45-50CM)	1	mg/kg	nd	2	yes	101	85	115	yes	91	100	70	130	yes	yes
Manganese	TP3 (30-35CM)	1	mg/kg	nd	2	yes	97	85	115	yes	74	100	70	130	yes	yes
Molybdenum	TP17 (0-2.5CM)	3	mg/kg	nd	6	yes	130	0	210	yes	186	200	140	260	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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Philip Analytical Services Corp

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				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Molybdenum	TP17 (45-50CM)	3	mg/kg	nd	6	yes	113	0	210	yes	177	200	140	260	yes	yes
Molybdenum	TP3 (30-35CM)	3	mg/kg	nd	6	yes	104	0	210	yes	169	200	140	260	yes	yes
Nickel	TP17 (0-2.5CM)	2	mg/kg	nd	4	yes	98	86	116	yes	*	*	*	*	*	yes
Nickel	TP17 (45-50CM)	2	mg/kg	nd	4	yes	96	86	116	yes	93	100	70	130	yes	yes
Nickel	TP3 (30-35CM)	2	mg/kg	nd	4	yes	93	86	116	yes	84	100	70	130	yes	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	114	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	116	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	111	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	134	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	138	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	119	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	126	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	131	37	174	yes	na	na	na	na	na	yes
Vanadium	TP17 (0-2.5CM)	1	mg/kg	nd	2	yes	105	81	119	yes	96	100	70	130	yes	yes
Vanadium	TP17 (45-50CM)	1	mg/kg	nd	2	yes	102	81	119	yes	91	100	70	130	yes	yes
Vanadium	TP3 (30-35CM)	1	mg/kg	nd	2	yes	99	81	119	yes	87	100	70	130	yes	yes
Zinc	TP17 (0-2.5CM)	5	mg/kg	nd	10	yes	101	85	112	yes	104	100	70	130	yes	yes
Zinc	TP17 (45-50CM)	5	mg/kg	nd	10	yes	98	85	112	yes	89	100	70	130	yes	yes
Zinc	TP3 (30-35CM)	5	mg/kg	nd	10	yes	91	85	112	yes	81	100	70	130	yes	yes

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PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

AT E

Work Order: G 214052
Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL
MARKHAM

Contact: M. ALAM
Phone: Fax:

PAS Quote #: JWEL-INCO
Page ___ of ___
Client P.O. #:
Client Project #: ONT 34651.1
Sampled by: M. ALAM
Please specify Guideline (if applicable): INCO SPECIAL (FOLLOW JWEL/INCO PROTOCOL)
AUG 28 '01

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab
STD (circled) 5-7 Business Days
RUSH Specify Date ___
Time ___

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METAL	~~BORON~~	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP9 (0-2.5)			✓	✓	✓	SOIL	1	FOLLOW
2	TP9 (2.5-5cm)			✓	✓	✓	〃	1	PROTOCOL
3	TP9 (5-7.5cm)			✓	✓	✓	〃	1	
4	TP9 (7.5-10cm)			✓	✓	✓	〃	1	
5	TP9 (10-12.5cm)			✓	✓	✓	〃	1	
6	TP9 (12.5-15cm)			✓	✓	✓	〃	1	
7	TP9 (15-17.5cm)			✓	✓	✓	〃	1	
8	TP9 (17.5-20cm)			✓	✓	✓	〃	1	
9	TP9 (20-22.5cm)			✓	✓	✓	〃	1	
10	TP9 (22.5-25cm)			✓	✓	✓	〃	1	
11	TP9 (25-27.5cm)			✓	✓	✓	〃	1	
12	TP9 (27.5-30cm)			✓	✓	✓	〃	1	

Samples Relinquished to PAS by (Client Signature): Date: Time: Method of Shipment

Samples Received in lab by: A. Chijno Date: 01/08/28 Time: 15:50 Condition of samples upon receipt at lab: 24°C

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº [redacted] 3315

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Date Reported: September 25/2001
Lab Ref # : G214050
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Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP17 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	4.2	5.0	3.5	6.5	yes	yes
Arsenic	TP17 (45-50CM)	0.2	mg/kg	nd	0.5	yes	117	84	120	yes	3.8	5.0	3.5	6.5	yes	yes
Arsenic	TP3 (30-35CM)	0.2	mg/kg	nd	0.5	yes	117	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Antimony	TP17 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	114	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP17 (45-50CM)	0.2	mg/kg	nd	0.5	yes	114	29	157	yes	4.0	5.0	3.5	6.5	yes	yes
Antimony	TP3 (30-35CM)	0.2	mg/kg	nd	0.5	yes	100	29	157	yes	4.7	5.0	3.5	6.5	yes	yes
Selenium	TP17 (0-2.5CM)	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP17 (45-50CM)	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.0	5.0	3.5	6.5	yes	yes
Selenium	TP3 (30-35CM)	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.9	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	nd	40	yes	102	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	93	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	99	74	125	yes	na	na	na	na	na	yes
Barium	TP17 (0-2.5CM)	5	mg/kg	nd	10	yes	100	82	113	yes	101	100	70	130	yes	yes
Barium	TP17 (45-50CM)	5	mg/kg	nd	10	yes	98	82	113	yes	95	100	70	130	yes	yes
Barium	TP3 (30-35CM)	5	mg/kg	nd	10	yes	96	82	113	yes	88	100	70	130	yes	yes
Beryllium	TP17 (0-2.5CM)	0.2	mg/kg	nd	0.4	yes	84	72	124	yes	9.4	10	7	13	yes	yes
Beryllium	TP17 (45-50CM)	0.2	mg/kg	nd	0.4	yes	80	72	124	yes	8.8	10	7	13	yes	yes
Beryllium	TP3 (30-35CM)	0.2	mg/kg	nd	0.4	yes	76	72	124	yes	8.4	10	7	13	yes	yes
Cadmium	TP17 (0-2.5CM)	0.5	mg/kg	nd	0.6	yes	162	0	180	yes	95.4	100	70	130	yes	yes
Cadmium	TP17 (45-50CM)	0.5	mg/kg	nd	0.6	yes	112	0	180	yes	91.1	100	70	130	yes	yes

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Philip Analytical Services Corp

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Chromium	TP17 (0-2.5CM)	1	mg/kg	nd	2	yes	108	72	124	yes	96	100	70	130	yes	yes
Chromium	TP17 (45-50CM)	1	mg/kg	nd	2	yes	104	72	124	yes	92	100	70	130	yes	yes
Chromium	TP3 (30-35CM)	1	mg/kg	nd	2	yes	104	72	124	yes	89	100	70	130	yes	yes
Cobalt	TP17 (0-2.5CM)	2	mg/kg	nd	4	yes	102	85	123	yes	94	100	70	130	yes	yes
Cobalt	TP17 (45-50CM)	2	mg/kg	nd	4	yes	97	85	123	yes	90	100	70	130	yes	yes
Cobalt	TP3 (30-35CM)	2	mg/kg	nd	4	yes	96	85	123	yes	85	100	70	130	yes	yes
Copper	TP17 (0-2.5CM)	1	mg/kg	nd	4	yes	107	78	122	yes	98	100	70	130	yes	yes
Copper	TP17 (45-50CM)	1	mg/kg	nd	4	yes	100	78	122	yes	90	100	70	130	yes	yes
Copper	TP3 (30-35CM)	1	mg/kg	nd	4	yes	97	78	122	yes	84	100	70	130	yes	yes
Iron	na	50	mg/kg	nd	100	yes	90	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	96	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	97	85	119	yes	na	na	na	na	na	yes
Lead	TP17 (0-2.5CM)	5	mg/kg	nd	10	yes	107	48	152	yes	110	100	70	130	yes	yes
Lead	TP17 (45-50CM)	5	mg/kg	nd	10	yes	100	48	152	yes	87	100	70	130	yes	yes
Lead	TP3 (30-35CM)	5	mg/kg	nd	10	yes	83	48	152	yes	85	100	70	130	yes	yes
Manganese	TP17 (0-2.5CM)	1	mg/kg	nd	2	yes	103	85	115	yes	94	100	70	130	yes	yes
Manganese	TP17 (45-50CM)	1	mg/kg	nd	2	yes	101	85	115	yes	91	100	70	130	yes	yes
Manganese	TP3 (30-35CM)	1	mg/kg	nd	2	yes	97	85	115	yes	74	100	70	130	yes	yes
Molybdenum	TP17 (0-2.5CM)	3	mg/kg	nd	6	yes	130	0	210	yes	186	200	140	260	yes	yes

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Molybdenum	TP3 (30-35CM)	3	mg/kg	nd	6	yes	104	0	210	yes	169	200	140	260	yes	yes
Nickel	TP17 (0-2.5CM)	2	mg/kg	nd	4	yes	98	86	116	yes	*	*	*	*	*	yes
Nickel	TP17 (45-50CM)	2	mg/kg	nd	4	yes	96	86	116	yes	93	100	70	130	yes	yes
Nickel	TP3 (30-35CM)	2	mg/kg	nd	4	yes	93	86	116	yes	84	100	70	130	yes	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	114	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	116	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	111	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	134	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	138	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	119	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	126	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	131	37	174	yes	na	na	na	na	na	yes
Vanadium	TP17 (0-2.5CM)	1	mg/kg	nd	2	yes	105	81	119	yes	96	100	70	130	yes	yes
Vanadium	TP17 (45-50CM)	1	mg/kg	nd	2	yes	102	81	119	yes	91	100	70	130	yes	yes
Vanadium	TP3 (30-35CM)	1	mg/kg	nd	2	yes	99	81	119	yes	87	100	70	130	yes	yes
Zinc	TP17 (0-2.5CM)	5	mg/kg	nd	10	yes	101	85	112	yes	104	100	70	130	yes	yes
Zinc	TP17 (45-50CM)	5	mg/kg	nd	10	yes	98	85	112	yes	89	100	70	130	yes	yes
Zinc	TP3 (30-35CM)	5	mg/kg	nd	10	yes	91	85	112	yes	81	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Date Reported: September 25/2001
Lab Ref # : G214050
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	100	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	100	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	100	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214050
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP17 (0-2.5CM)	TP17 (0-2.5CM) Replicate	TP17 (2.5-5CM)	TP17 (5-7.5CM)	TP17 (35-40CM)
Antimony	0.2	mg/kg	0.8	0.8	1.7	1.7	0.4
Arsenic	0.2	mg/kg	23.7	22.7	47.9	71.2	4.5
Selenium	0.2	mg/kg	2.9	3.2	4.6	4.5	0.4
Aluminum	20	mg/kg	3220	3370	4300	4050	1530
Barium	5	mg/kg	76	82	112	113	28
Beryllium	0.2	mg/kg	0.3	0.3	0.5	0.4	nd
Cadmium	0.5	mg/kg	1.6	1.2	3.9	5.0	nd
Chromium	1	mg/kg	21	24	46	51	4
Cobalt	2	mg/kg	48	50	107	100	2
Copper	1	mg/kg	262	266	589	764	16
Iron	50	mg/kg	27700	28600	62400	82900	4630
Lead	5	mg/kg	216	226	398	448	23
Manganese	1	mg/kg	541	519	1040	1290	78
Molybdenum	3	mg/kg	nd	nd	3	5	nd
Nickel	2	mg/kg	2200	2220	5310	6660	87
Phosphorus	20	mg/kg	945	984	1390	1100	459
Silver	1	mg/kg	1	1	3	4	nd
Titanium	5	mg/kg	75	80	86	105	113
Vanadium	1	mg/kg	15	15	26	24	6
Zinc	5	mg/kg	403	406	825	1120	44
pH	0.01	Units	6.85	6.87	6.81	6.86	7.34
Moisture Content	0.01	%	21.3	21.4	18.2	15.9	9.45

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214050
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP17 (40-45CM)	TP17 (45-50CM)	TP17 (45-50CM) Replicate	TP17 (7.5-10CM)	TP17 (70-75CM)
Antimony	0.2	mg/kg	0.4	0.2	0.2	1.6	nd
Arsenic	0.2	mg/kg	6.3	4.5	4.0	79.0	0.7
Selenium	0.2	mg/kg	nd	nd	nd	4.8	nd
Aluminum	20	mg/kg	1190	1200	1160	4040	1980
Barium	5	mg/kg	14	10	10	108	8
Beryllium	0.2	mg/kg	nd	nd	nd	0.4	nd
Cadmium	0.5	mg/kg	nd	nd	nd	4.3	nd
Chromium	1	mg/kg	4	4	4	37	4
Cobalt	2	mg/kg	nd	nd	nd	97	nd
Copper	1	mg/kg	6	4	3	989	4
Iron	50	mg/kg	1850	1640	1530	79900	3050
Lead	5	mg/kg	5	nd	11	476	5
Manganese	1	mg/kg	18	17	17	1140	25
Molybdenum	3	mg/kg	nd	nd	nd	3	nd
Nickel	2	mg/kg	33	22	20	8390	11
Phosphorus	20	mg/kg	261	168	143	883	319
Silver	1	mg/kg	nd	nd	nd	4	nd
Titanium	5	mg/kg	143	132	126	125	124
Vanadium	1	mg/kg	5	6	6	19	9
Zinc	5	mg/kg	10	8	8	1030	13
pH	0.01	Units	7.39	7.58	7.60	7.03	7.61
Moisture Content	0.01	%	7.48	3.92	3.76	17.0	5.00

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214050
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP17 (95-100CM)	TP17 (10-12.5CM)	TP17 (12.5-15CM)	TP17 (15-17.5CM)	TP17 (17.5-20CM)
Antimony	0.2	mg/kg	nd	0.6	0.6	0.5	0.5
Arsenic	0.2	mg/kg	0.5	111	12.2	6.6	6.4
Selenium	0.2	mg/kg	nd	2.1	1.0	0.6	0.8
Aluminum	20	mg/kg	1450	6650	3770	2380	4490
Barium	5	mg/kg	5	109	64	53	71
Beryllium	0.2	mg/kg	nd	0.5	0.3	nd	0.5
Cadmium	0.5	mg/kg	nd	2.7	0.8	nd	nd
Chromium	1	mg/kg	3	16	8	6	5
Cobalt	2	mg/kg	nd	25	9	4	3
Copper	1	mg/kg	2	548	152	58	45
Iron	50	mg/kg	2290	25100	11500	7210	8840
Lead	5	mg/kg	nd	170	87	54	43
Manganese	1	mg/kg	17	487	232	130	227
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	4	2790	810	333	208
Phosphorus	20	mg/kg	246	802	528	530	519
Silver	1	mg/kg	nd	2	nd	nd	nd
Titanium	5	mg/kg	97	147	98	77	134
Vanadium	1	mg/kg	5	18	11	9	11
Zinc	5	mg/kg	11	349	139	100	117
pH	0.01	Units	7.44	7.06	7.17	7.11	7.28
Moisture Content	0.01	%	4.46	16.0	12.2	9.81	11.5

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214050
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP17 (20-22.5CM)	TP17 (22.5-25CM)	TP17 (25-27.5CM)	TP17 (27.5-30CM)	TP17 (30-30.5CM)
Antimony	0.2	mg/kg	0.5	0.5	0.5	0.4	0.3
Arsenic	0.2	mg/kg	5.7	5.1	4.4	3.7	3.7
Selenium	0.2	mg/kg	1.0	0.6	0.7	0.6	0.5
Aluminum	20	mg/kg	9710	4370	3380	2570	1770
Barium	5	mg/kg	102	67	58	48	35
Beryllium	0.2	mg/kg	1.3	0.5	0.4	0.3	nd
Cadmium	0.5	mg/kg	0.9	1.0	0.5	nd	nd
Chromium	1	mg/kg	4	6	5	5	4
Cobalt	2	mg/kg	2	4	4	3	nd
Copper	1	mg/kg	47	56	39	26	13
Iron	50	mg/kg	12300	13400	11000	7930	6690
Lead	5	mg/kg	36	53	46	43	83
Manganese	1	mg/kg	423	282	231	169	122
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	177	249	179	116	47
Phosphorus	20	mg/kg	610	717	664	574	534
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	244	159	121	95	92
Vanadium	1	mg/kg	12	13	10	7	7
Zinc	5	mg/kg	105	124	104	78	57
pH	0.01	Units	7.42	7.38	7.39	7.33	7.33
Moisture Content	0.01	%	13.6	13.6	13.3	14.6	12.0

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214050
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP3 (0-2.5CM)	TP3 (2.5-5CM)	TP3 (30-35CM)	TP3 (30-35CM) Replicate	TP3 (35-40CM)
Antimony	0.2	mg/kg	0.6	0.7	0.2	0.2	0.2
Arsenic	0.2	mg/kg	15.8	24.8	2.8	3.0	3.6
Selenium	0.2	mg/kg	4.6	5.0	0.4	0.3	nd
Aluminum	20	mg/kg	10600	15000	17700	19300	20500
Barium	5	mg/kg	123	154	121	129	147
Beryllium	0.2	mg/kg	0.7	1.1	0.9	0.9	1.0
Cadmium	0.5	mg/kg	1.1	1.4	nd	nd	nd
Chromium	1	mg/kg	21	25	26	28	29
Cobalt	2	mg/kg	62	62	16	17	14
Copper	1	mg/kg	462	597	24	25	25
Iron	50	mg/kg	13700	17900	24800	26100	30900
Lead	5	mg/kg	46	48	10	14	10
Manganese	1	mg/kg	250	222	207	214	231
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	2690	3890	47	52	42
Phosphorus	20	mg/kg	1100	1100	268	290	500
Silver	1	mg/kg	2	2	nd	nd	nd
Titanium	5	mg/kg	80	81	192	215	218
Vanadium	1	mg/kg	21	27	35	38	39
Zinc	5	mg/kg	124	135	68	72	70
pH	0.01	Units	6.73	6.71	6.83	6.83	7.14
Moisture Content	0.01	%	27.0	23.7	15.6	15.6	18.2

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214050
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP3 (40-45CM)	TP3 (45-50CM)	TP3 (5-7.5CM)	TP3 (7.5-10CM)	TP3 (70-75CM)
Antimony	0.2	mg/kg	0.2	0.3	0.7	0.6	0.4
Arsenic	0.2	mg/kg	3.8	4.2	37.9	41.1	8.3
Selenium	0.2	mg/kg	nd	nd	7.8	8.1	nd
Aluminum	20	mg/kg	21400	20800	16100	16500	17800
Barium	5	mg/kg	154	157	164	169	144
Beryllium	0.2	mg/kg	1.0	0.9	1.2	1.2	0.8
Cadmium	0.5	mg/kg	nd	nd	1.8	1.9	nd
Chromium	1	mg/kg	31	30	27	29	26
Cobalt	2	mg/kg	13	14	80	86	13
Copper	1	mg/kg	30	31	838	841	27
Iron	50	mg/kg	31700	41400	20200	21400	32000
Lead	5	mg/kg	15	16	52	59	11
Manganese	1	mg/kg	261	1210	178	185	474
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	40	49	5720	5910	32
Phosphorus	20	mg/kg	568	612	1100	1110	553
Silver	1	mg/kg	nd	nd	3	3	nd
Titanium	5	mg/kg	223	255	89	89	275
Vanadium	1	mg/kg	41	40	31	32	35
Zinc	5	mg/kg	71	71	162	161	62
pH	0.01	Units	7.14	7.43	6.59	6.52	7.88
Moisture Content	0.01	%	17.8	17.2	21.9	19.5	18.4

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214050
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP3 (95-100CM)	TP3 (10-12.5CM)	TP3 (12.5-15CM)	TP3 (15-17.5CM)	TP3 (17.5-20CM)
Antimony	0.2	mg/kg	0.3	0.6	0.6	0.6	0.6
Arsenic	0.2	mg/kg	7.1	37.9	36.8	34.7	36.8
Selenium	0.2	mg/kg	nd	7.5	7.0	8.0	7.5
Aluminum	20	mg/kg	18200	15900	16000	17200	15100
Barium	5	mg/kg	159	164	159	174	150
Beryllium	0.2	mg/kg	0.8	1.2	1.1	1.3	1.1
Cadmium	0.5	mg/kg	nd	1.5	1.5	2.3	1.3
Chromium	1	mg/kg	27	27	28	30	26
Cobalt	2	mg/kg	13	71	71	75	65
Copper	1	mg/kg	26	739	705	806	685
Iron	50	mg/kg	32300	20100	19800	20500	19000
Lead	5	mg/kg	12	53	47	55	50
Manganese	1	mg/kg	422	156	167	155	142
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	32	4830	4610	5100	4370
Phosphorus	20	mg/kg	578	1050	1020	1140	970
Silver	1	mg/kg	nd	3	3	3	2
Titanium	5	mg/kg	295	86	88	92	83
Vanadium	1	mg/kg	37	31	32	34	30
Zinc	5	mg/kg	65	149	146	154	137
pH	0.01	Units	7.93	6.55	6.55	6.45	6.50
Moisture Content	0.01	%	20.6	18.5	22.0	22.9	23.0

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214050
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP3 (20-22.5CM)	TP3 (22.5-25CM)	TP3 (25-27.5CM)	TP3 (27.5-30CM)	
Antimony	0.2	mg/kg	0.6	0.6	nd	nd	
Arsenic	0.2	mg/kg	33.7	29.5	2.5	3.0	
Selenium	0.2	mg/kg	7.9	6.3	nd	0.2	
Aluminum	20	mg/kg	14700	14300	11600	12400	
Barium	5	mg/kg	145	138	96	108	
Beryllium	0.2	mg/kg	1.1	1.0	0.6	0.6	
Cadmium	0.5	mg/kg	1.7	1.2	nd	nd	
Chromium	1	mg/kg	25	24	19	21	
Cobalt	2	mg/kg	67	52	11	10	
Copper	1	mg/kg	773	584	15	18	
Iron	50	mg/kg	17800	17200	19300	20400	
Lead	5	mg/kg	52	44	11	11	
Manganese	1	mg/kg	138	132	115	111	
Molybdenum	3	mg/kg	nd	nd	nd	nd	
Nickel	2	mg/kg	4770	3510	44	36	
Phosphorus	20	mg/kg	932	815	162	170	
Silver	1	mg/kg	3	2	nd	nd	
Titanium	5	mg/kg	82	76	121	109	
Vanadium	1	mg/kg	29	28	33	33	
Zinc	5	mg/kg	134	118	57	58	
pH	0.01	Units	6.36	6.38	6.68	6.69	
Moisture Content	0.01	%	24.6	23.5	13.6	10.6	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

REVISED

Date Received: August 28/2001
Date Reported: September 25/2001
Lab Ref#: G214050
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Certificate of Analysis

Additional Comments:

Revised Report:
Antimony analysis of soil added.

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214050

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL
MARKHAM

Contact: M. ALAM

Phone: Fax:

PAS Quote #: JWEL-INCO

AUG 28 '01 PM 1:28

Page of

Client P.O. #:

Client Project #: ONT 34651.1

Sampled by:

Please specify Guideline (if applicable) INCO SPECIAL (JWEL/INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23M TAL	[illegible]	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP17 (0-2.5m)			✓	✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP17 (2.5-5m)			✓	✓	✓	"	1	
3	TP17 (5-7.5m)			✓	✓	✓	"	1	
4	TP17 (7.5-10m)			✓	✓	✓	"	1	
5	TP17 (10-12.5m)			✓	✓	✓	"	1	
6	TP17 (12.5-15m)			✓	✓	✓	"	1	
7	TP17 (15-17.5m)			✓	✓	✓	"	1	
8	TP17 (17.5-20m)			✓	✓	✓	"	1	
9	TP17 (20-22.5m)			✓	✓	✓	"	1	
10	TP17 (22.5-25m)			✓	✓	✓	"	1	
11	TP17 (25-27.5m)			✓	✓	✓	"	1	
12	TP17 (27.5-30m)			✓	✓	✓	"	1	

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Ch[illegible]	Date: 01/08/28	Time: 13:28	Condition of samples upon receipt at lab: 24°C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

3

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

AT EC

Work Order: G 214050

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

PAS Quote # : JWEL-INCO

Page ____ of ____

Client P.O. # :

Client Project # : ONT34651.1

Contact: M. ALAM

Sampled by:

Phone: ____ Fax: ____

Please specify Guideline (if applicable) INO SPECIAL

AUG 28 '01 PM 1:28

Analysis Required:

Invoice to (if other than above):

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date ____

Time ____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 Metal	Boron (Hot Water)	pH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP17 (30-35 cm)			✓	✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP17 (35-40 cm)			✓	✓	✓	"	1	
3	TP17 (40-45 cm)			✓	✓	✓	"	1	
4	TP17 (45-50 cm)			✓	✓	✓	"	1	
5	TP17 (70-75 cm)			✓	✓	✓	"	1	
6	TP17 (95-100 cm)			✓	✓	✓	"	1	
7									
8									
9									
10									
11									
12									

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Chopra	Date: 01/08/28	Time: 13:28	Condition of samples upon receipt at lab: 24°C

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

No. 3334

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214050

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M.ALAM

Phone: _____ Fax: _____

PAS Quote # : INCO-JWEL SPECIAL

Client P.O. # :

Client Project # : ONT 34651.1

Sampled by: M.ALAM

Please specify Guideline (if applicable) INCO SPECIAL PROTOCOL AUG 28/01 MD 1:23

Page _____ of _____

Invoice to (if other than above):

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date _____

Time _____

Analysis Required: ICP/GFAA-23 METAL; PH

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	TP3 (0-2.5cm)			SOIL	1	FOLLOW
2	TP3 (2.5-5 cm)			"	1	PROTOCOL
3	TP3 (5-7.5cm)			"	1	
4	TP3 (7.5-10cm)			"	1	
5	TP3 (10-12.5cm)			"	1	
6	TP3 (12.5-15cm)			"	1	
7	TP3 (15-17.5cm)			"	1	
8	TP3 (17.5-20cm)			"	1	
9	TP3 (20-22.5cm)			"	1	
10	TP3 (22.5-25cm)			"	1	
11	TP3 (25-27.5cm)			"	1	
12	TP3 (27.5-30cm)			"	1	

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Chiu	Date: 01/08/28	Time: 13:22	Condition of samples upon receipt at lab: 2 4C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

ATC E C

Work Order:

Comments: G 214050

CHAIN OF CUSTODY RECORD

Client: JWEL
MARKHAM

Contact: M. ALAM

Phone: Fax:

PAS Quote # : INCO-JWEL SPECIAL

Client P.O. # :

Client Project # : ONT 346511

Sampled by:

AUG 28 '01 PM 1:23

Please specify Guideline (if applicable) INCO SPECIAL PROTOCOL

Page of

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METAL	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP3 (30-35cm)			✓	✓	SOIL	1	FOLLOW
2	TP3 (35-40cm)			✓	✓	"	1	PROTOCOL
3	TP3 (40-45cm)			✓	✓	"	1	
4	TP3 (45-50cm)			✓	✓	"	1	
5	TP3 (70-75cm)			✓	✓	"	1	
6	TP3 (95-100cm)			✓	✓	"	1	
7								
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Chiu	Date: 01/08/28	Time: 13:22	Condition of samples upon receipt at lab: 2 4 C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº [redacted] 8224

PSC
ANALYTICAL SERVICES

REVISED

RECH/RECEIVED
n 1 -10- 2001

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 30/2001
Date Reported:	September 25/2001
Lab Ref#:	G214120
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M. Alam

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

REVISED

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 30/2001
Date Reported:	September 25/2001
Lab Ref#:	G214120
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M. Alam

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

REVISED

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 25/2001
Lab Ref # : G214120
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP5(0-2.5C M)	0.2	mg/kg	nd	0.5	yes	117	84	120	yes	*	*	*	*	*	yes
Arsenic	TP5(45-50C M)	0.2	mg/kg	nd	0.5	yes	102	84	120	yes	4.1	5.0	3.5	6.5	yes	yes
Antimony	TP5(0-2.5C M)	0.2	mg/kg	0.2	0.5	yes	100	29	157	yes	4.4	5.0	3.5	6.5	yes	yes
Antimony	TP5(45-50C M)	0.2	mg/kg	nd	0.5	yes	114	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP5(0-2.5C M)	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.9	5.0	3.5	6.5	yes	yes
Selenium	TP5(45-50C M)	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.6	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	nd	40	yes	104	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	106	74	125	yes	na	na	na	na	na	yes
Barium	TP5(0-2.5C M)	5	mg/kg	nd	10	yes	100	82	113	yes	108	100	70	130	yes	yes
Barium	TP5(45-50C M)	5	mg/kg	nd	10	yes	101	82	113	yes	87	100	70	130	yes	yes
Beryllium	TP5(0-2.5C M)	0.2	mg/kg	nd	0.4	yes	87	72	124	yes	9.8	10	7	13	yes	yes
Beryllium	TP5(45-50C M)	0.2	mg/kg	nd	0.4	yes	88	72	124	yes	8.8	10	7	13	yes	yes
Cadmium	TP5(0-2.5C M)	0.5	mg/kg	nd	0.6	yes	162	0	180	yes	97.4	100	70	130	yes	yes
Cadmium	TP5(45-50C M)	0.5	mg/kg	nd	0.6	yes	153	0	180	yes	91.5	100	70	130	yes	yes
Chromium	TP5(0-2.5C M)	1	mg/kg	nd	2	yes	108	72	124	yes	96	100	70	130	yes	yes
Chromium	TP5(45-50C M)	1	mg/kg	nd	2	yes	110	72	124	yes	86	100	70	130	yes	yes
Cobalt	TP5(0-2.5C M)	2	mg/kg	nd	4	yes	104	85	123	yes	96	100	70	130	yes	yes
Cobalt	TP5(45-50C M)	2	mg/kg	nd	4	yes	107	85	123	yes	87	100	70	130	yes	yes
Copper	TP5(0-2.5C M)	1	mg/kg	nd	4	yes	106	78	122	yes	106	100	70	130	yes	yes
Copper	TP5(45-50C M)	1	mg/kg	nd	4	yes	103	78	122	yes	90	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Date Reported: September 25/2001
Lab Ref # : G214120
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	100	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	101	85	119	yes	na	na	na	na	na	yes
Lead	TP5(0-2.5C M)	5	mg/kg	nd	10	yes	103	48	152	yes	96	100	70	130	yes	yes
Lead	TP5(45-50C M)	5	mg/kg	nd	10	yes	113	48	152	yes	87	100	70	130	yes	yes
Manganese	TP5(0-2.5C M)	1	mg/kg	nd	2	yes	104	85	115	yes	100	100	70	130	yes	yes
Manganese	TP5(45-50C M)	1	mg/kg	nd	2	yes	106	85	115	yes	*	*	*	*	*	yes
Molybdenum	TP5(0-2.5C M)	3	mg/kg	nd	6	yes	156	0	210	yes	186	200	140	260	yes	yes
Molybdenum	TP5(45-50C M)	3	mg/kg	nd	6	yes	121	0	210	yes	178	200	140	260	yes	yes
Nickel	TP5(0-2.5C M)	2	mg/kg	nd	4	yes	101	86	116	yes	*	*	*	*	*	yes
Nickel	TP5(45-50C M)	2	mg/kg	nd	4	yes	102	86	116	yes	82	100	70	130	yes	yes
Phosphorus	na	20	mg/kg	nd	40	yes	121	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	122	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	122	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	143	25	200	yes	na	na	na	na	na	yes
Titanium	TP5(0-2.5C M)	5	mg/kg	nd	10	yes	142	37	174	yes	123	100	70	130	yes	yes
Titanium	TP5(45-50C M)	5	mg/kg	nd	10	yes	146	37	174	yes	115	100	70	130	yes	yes
Vanadium	TP5(0-2.5C M)	1	mg/kg	nd	2	yes	106	81	119	yes	99	100	70	130	yes	yes
Vanadium	TP5(45-50C M)	1	mg/kg	nd	2	yes	109	81	119	yes	88	100	70	130	yes	yes
Zinc	TP5(0-2.5C M)	5	mg/kg	nd	10	yes	104	85	112	yes	103	100	70	130	yes	yes
Zinc	TP5(45-50C M)	5	mg/kg	nd	10	yes	108	85	112	yes	91	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

REVISED

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 25/2001
Lab Ref # : G214120
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	95	90	110	yes	na	na	na	na	na	yes

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TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214120
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP1(BEDROCK)	TP5(0-2.5CM)	TP5(0-2.5CM) Replicate	TP5(10-12.5CM)	TP5(12.5-15CM)
Antimony	0.2	mg/kg	nd	0.7	0.7	0.2	0.4
Arsenic	0.2	mg/kg	1.5	47.5	47.5	5.5	18.0
Selenium	0.2	mg/kg	nd	7.1	7.1	1.2	3.1
Aluminum	20	mg/kg	1300	29000	27800	22600	23900
Barium	5	mg/kg	12	203	198	132	146
Beryllium	0.2	mg/kg	nd	1.6	1.6	1.0	1.2
Cadmium	0.5	mg/kg	nd	2.2	2.4	0.8	1.1
Chromium	1	mg/kg	6	37	36	30	31
Cobalt	2	mg/kg	nd	108	109	21	48
Copper	1	mg/kg	10	818	823	92	324
Iron	50	mg/kg	3120	28100	28000	22600	23500
Lead	5	mg/kg	nd	50	52	17	27
Manganese	1	mg/kg	153	346	339	175	199
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	7	7400	7510	814	3010
Phosphorus	20	mg/kg	132	1370	1360	262	575
Silver	1	mg/kg	nd	2	2	nd	nd
Titanium	5	mg/kg	15	157	162	160	156
Vanadium	1	mg/kg	4	51	50	43	44
Zinc	5	mg/kg	6	192	191	92	122
pH	0.01	Units	8.44	6.40	6.40	6.33	6.27
Moisture Content	0.01	%	is	19.5	19.5	14.3	14.5

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
is Insufficient Sample for analysis.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214120
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP5(15-17.5CM)	TP5(17.5-20CM)	TP5(2.5-5CM)	TP5(20-22.5CM)	TP5(22.5-25CM)
Antimony	0.2	mg/kg	nd	nd	0.6	nd	nd
Arsenic	0.2	mg/kg	2.2	2.5	45.6	2.7	2.1
Selenium	0.2	mg/kg	0.6	0.8	7.4	0.7	0.6
Aluminum	20	mg/kg	22100	22000	29100	24400	23000
Barium	5	mg/kg	129	126	204	155	144
Beryllium	0.2	mg/kg	1.0	1.0	1.6	1.2	1.1
Cadmium	0.5	mg/kg	nd	nd	2.5	0.5	0.5
Chromium	1	mg/kg	29	29	38	32	30
Cobalt	2	mg/kg	15	14	112	16	17
Copper	1	mg/kg	21	20	848	23	21
Iron	50	mg/kg	24400	23500	28800	27600	26700
Lead	5	mg/kg	15	14	57	15	16
Manganese	1	mg/kg	180	171	329	187	190
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	60	71	7920	44	38
Phosphorus	20	mg/kg	172	162	1390	189	208
Silver	1	mg/kg	nd	nd	2	nd	nd
Titanium	5	mg/kg	179	160	166	197	207
Vanadium	1	mg/kg	45	44	52	47	46
Zinc	5	mg/kg	86	83	195	88	87
pH	0.01	Units	6.35	6.33	6.33	6.44	6.47
Moisture Content	0.01	%	14.0	12.6	19.8	16.1	13.6

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214120
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP5(25-27.5CM)	TP5(27.5-30CM)	TP5(30-35CM)	TP5(35-40CM)	TP5(40-45CM)
Antimony	0.2	mg/kg	nd	nd	0.2	0.2	0.2
Arsenic	0.2	mg/kg	2.0	2.7	2.7	4.0	4.4
Selenium	0.2	mg/kg	0.5	1.0	0.6	0.6	0.3
Aluminum	20	mg/kg	21700	22900	24300	26300	27200
Barium	5	mg/kg	130	137	152	167	190
Beryllium	0.2	mg/kg	1.1	1.1	1.2	1.2	1.3
Cadmium	0.5	mg/kg	nd	nd	0.6	nd	nd
Chromium	1	mg/kg	28	30	32	34	36
Cobalt	2	mg/kg	16	17	17	17	17
Copper	1	mg/kg	21	34	30	35	35
Iron	50	mg/kg	25100	27100	29800	36800	39500
Lead	5	mg/kg	13	16	15	16	14
Manganese	1	mg/kg	179	187	203	239	358
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	46	67	70	80	82
Phosphorus	20	mg/kg	227	226	362	628	695
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	207	233	215	232	275
Vanadium	1	mg/kg	43	46	45	46	47
Zinc	5	mg/kg	86	90	119	199	219
pH	0.01	Units	6.51	6.49	6.71	6.94	7.18
Moisture Content	0.01	%	14.6	14.9	14.9	13.4	17.5

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Philip Analytical Services Corp

Report of Analysis

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Contact: Mahaboob Alam

REVISED

Report Date: September 25/2001
Lab Ref # : G214120
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP5(45-50CM)	TP5(45-50CM) Replicate	TP5(5-7.5CM)	TP5(7.5-10CM)	TP5(70-75CM)
Antimony	0.2	mg/kg	nd	nd	0.7	0.6	0.4
Arsenic	0.2	mg/kg	3.8	4.0	64.0	65.0	5.1
Selenium	0.2	mg/kg	0.6	0.6	9.4	10.0	nd
Aluminum	20	mg/kg	27200	27600	33200	33300	19200
Barium	5	mg/kg	203	204	238	242	153
Beryllium	0.2	mg/kg	1.2	1.2	1.9	1.9	0.9
Cadmium	0.5	mg/kg	0.6	0.6	3.1	3.3	0.6
Chromium	1	mg/kg	36	36	43	43	26
Cobalt	2	mg/kg	19	19	155	160	12
Copper	1	mg/kg	40	40	1280	1340	25
Iron	50	mg/kg	69400	69600	33800	34500	33100
Lead	5	mg/kg	14	13	68	71	9
Manganese	1	mg/kg	2140	2100	356	361	723
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	111	110	11800	12100	34
Phosphorus	20	mg/kg	788	789	1800	1850	632
Silver	1	mg/kg	nd	nd	4	4	nd
Titanium	5	mg/kg	353	358	180	181	298
Vanadium	1	mg/kg	47	48	59	59	35
Zinc	5	mg/kg	118	118	252	257	72
pH	0.01	Units	7.67	7.69	6.23	6.19	7.87
Moisture Content	0.01	%	20.8	18.9	22.7	22.6	15.3

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

REVISED

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: September 25/2001
Lab Ref # : G214120
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP5(95-100 CM)	TRAVEL BLANK	TRAVEL SPIKE		
Antimony	0.2	mg/kg	0.3	0.3	0.8		
Arsenic	0.2	mg/kg	5.7	2.1	26.5		
Selenium	0.2	mg/kg	nd	nd	0.6		
Aluminum	20	mg/kg	17900	4240	17000		
Barium	5	mg/kg	156	49	161		
Beryllium	0.2	mg/kg	0.8	0.3	0.6		
Cadmium	0.5	mg/kg	nd	nd	0.8		
Chromium	1	mg/kg	25	10	49		
Cobalt	2	mg/kg	12	4	27		
Copper	1	mg/kg	26	6	33		
Iron	50	mg/kg	31900	11600	33400		
Lead	5	mg/kg	11	10	27		
Manganese	1	mg/kg	552	174	1200		
Molybdenum	3	mg/kg	nd	nd	nd		
Nickel	2	mg/kg	30	4	45		
Phosphorus	20	mg/kg	600	381	971		
Silver	1	mg/kg	nd	nd	2		
Titanium	5	mg/kg	320	315	1150		
Vanadium	1	mg/kg	34	22	50		
Zinc	5	mg/kg	69	27	133		
pH	0.01	Units	7.94	ns	ns		
Moisture Content	0.01	%	15.1	na	na		

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
ns Insufficient Sample Submitted

Philip Analytical Services Corp

Report of Analysis-Blank and Spike

Client : Jacques Whitford Environment Ltd. **REVISED** Project: INCO
Contact: Mahaboob Alam

Analysis of Soil, expressed on a dry weight basis Client Ref#: ONT34651.1

Parameter	EQL	Units	Certified Travel Blank Soil Value	Expected Travel Spike Values			
Arsenic	0.2	mg/kg	<2	20.4			
Antimony	0.2	mg/kg	<12	0.7			
Selenium	0.2	mg/kg	<1	0.5			
Aluminum	20	mg/kg	3960	16300			
Barium	5	mg/kg	48	157			
Beryllium	0.2	mg/kg	<1	0.6			
Cadmium	0.5	mg/kg	<1	0.3			
Chromium	1	mg/kg	7	45			
Cobalt	2	mg/kg	<10	25			
Copper	1	mg/kg	<5	32			
Iron	50	mg/kg	8180	31000			
Lead	5	mg/kg	9	20			
Manganese	1	mg/kg	159	1140			
Molybdenum	3	mg/kg	-	1			
Nickel	2	mg/kg	<8	43			
Phosphorus	20	mg/kg	-	810			
Silver	1	mg/kg	<2	2			
Titanium	5	mg/kg	-	880			
Vanadium	1	mg/kg	14	50			
Zinc	5	mg/kg	23	125			

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

...LIP ...ALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

...AT... E C...

Work Order:
Comments: 6214120

CHAIN OF CUSTODY RECORD

Client: JWEL
MARKHAM

Contact: M. ALAM

Phone: Fax:

PAS Quote # : INCO-JWEL SPECIAL

Page ___ of ___

Client P.O. # :

Client Project # : ONT 34651.1

AUG 30 '01 PM 1:43

Sampled by: M.ALAM

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23METAL	PH	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	TP5(0-2.5cm)			✓	✓	SOIL	1	FOLLOW
2	TP5(2.5-5cm)			✓	✓	"	1	PROTOCOL
3	TP5(5-7.5cm)			✓	✓	"	1	
4	TP5(7.5-10cm)			✓	✓	"	1	
5	TP5(10-12.5cm)			✓	✓	"	1	
6	TP5(12.5-15cm)			✓	✓	"	1	
7	TP5(15-17.5cm)			✓	✓	"	1	
8	TP5(17.5-20cm)			✓	✓	"	1	
9	TP5(20-22.5cm)			✓	✓	"	1	
10	TP5(22.5-25cm)			✓	✓	"	1	
11	TP5(25-27.5cm)			✓	✓	"	1	
12	TP5(27.5-30cm)			✓	✓	"	1	

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: V. [illegible]	Date: 01/08/30	Time: 13:40	Condition of samples upon receipt at lab: 24C

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 008229

LABORATORY USE ONLY

Work Order: _____

Comments: _____

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

CHAIN OF CUSTODY RECORD

Client: JNEL MARKHAM

Contact: M. ALAM

Phone: _____ Fax: _____

PAS Quote # : JNEL-INCO

Client P.O. # : _____

Client Project # : ONT 346511

AUG 30 '01 PM 1:43

Sampled by: M. ALAM

Please specify Guideline (if applicable) INCO PROTOCOL

Page ____ of ____

Invoice to (if other than above):

_____

_____

_____

_____

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/AFAA-23 Metal	pH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP5 (30-35cm)			✓	✓	SOIL	1	FOLLOW
2	TP5 (35-40cm)			✓	✓	"	1	PROTOCOL
3	TP5 (40-45cm)			✓	✓	"	1	
4	TP5 (45-50cm)			✓	✓	"	1	
5	TP5 (70-75cm)			✓	✓	"	1	
6	TP5 (95-100cm)			✓	✓	"	1	
7								
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: J. Green	Date: 01/08/30	Time: 13:40	Condition of samples upon receipt at lab: 24C

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

B2

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

AT EC

Work Order:

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M.ALAM

Phone: Fax:

PAS Quote # : INCO-JWEL SPECIAL

Client P.O. # :

Client Project # : ONT 346510.1

Sampled by: M.ALAM

Please specify Guideline (if applicable) INCO PROTOCOL AUG 30 '01 PM 1:44

Page of

Invoice to (if other than above):

Analysis Required:

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METAL	PH	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	TP1 (BEDROCK)			✓	✓	soil	1	FOLLOW PROTOCOL
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date

Time

Samples Relinquished to PAS by (Client Signature)		Date:	Time:	Method of Shipment
Samples Received in lab by:	J. Cesar	Date: 01/08/30	Time: 13:40	Condition of samples upon receipt at lab: 24°C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

№ [redacted] 8230

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

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Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: _____

Comments: _____

CHAIN OF CUSTODY RECORD

Client: TWEL MARKHAM

Contact: M. ALAM

Phone: _____ Fax: _____

PAS Quote # : INCO-TWEL SPECIAL

Client P.O. # : _____

Client Project # : ONT 34651.1

Sampled by: _____

AUG 30 '01 PM 1:44

Please specify Guideline (if applicable) INCO-PROTOCOL

Page ____ of ____

Invoice to (if other than above):

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_____

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 Metal	pH	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	TRAVEL BLANK	AUG 21		✓	✓	SOIL	1	FOLLOW
2	TRAVEL SPIKE	AUG 21		✓	✓	"	1	PROTOCOL
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: V. [illegible]	Date: 01/03/30	Time: 13:40	Condition of samples upon receipt at lab: 24.C

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: August 31/2001
Lab Ref # : G213868
Lab Quote #: EG009 0811 INCO
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	ALGOMA PELLET 08/15/2001	ALGOMA ORE 08/15/2001			
Arsenic	0.2	mg/kg	12.9	29.9			
Selenium	0.2	mg/kg	nd	1.0			
Aluminum	20	mg/kg	1200	10800			
Barium	5	mg/kg	8	84			
Beryllium	0.2	mg/kg	nd	1.6			
Cadmium	0.5	mg/kg	nd	nd			
Chromium	1	mg/kg	87	48			
Cobalt	2	mg/kg	nd	nd			
Copper	1	mg/kg	10	22			
Iron	50	mg/kg	254000	412000			
Lead	5	mg/kg	nd	nd			
Manganese	1	mg/kg	1090	1820			
Molybdenum	3	mg/kg	8	9			
Nickel	2	mg/kg	32	31			
Phosphorus	20	mg/kg	226	338			
Silver	1	mg/kg	nd	nd			
Titanium	5	mg/kg	223	241			
Vanadium	1	mg/kg	15	26			
Zinc	5	mg/kg	14	nd			
pH	0.01	Units	8.84	9.65			

EQL Estimated Quantitation Limit – lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution () Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contract: Mahaboob Alam

Report Date: November 8/2001
Lab Ref # : G215491
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP-A (0-5cm)	TP-A (0-5cm) Replicate	TP-C (0-5cm)	TP-D (0-5cm)	TP-E (0-5cm)
Antimony	0.2	mg/kg	0.3	0.3	0.6	0.4	0.3
Arsenic	0.2	mg/kg	5.4	5.4	16.8	9.6	6.7
Selenium	0.2	mg/kg	1.0	1.0	3.6	2.3	1.6
Aluminum	20	mg/kg	12500	12700	11300	10800	13900
Barium	5	mg/kg	100	101	113	93	118
Beryllium	0.2	mg/kg	0.7	0.7	0.7	0.6	0.8
Cadmium	0.5	mg/kg	0.6	nd	0.8	1.0	0.8
Chromium	1	mg/kg	18	18	22	22	21
Cobalt	2	mg/kg	11	11	37	34	20
Copper	1	mg/kg	51	52	211	193	93
Iron	50	mg/kg	21300	21700	22800	19100	25300
Lead	5	mg/kg	104	105	89	45	30
Manganese	1	mg/kg	303	305	548	395	341
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	241	235	1840	1290	549
Phosphorus	20	mg/kg	790	790	961	1440	1350
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	100	99	118	99	109
Vanadium	1	mg/kg	28	28	28	26	28
Zinc	5	mg/kg	120	124	169	133	103
pH	0.01	Units	7.19	-	7.02	6.84	7.24

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
- Not Requested
nd parameter not detected ! = EQL higher than listed due to dilution () Adjusted EQL

PSC

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
Date Reported:	September 7/2001
Lab Ref#:	G214051
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M. Alam

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
3) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
4) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045
5) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
Date Reported:	September 7/2001
Lab Ref#:	G214051
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M. Alam

Certificate of Analysis

Instrumentation:	1) Varian VGA 76 2) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76 3) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer 4) Orion Research Expandable Ion Analyzer EA940 5) Precision Mechanical Convention Oven/Sartorius Basic Balance
Sample Description:	Soil
QA/QC:	Refer to CERTIFICATE OF QUALITY CONTROL report.
Results:	Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 7/2001
Lab Ref # : G214051
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP14 COAL (50CM)	0.2	mg/kg	nd	0.5	yes	112	84	120	yes	4.5	5.0	3.5	6.5	yes	yes
Selenium	TP14 COAL (50CM)	0.2	mg/kg	nd	0.5	yes	80	60	140	yes	4.8	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	nd	40	yes	86	74	125	yes	na	na	na	na	na	yes
Barium	TP14 COAL (50CM)	5	mg/kg	nd	10	yes	89	82	113	yes	103	100	70	130	yes	yes
Beryllium	TP14 COAL (50CM)	0.2	mg/kg	nd	0.4	yes	76	72	124	yes	9.7	10	7	13	yes	yes
Cadmium	TP14 COAL (50CM)	0.5	mg/kg	nd	0.6	yes	113	0	180	yes	98.5	100	70	130	yes	yes
Chromium	TP14 COAL (50CM)	1	mg/kg	nd	2	yes	91	72	124	yes	99	100	70	130	yes	yes
Cobalt	TP14 COAL (50CM)	2	mg/kg	nd	4	yes	91	85	123	yes	99	100	70	130	yes	yes
Copper	TP14 COAL (50CM)	1	mg/kg	nd	4	yes	90	78	122	yes	97	100	70	130	yes	yes
Iron	na	50	mg/kg	nd	100	yes	90	85	119	yes	na	na	na	na	na	yes
Lead	TP14 COAL (50CM)	5	mg/kg	nd	10	yes	73	48	152	yes	96	100	70	130	yes	yes
Manganese	TP14 COAL (50CM)	1	mg/kg	nd	2	yes	94	85	115	yes	100	100	70	130	yes	yes
Molybdenum	TP14 COAL (50CM)	3	mg/kg	nd	6	yes	71	0	210	yes	154	200	140	260	yes	yes
Nickel	TP14 COAL (50CM)	2	mg/kg	nd	4	yes	91	86	116	yes	100	100	70	130	yes	yes
Phosphorus	na	20	mg/kg	nd	40	yes	107	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	92	25	200	yes	na	na	na	na	na	yes
Titanium	TP14 COAL (50CM)	5	mg/kg	nd	10	yes	97	37	174	yes	85	100	70	130	yes	yes
Vanadium	TP14 COAL (50CM)	1	mg/kg	nd	2	yes	88	81	119	yes	96	100	70	130	yes	yes
Zinc	TP14 COAL (50CM)	5	mg/kg	nd	10	yes	93	85	112	yes	99	100	70	130	yes	yes
pH	na	0.01	Units	nd	0.02	yes	100	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: September 7/2001
Lab Ref # : G214051
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	ALGOMA PELLET	ALGOMA SLAG	TP14 COAL (50CM)	TP14 COAL (50CM) Replicate	
Arsenic	0.2	mg/kg	2.7	24.0	0.2	0.2	
Selenium	0.2	mg/kg	nd	1.1	0.6	0.6	
Aluminum	20	mg/kg	786	8000	369	354	
Barium	5	mg/kg	7	71	11	11	
Beryllium	0.2	mg/kg	nd	0.9	nd	nd	
Cadmium	0.5	mg/kg	0.7	3.4	nd	nd	
Chromium	1	mg/kg	24	15	1	nd	
Cobalt	2	mg/kg	nd	nd	nd	nd	
Copper	1	mg/kg	14	24	10	12	
Iron	50	mg/kg	108000	313000	303	335	
Lead	5	mg/kg	nd	nd	nd	nd	
Manganese	1	mg/kg	188	1920	12	12	
Molybdenum	3	mg/kg	nd	5	nd	nd	
Nickel	2	mg/kg	32	34	4	4	
Phosphorus	20	mg/kg	147	457	nd	nd	
Silver	1	mg/kg	nd	nd	nd	nd	
Titanium	5	mg/kg	82	385	75	76	
Vanadium	1	mg/kg	9	22	3	3	
Zinc	5	mg/kg	29	9	nd	nd	
pH	0.01	Units	8.63	7.83	8.30	8.32	
Moisture Content	0.01	%	0.78	ns	0.62	0.56	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
ns Insufficient Sample Submitted

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 28/2001
Date Reported:	September 21/2001
Lab Ref#:	G214051
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1
Sampled By:	M. Alam

Certificate of Analysis

Analysis Performed:	Antimony, Hydride Generation, Digestion Required
Methodology:	1) Analysis of antimony in soil by hydride generation. U.S. EPA Method No. 7042
Instrumentation:	1) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
Sample Description:	Soil
QA/QC:	Refer to CERTIFICATE OF QUALITY CONTROL report.
Results:	Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 21/2001
Lab Ref # : G214051
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall QC
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	Acceptable
Antimony	TP14 COAL (50CM)	0.2	mg/kg	nd	0.5	yes	100	29	157	yes	4.4	5.0	3.5	6.5	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: September 21/2001
Lab Ref # : G214051
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	ALGOMA PELLET	ALGOMA SLAG	TP14 COAL (50CM)	TP14 COAL (50CM) Replicate	
Antimony	0.2	mg/kg	1.5	0.9	nd	nd	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution () Adjusted EQL

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order:

Comments: G 214055

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M. ALAM

Phone: _____ Fax: _____

PAS Quote # : INCO-JWEL SPECIAL

Page ____ of ____

Client P.O. # : AUG 28 '01 PM 1:23

Client Project # : ONT 34651.1

Sampled by: M. ALAM

Please specify Guideline (if applicable) INCO SPECIAL PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 Metal	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP14 COAL (50cm)			✓	✓	soil	1	Follow
2	ALGOMA SLAG			✓	✓	"	1	Protocol
3	ALGOMA PELLET			✓	✓	"	1	
4								
5								
6								
7								
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Chojn	Date: 01/08/28	Time: 13:21	Condition of samples upon receipt at lab: 7.4 C

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 30/2001
Date Reported:	September 14/2001
Lab Ref#:	G214115
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	August 30/2001
Date Reported:	September 14/2001
Lab Ref#:	G214115
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34651.1

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 14/2001
Lab Ref # : G214115
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP12(0-2.5 CM)	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	*	*	*	*	*	yes
Antimony	TP12(0-2.5 CM)	0.2	mg/kg	nd	0.5	yes	114	29	157	yes	5.0	5.0	3.5	6.5	yes	yes
Selenium	TP12(0-2.5 CM)	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.4	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	nd	40	yes	92	74	125	yes	na	na	na	na	na	yes
Barium	TP12(0-2.5 CM)	5	mg/kg	nd	10	yes	98	82	113	yes	116	100	70	130	yes	yes
Beryllium	TP12(0-2.5 CM)	0.2	mg/kg	nd	0.4	yes	79	72	124	yes	9.5	10	7	13	yes	yes
Cadmium	TP12(0-2.5 CM)	0.5	mg/kg	nd	0.6	yes	106	0	180	yes	98.9	100	70	130	yes	yes
Chromium	TP12(0-2.5 CM)	1	mg/kg	nd	2	yes	100	72	124	yes	93	100	70	130	yes	yes
Cobalt	TP12(0-2.5 CM)	2	mg/kg	nd	4	yes	100	85	123	yes	90	100	70	130	yes	yes
Copper	TP12(0-2.5 CM)	1	mg/kg	nd	4	yes	105	78	122	yes	95	100	70	130	yes	yes
Iron	na	50	mg/kg	nd	100	yes	98	85	119	yes	na	na	na	na	na	yes
Lead	TP12(0-2.5 CM)	5	mg/kg	nd	10	yes	106	48	152	yes	90	100	70	130	yes	yes
Manganese	TP12(0-2.5 CM)	1	mg/kg	nd	2	yes	102	85	115	yes	*	*	*	*	*	yes
Molybdenum	TP12(0-2.5 CM)	3	mg/kg	nd	6	yes	168	0	210	yes	183	200	140	260	yes	yes
Nickel	TP12(0-2.5 CM)	2	mg/kg	nd	4	yes	99	86	116	yes	91	100	70	130	yes	yes
Phosphorus	na	20	mg/kg	nd	40	yes	117	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	152	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	103	37	174	yes	na	na	na	na	na	yes
Vanadium	TP12(0-2.5 CM)	1	mg/kg	nd	2	yes	96	81	119	yes	96	100	70	130	yes	yes
Zinc	TP12(0-2.5 CM)	5	mg/kg	nd	10	yes	101	85	112	yes	98	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: September 14/2001
Lab Ref # : G214115
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	ns	0.01	Units	na	na	na	90	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: September 14/2001
Lab Ref # : G214115
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34651.1

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP12(0-2.5 CM)	TP12(0-2.5 CM) Replicate	TP12(2.5-5 CM)	TP12(5-10C M)	
Antimony	0.2	mg/kg	0.9	0.9	0.3	0.2	
Arsenic	0.2	mg/kg	15.2	15.2	5.9	4.9	
Selenium	0.2	mg/kg	7.5	7.9	9.1	9.1	
Aluminum	20	mg/kg	42100	44000	41200	36600	
Barium	5	mg/kg	691	723	201	160	
Beryllium	0.2	mg/kg	6.1	6.4	7.5	7.4	
Cadmium	0.5	mg/kg	1.6	2.1	1.0	1.0	
Chromium	1	mg/kg	39	41	23	21	
Cobalt	2	mg/kg	7	8	3	nd	
Copper	1	mg/kg	73	59	27	20	
Iron	50	mg/kg	73100	76000	30300	18300	
Lead	5	mg/kg	11	11	nd	nd	
Manganese	1	mg/kg	3980	4040	3480	2960	
Molybdenum	3	mg/kg	6	6	nd	nd	
Nickel	2	mg/kg	77	81	33	22	
Phosphorus	20	mg/kg	804	833	271	226	
Silver	1	mg/kg	nd	nd	1	2	
Titanium	5	mg/kg	885	906	864	841	
Vanadium	1	mg/kg	13	14	7	6	
Zinc	5	mg/kg	153	156	42	21	
pH	0.01	Units	9.00	9.00	10.3	10.5	
Moisture Content	0.01	%	1.75	1.82	5.91	7.38	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214115

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

PAS Quote # : INCO-JWEL SPECIAL

Page ___ of ___

Client P.O. # :

Client Project # : ONT 34651.1 AUG 30 '01 PM 1:41

Contact: M. ALAM

Sampled by:

Phone: Fax:

Please specify Guideline (if applicable) INCO SPECIAL PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METALS	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP12(0-2.5cm)			✓	✓	SOIL	1	FOLLOW
2	TP12(2.5-5cm)			✓	✓	"	1	PROTOCOL
3	TP12 (5-10cm)			✓	✓	"	1	
4								
5								
6								
7								
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: V. [signature]	Date: 01/08/30	Time: 13:41	Condition of samples upon receipt at lab: 24 C

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

ANALYTICAL SERVICES

Facsimile Cover Sheet

To: Mahaboob Alam	Date: 10/09/01	Fax No:
Company: JWEL		Total Pages (incl. Cover): 5
From: Jennifer McCarthy jmccarthy@contactpsc.com	Tel No: 905-890-8566 Ext: 260	Fax: No: 905-890-8575
Urgent ☐	Reply ASAP ☐	For your review ☐

If you do not receive all pages, please call our office

Inorganic results for PSC job G214758.
Please note comment

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 4/2001
Lab Ref # : G214758
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP1 (0-2.5CM)	TP1 (0-2.5CM) Replicate	TP1 (2.5-5CM)	TP16 (0-2.5CM)	TP16 (2.5-5CM)
Antimony	0.2	mg/kg	0.4	0.5	0.3	nd	nd
Arsenic	0.2	mg/kg	9.3	9.3	10.9	4.2	3.8
Selenium	0.2	mg/kg	2.4	2.4	1.5	0.8	0.6
Aluminum	20	mg/kg	11800	13000	15100	18000	15900
Barium	5	mg/kg	107	109	120	123	107
Beryllium	0.2	mg/kg	0.5	0.6	0.6	0.7	0.6
Cadmium	0.5	mg/kg	0.6	0.6	nd	nd	nd
Chromium	1	mg/kg	19	21	23	26	23
Cobalt	2	mg/kg	61	64	43	16	12
Copper	1	mg/kg	241	247	190	56	43
Iron	50	mg/kg	21400	22000	24900	26400	24600
Lead	5	mg/kg	50	52	32	9	11
Manganese	1	mg/kg	389	396	493	515	467
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	2460	2450	1920	195	141
Phosphorus	20	mg/kg	842	863	661	586	567
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	39	62	70	165	171
Vanadium	1	mg/kg	24	27	29	31	30
Zinc	5	mg/kg	129	136	100	75	74
pH	0.01	Units	7.38	7.38	7.46	7.82	7.95
Moisture Content	0.01	%	7.69	7.67	11.3	16.4	15.9

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Phillip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 4/2001
Lab Ref # : G214758
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP4 (0-2.5CM)	TP4 (2.5-5CM)	TP6 (0-2.5CM)	TP6 (2.5-5CM)	TP7 (0-2.5CM)
Antimony	0.2	mg/kg	nd	0.2	1.6	1.1	0.8
Arsenic	0.2	mg/kg	3.4	3.6	45.0	51.2	48.4
Selenium	0.2	mg/kg	0.6	0.7	7.9	8.9	5.4
Aluminum	20	mg/kg	5960	10500	24500	31700	21100
Barium	5	mg/kg	46	69	198	233	184
Beryllium	0.2	mg/kg	0.3	0.5	1.4	1.8	1.0
Cadmium	0.5	mg/kg	nd	nd	2.2	3.3	1.8
Chromium	1	mg/kg	12	17	37	44	50
Cobalt	2	mg/kg	14	17	137	168	163
Copper	1	mg/kg	73	75	1400	1400	1400
Iron	50	mg/kg	12900	15900	19300	26100	22800
Lead	5	mg/kg	29	43	85	86	59
Manganese	1	mg/kg	430	426	163	179	181
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	503	518	9350	11700	11400
Phosphorus	20	mg/kg	782	719	2010	2090	1020
Silver	1	mg/kg	nd	nd	5	4	1
Titanium	5	mg/kg	40	32	25	25	12
Vanadium	1	mg/kg	19	25	56	61	36
Zinc	5	mg/kg	90	89	192	243	197
pH	0.01	Units	7.07	7.33	5.95	5.90	5.92
Moisture Content	0.01	%	13.7	13.5	62.9	53.5	19.3

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date:	October 4/2001
Lab Ref # :	G214758
Lab Quote #:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP7 (2.5-5CM)				
Antimony	0.2	mg/kg	0.6				
Arsenic	0.2	mg/kg	42.1				
Selenium	0.2	mg/kg	5.6				
Aluminum	20	mg/kg	24200				
Barium	5	mg/kg	192				
Beryllium	0.2	mg/kg	1.1				
Cadmium	0.5	mg/kg	1.7				
Chromium	1	mg/kg	36				
Cobalt	2	mg/kg	147				
Copper	1	mg/kg	1240				
Iron	50	mg/kg	22600				
Lead	5	mg/kg	51				
Manganese	1	mg/kg	182				
Molybdenum	3	mg/kg	nd				
Nickel	2	mg/kg	10200				
Phosphorus	20	mg/kg	1010				
Silver	1	mg/kg	2				
Titanium	5	mg/kg	15				
Vanadium	1	mg/kg	39				
Zinc	5	mg/kg	194				
pH	0.01	Units	5.91				
Moisture Content	0.01	%	19.6				

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client:	Jacques Whitford Environment Ltd. 1200 Denison Street Markham, ON, CANADA L3R 8G6	Date Received:	September 26/2001
		Date Reported:	October 4/2001
		Lab Ref#:	G214758
		Lab Quote#:	EG009-0811
		Client PO#:	INCO
Fax:	905-479-9326	Client Ref#:	ONT34646
Attn:	Mahaboob Alam		

Certificate of Analysis

Additional Comments:

Antimony Analysis of Soil:
Spike recovery was below acceptance limits. Redigest and re-analysis did not improve spike recovery. Please view antimony results with discretion as they may be biased low. Post digest spike recovery was 72% (Acceptance criteria 70% - 130%).

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 1/2001
Lab Ref # : G214769
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP10 0-2.5	TP10 2.5-5	TP11 0-2.5	TP11 2.5-5	TP14 0-2.5
Antimony	0.2	mg/kg	1.3	1.3	1.6	1.2	2.6
Arsenic	0.2	mg/kg	7.9	8.7	11.9	11.1	17.9
Selenium	0.2	mg/kg	1.9	1.8	2.5	1.8	4.6
Aluminum	20	mg/kg	15100	16900	9040	7980	32000
Barium	5	mg/kg	154	167	138	123	408
Beryllium	0.2	mg/kg	0.9	1.1	1.2	0.9	4.1
Cadmium	0.5	mg/kg	1.3	1.6	1.3	1.4	2.2
Chromium	1	mg/kg	21	22	22	20	90
Cobalt	2	mg/kg	41	47	46	41	11
Copper	1	mg/kg	153	166	225	257	131
Iron	50	mg/kg	22300	23800	47700	39600	175000
Lead	5	mg/kg	133	149	138	147	623
Manganese	1	mg/kg	434	499	1040	881	5140
Molybdenum	3	mg/kg	nd	nd	nd	nd	16
Nickel	2	mg/kg	1170	1310	1610	1500	187
Phosphorus	20	mg/kg	928	929	685	566	368
Silver	1	mg/kg	1	nd	nd	1	nd
Titanium	5	mg/kg	191	177	288	300	617
Vanadium	1	mg/kg	31	34	22	21	28
Zinc	5	mg/kg	215	214	311	264	382
pH	0.01	Units	7.24	7.25	7.59	7.75	8.46

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 1/2001
Lab Ref # : G214769
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP14 2.5-5	TP15 0-2.5	TP15 2.5-5	TP2 0-2.5	TP2 0-2.5 Replicate
Antimony	0.2	mg/kg	2.5	0.4	1.3	1.4	1.2
Arsenic	0.2	mg/kg	18.8	3.3	6.6	37.8	37.8
Selenium	0.2	mg/kg	4.5	0.3	0.9	7.4	7.3
Aluminum	20	mg/kg	33900	10900	16700	17100	17000
Barium	5	mg/kg	488	95	120	191	194
Beryllium	0.2	mg/kg	4.2	0.5	0.7	0.7	0.7
Cadmium	0.5	mg/kg	2.1	1.2	1.2	2.0	2.4
Chromium	1	mg/kg	103	17	24	42	42
Cobalt	2	mg/kg	11	8	23	213	214
Copper	1	mg/kg	173	71	122	1330	1340
Iron	50	mg/kg	185000	18700	26900	17900	17800
Lead	5	mg/kg	665	44	103	85	88
Manganese	1	mg/kg	5880	425	490	280	287
Molybdenum	3	mg/kg	13	nd	nd	nd	nd
Nickel	2	mg/kg	188	185	1310	10100	10100
Phosphorus	20	mg/kg	372	1210	757	830	837
Silver	1	mg/kg	nd	nd	nd	4	4
Titanium	5	mg/kg	658	164	260	77	74
Vanadium	1	mg/kg	34	22	34	45	46
Zinc	5	mg/kg	388	146	156	159	161
pH	0.01	Units	8.55	7.32	7.63	6.81	6.80

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 1/2001
Lab Ref # : G214769
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP2 2.5-5	TP8 0-2.5	TP8 2.5-5		
Antimony	0.2	mg/kg	1.1	0.8	0.7		
Arsenic	0.2	mg/kg	35.7	12.4	11.5		
Selenium	0.2	mg/kg	6.9	2.7	2.0		
Aluminum	20	mg/kg	21200	2410	2140		
Barium	5	mg/kg	164	68	37		
Beryllium	0.2	mg/kg	0.9	0.2	nd		
Cadmium	0.5	mg/kg	2.4	1.3	0.9		
Chromium	1	mg/kg	35	11	11		
Cobalt	2	mg/kg	154	48	27		
Copper	1	mg/kg	1290	165	121		
Iron	50	mg/kg	20300	23900	25000		
Lead	5	mg/kg	47	78	61		
Manganese	1	mg/kg	225	1080	446		
Molybdenum	3	mg/kg	nd	nd	nd		
Nickel	2	mg/kg	10400	1730	1250		
Phosphorus	20	mg/kg	540	1010	672		
Silver	1	mg/kg	3	1	nd		
Titanium	5	mg/kg	94	94	180		
Vanadium	1	mg/kg	47	18	16		
Zinc	5	mg/kg	149	224	285		
pH	0.01	Units	6.56	6.91	7.29		

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	111	84	120	yes	6.4	5.0	3.5	6.5	yes	yes
Arsenic	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	116	84	120	yes	*	*	*	*	*	yes
Antimony	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Antimony	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.8	5.0	3.5	6.5	yes	yes
Selenium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.5	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	27	40	yes	102	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	104	74	125	yes	na	na	na	na	na	yes
Barium	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	93	82	113	yes	92	100	70	130	yes	yes
Barium	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	95	82	113	yes	93	100	70	130	yes	yes
Beryllium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.6	10	7	13	yes	yes
Beryllium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.4	yes	91	72	124	yes	9.1	10	7	13	yes	yes
Cadmium	TP1 -5-7.5CM	0.5	mg/kg	nd	0.6	yes	45	0	180	yes	90.3	100	70	130	yes	yes
Cadmium	TP6 -15-17.5CM	0.5	mg/kg	nd	0.6	yes	123	0	180	yes	95.5	100	70	130	yes	yes
Chromium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	104	72	124	yes	87	100	70	130	yes	yes
Chromium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	121	72	124	yes	97	100	70	130	yes	yes
Cobalt	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	85	123	yes	83	100	70	130	yes	yes
Cobalt	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	111	85	123	yes	93	100	70	130	yes	yes
Copper	TP1 -5-7.5CM	1	mg/kg	2	4	yes	95	78	122	yes	89	100	70	130	yes	yes
Copper	TP6 -15-17.5CM	1	mg/kg	nd	4	yes	114	78	122	yes	94	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

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Date Reported: October 21/2001
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Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	93	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	94	85	119	yes	na	na	na	na	na	yes
Lead	TP1 -5-7.5CM	5	mg/kg	5	10	yes	117	48	152	yes	88	100	70	130	yes	yes
Lead	TP6 -15-17.5CM	5	mg/kg	6	10	yes	108	48	152	yes	93	100	70	130	yes	yes
Manganese	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	97	85	115	yes	79	100	70	130	yes	yes
Manganese	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	109	85	115	yes	89	100	70	130	yes	yes
Molybdenum	TP1 -5-7.5CM	3	mg/kg	nd	6	yes	181	0	210	yes	166	200	140	260	yes	yes
Molybdenum	TP6 -15-17.5CM	3	mg/kg	nd	6	yes	206	0	210	yes	167	200	140	260	yes	yes
Nickel	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	86	116	yes	75	100	70	130	yes	yes
Nickel	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	104	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	110	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	95	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	152	37	174	yes	na	na	na	na	na	yes
Vanadium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	103	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	118	81	119	yes	96	100	70	130	yes	yes
Zinc	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	97	85	112	yes	89	100	70	130	yes	yes
Zinc	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	103	85	112	yes	87	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 21/2001
Lab Ref # : G214759
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP1 BEDROCK	TP1 -45-50CM	TP1 -5-7.5CM	TP1 -5-7.5CM Replicate	TP1 -70-75CM
Antimony	0.2	mg/kg	nd	0.3	0.4	0.4	0.2
Arsenic	0.2	mg/kg	2.0	5.3	7.8	7.8	2.0
Selenium	0.2	mg/kg	nd	1.2	0.9	0.9	0.9
Aluminum	20	mg/kg	1830	19400	20300	19900	18600
Barium	5	mg/kg	11	133	144	141	72
Beryllium	0.2	mg/kg	nd	0.8	0.9	0.8	0.8
Cadmium	0.5	mg/kg	nd	nd	nd	nd	nd
Chromium	1	mg/kg	7	26	27	27	22
Cobalt	2	mg/kg	2	13	20	21	7
Copper	1	mg/kg	11	62	89	90	41
Iron	50	mg/kg	3450	28700	31200	30500	13100
Lead	5	mg/kg	nd	12	23	21	32
Manganese	1	mg/kg	129	524	537	518	95
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	45	582	920	924	81
Phosphorus	20	mg/kg	128	584	694	652	735
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	24	330	306	295	162
Vanadium	1	mg/kg	6	37	39	38	30
Zinc	5	mg/kg	8	74	78	77	69
pH	0.01	Units	8.46	7.76	7.78	7.75	7.23
Moisture Content	0.01	%	0.26	13.1	11.2	10.9	17.8

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 21/2001
Lab Ref # : G214759
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP1 -10-12.5CM	TP1 -25-27.5CM			
Antimony	0.2	mg/kg	0.5	0.4			
Arsenic	0.2	mg/kg	6.7	6.7			
Selenium	0.2	mg/kg	1.6	1.7			
Aluminum	20	mg/kg	20000	18200			
Barium	5	mg/kg	140	115			
Beryllium	0.2	mg/kg	0.9	0.8			
Cadmium	0.5	mg/kg	nd	nd			
Chromium	1	mg/kg	27	29			
Cobalt	2	mg/kg	21	24			
Copper	1	mg/kg	121	177			
Iron	50	mg/kg	32400	29300			
Lead	5	mg/kg	20	26			
Manganese	1	mg/kg	532	449			
Molybdenum	3	mg/kg	nd	nd			
Nickel	2	mg/kg	1020	1970			
Phosphorus	20	mg/kg	591	582			
Silver	1	mg/kg	nd	nd			
Titanium	5	mg/kg	308	349			
Vanadium	1	mg/kg	39	38			
Zinc	5	mg/kg	74	74			
pH	0.01	Units	7.75	7.80			
Moisture Content	0.01	%	10.7	8.72			

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 27/2001
Date Reported:	October 26/2001
Lab Ref#:	G214771
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

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ANALYTICAL SERVICES

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Fax: 905-479-9326

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Date Received: September 27/2001
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Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

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Philip Analytical Services Corp

Certificate of Quality Control

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Date Reported: October 26/2001
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Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP10 70-75	0.2	mg/kg	nd	0.5	yes	107	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Arsenic	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	5.9	5.0	3.5	6.5	yes	yes
Arsenic	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	109	84	120	yes	*	*	*	*	*	yes
Antimony	TP10 70-75	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	4.8	5.0	3.5	6.5	yes	yes
Antimony	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP10 70-75	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.0	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	21	40	yes	99	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	94	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	98	74	125	yes	na	na	na	na	na	yes
Barium	TP10 70-75	5	mg/kg	nd	10	yes	92	82	113	yes	88	100	70	130	yes	yes
Barium	TP15 15- 17.5	5	mg/kg	nd	10	yes	89	82	113	yes	90	100	70	130	yes	yes
Barium	TP2 5-7.5	5	mg/kg	nd	10	yes	92	82	113	yes	90	100	70	130	yes	yes
Beryllium	TP10 70-75	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.4	10	7	13	yes	yes
Beryllium	TP15 15- 17.5	0.2	mg/kg	nd	0.4	yes	79	72	124	yes	8.7	10	7	13	yes	yes
Beryllium	TP2 5-7.5	0.2	mg/kg	nd	0.4	yes	86	72	124	yes	8.9	10	7	13	yes	yes
Cadmium	TP10 70-75	0.5	mg/kg	nd	0.6	yes	53	0	180	yes	88.6	100	70	130	yes	yes
Cadmium	TP15 15- 17.5	0.5	mg/kg	nd	0.6	yes	34	0	180	yes	91.4	100	70	130	yes	yes

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				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Cadmium	TP2 5-7.5	0.5	mg/kg	nd	0.6	yes	121	0	180	yes	92.1	100	70	130	yes	yes
Chromium	TP10 70-75	1	mg/kg	nd	2	yes	105	72	124	yes	89	100	70	130	yes	yes
Chromium	TP15 15- 17.5	1	mg/kg	nd	2	yes	99	72	124	yes	90	100	70	130	yes	yes
Chromium	TP2 5-7.5	1	mg/kg	nd	2	yes	105	72	124	yes	90	100	70	130	yes	yes
Cobalt	TP10 70-75	2	mg/kg	nd	4	yes	95	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP15 15- 17.5	2	mg/kg	nd	4	yes	90	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP2 5-7.5	2	mg/kg	nd	4	yes	97	85	123	yes	99	100	70	130	yes	yes
Copper	TP10 70-75	1	mg/kg	nd	4	yes	97	78	122	yes	84	100	70	130	yes	yes
Copper	TP15 15- 17.5	1	mg/kg	nd	4	yes	86	78	122	yes	87	100	70	130	yes	yes
Copper	TP2 5-7.5	1	mg/kg	nd	4	yes	96	78	122	yes	*	*	*	*	*	yes
Iron	na	50	mg/kg	nd	100	yes	86	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	88	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	89	85	119	yes	na	na	na	na	na	yes
Lead	TP10 70-75	5	mg/kg	nd	10	yes	108	48	152	yes	86	100	70	130	yes	yes
Lead	TP15 15- 17.5	5	mg/kg	nd	10	yes	73	48	152	yes	86	100	70	130	yes	yes
Lead	TP2 5-7.5	5	mg/kg	nd	10	yes	113	48	152	yes	89	100	70	130	yes	yes
Manganese	TP10 70-75	1	mg/kg	nd	2	yes	97	85	115	yes	91	100	70	130	yes	yes
Manganese	TP15 15- 17.5	1	mg/kg	nd	2	yes	92	85	115	yes	78	100	70	130	yes	yes
Manganese	TP2 5-7.5	1	mg/kg	nd	2	yes	97	85	115	yes	82	100	70	130	yes	yes
Molybdenum	TP10 70-75	3	mg/kg	nd	6	yes	160	0	210	yes	175	200	140	260	yes	yes

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Molybdenum	TP2 5-7.5	3	mg/kg	nd	6	yes	147	0	210	yes	176	200	140	260	yes	yes
Nickel	TP10 70-75	2	mg/kg	nd	4	yes	97	86	116	yes	87	100	70	130	yes	yes
Nickel	TP15 15- 17.5	2	mg/kg	nd	4	yes	92	86	116	yes	81	100	70	130	yes	yes
Nickel	TP2 5-7.5	2	mg/kg	nd	4	yes	96	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	114	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	109	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	141	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	147	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	132	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	TP15 15- 17.5	5	mg/kg	nd	10	yes	126	37	174	yes	120	100	70	130	yes	yes
Vanadium	TP10 70-75	1	mg/kg	nd	2	yes	102	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP15 15- 17.5	1	mg/kg	nd	2	yes	97	81	119	yes	88	100	70	130	yes	yes
Vanadium	TP2 5-7.5	1	mg/kg	nd	2	yes	102	81	119	yes	91	100	70	130	yes	yes
Zinc	TP10 70-75	5	mg/kg	nd	10	yes	95	85	112	yes	87	100	70	130	yes	yes
Zinc	TP15 15- 17.5	5	mg/kg	nd	10	yes	91	85	112	yes	84	100	70	130	yes	yes
Zinc	TP2 5-7.5	5	mg/kg	nd	10	yes	95	85	112	yes	98	100	70	130	yes	yes

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TR = trace level less than EQL

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 26/2001
Lab Ref # : G214771
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP2 10-12.5	TP2 15-17.5	TP2 5-7.5	TP2 5-7.5 Replicate	TP2 70-75
Antimony	0.2	mg/kg	1.6	1.2	1.2	1.0	0.2
Arsenic	0.2	mg/kg	54.8	34.3	45.4	43.6	4.8
Selenium	0.2	mg/kg	7.9	8.7	8.2	7.9	nd
Aluminum	20	mg/kg	19200	21900	22200	22900	21000
Barium	5	mg/kg	160	165	183	183	141
Beryllium	0.2	mg/kg	0.9	0.9	1.0	1.0	0.9
Cadmium	0.5	mg/kg	2.0	1.0	1.3	0.9	nd
Chromium	1	mg/kg	32	32	33	34	27
Cobalt	2	mg/kg	192	131	153	149	12
Copper	1	mg/kg	2050	1240	1860	1790	32
Iron	50	mg/kg	19900	19400	20600	20300	30800
Lead	5	mg/kg	50	38	48	49	13
Manganese	1	mg/kg	202	205	227	229	441
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	14900	9550	11500	11000	103
Phosphorus	20	mg/kg	684	646	720	703	583
Silver	1	mg/kg	4	2	2	2	nd
Titanium	5	mg/kg	145	143	144	158	263
Vanadium	1	mg/kg	42	41	44	44	39
Zinc	5	mg/kg	173	140	157	157	72
pH	0.01	Units	6.59	6.57	6.79	6.79	7.94
Moisture Content	0.01	%	15.4	15.3	15.5	15.6	12.8

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

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1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	111	84	120	yes	6.4	5.0	3.5	6.5	yes	yes
Arsenic	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	116	84	120	yes	*	*	*	*	*	yes
Antimony	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Antimony	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.8	5.0	3.5	6.5	yes	yes
Selenium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.5	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	27	40	yes	102	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	104	74	125	yes	na	na	na	na	na	yes
Barium	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	93	82	113	yes	92	100	70	130	yes	yes
Barium	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	95	82	113	yes	93	100	70	130	yes	yes
Beryllium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.6	10	7	13	yes	yes
Beryllium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.4	yes	91	72	124	yes	9.1	10	7	13	yes	yes
Cadmium	TP1 -5-7.5CM	0.5	mg/kg	nd	0.6	yes	45	0	180	yes	90.3	100	70	130	yes	yes
Cadmium	TP6 -15-17.5CM	0.5	mg/kg	nd	0.6	yes	123	0	180	yes	95.5	100	70	130	yes	yes
Chromium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	104	72	124	yes	87	100	70	130	yes	yes
Chromium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	121	72	124	yes	97	100	70	130	yes	yes
Cobalt	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	85	123	yes	83	100	70	130	yes	yes
Cobalt	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	111	85	123	yes	93	100	70	130	yes	yes
Copper	TP1 -5-7.5CM	1	mg/kg	2	4	yes	95	78	122	yes	89	100	70	130	yes	yes
Copper	TP6 -15-17.5CM	1	mg/kg	nd	4	yes	114	78	122	yes	94	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
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nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	93	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	94	85	119	yes	na	na	na	na	na	yes
Lead	TP1 -5-7.5CM	5	mg/kg	5	10	yes	117	48	152	yes	88	100	70	130	yes	yes
Lead	TP6 -15-17.5CM	5	mg/kg	6	10	yes	108	48	152	yes	93	100	70	130	yes	yes
Manganese	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	97	85	115	yes	79	100	70	130	yes	yes
Manganese	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	109	85	115	yes	89	100	70	130	yes	yes
Molybdenum	TP1 -5-7.5CM	3	mg/kg	nd	6	yes	181	0	210	yes	166	200	140	260	yes	yes
Molybdenum	TP6 -15-17.5CM	3	mg/kg	nd	6	yes	206	0	210	yes	167	200	140	260	yes	yes
Nickel	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	86	116	yes	75	100	70	130	yes	yes
Nickel	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	104	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	110	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	95	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	152	37	174	yes	na	na	na	na	na	yes
Vanadium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	103	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	118	81	119	yes	96	100	70	130	yes	yes
Zinc	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	97	85	112	yes	89	100	70	130	yes	yes
Zinc	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	103	85	112	yes	87	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 21/2001
Lab Ref # : G214759
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP4 -45-50CM	TP4 -5-7.5CM	TP4 -10-12.5CM	TP4 -15-17.5CM	TP4 -25-27.5CM
Antimony	0.2	mg/kg	0.6	0.3	0.3	0.9	0.8
Arsenic	0.2	mg/kg	17.1	3.5	3.9	13.9	19.5
Selenium	0.2	mg/kg	4.3	0.4	0.6	2.2	3.5
Aluminum	20	mg/kg	13900	19100	18700	9140	12300
Barium	5	mg/kg	85	105	106	79	96
Beryllium	0.2	mg/kg	0.7	0.8	0.9	0.7	0.6
Cadmium	0.5	mg/kg	1.2	nd	nd	nd	0.9
Chromium	1	mg/kg	26	27	27	38	24
Cobalt	2	mg/kg	39	14	13	47	67
Copper	1	mg/kg	274	34	38	236	477
Iron	50	mg/kg	24500	22200	21700	19900	22500
Lead	5	mg/kg	70	29	32	107	133
Manganese	1	mg/kg	258	317	356	478	438
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	3520	153	189	2630	5690
Phosphorus	20	mg/kg	688	504	529	659	609
Silver	1	mg/kg	nd	nd	nd	nd	1
Titanium	5	mg/kg	334	268	278	272	268
Vanadium	1	mg/kg	40	41	41	32	33
Zinc	5	mg/kg	282	76	75	195	187
pH	0.01	Units	7.34	7.69	7.78	7.78	7.6
Moisture Content	0.01	%	16.3	11.3	9.96	5.43	7.64

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

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Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	111	84	120	yes	6.4	5.0	3.5	6.5	yes	yes
Arsenic	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	116	84	120	yes	*	*	*	*	*	yes
Antimony	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Antimony	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.8	5.0	3.5	6.5	yes	yes
Selenium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.5	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	27	40	yes	102	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	104	74	125	yes	na	na	na	na	na	yes
Barium	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	93	82	113	yes	92	100	70	130	yes	yes
Barium	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	95	82	113	yes	93	100	70	130	yes	yes
Beryllium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.6	10	7	13	yes	yes
Beryllium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.4	yes	91	72	124	yes	9.1	10	7	13	yes	yes
Cadmium	TP1 -5-7.5CM	0.5	mg/kg	nd	0.6	yes	45	0	180	yes	90.3	100	70	130	yes	yes
Cadmium	TP6 -15-17.5CM	0.5	mg/kg	nd	0.6	yes	123	0	180	yes	95.5	100	70	130	yes	yes
Chromium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	104	72	124	yes	87	100	70	130	yes	yes
Chromium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	121	72	124	yes	97	100	70	130	yes	yes
Cobalt	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	85	123	yes	83	100	70	130	yes	yes
Cobalt	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	111	85	123	yes	93	100	70	130	yes	yes
Copper	TP1 -5-7.5CM	1	mg/kg	2	4	yes	95	78	122	yes	89	100	70	130	yes	yes
Copper	TP6 -15-17.5CM	1	mg/kg	nd	4	yes	114	78	122	yes	94	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	93	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	94	85	119	yes	na	na	na	na	na	yes
Lead	TP1 -5-7.5CM	5	mg/kg	5	10	yes	117	48	152	yes	88	100	70	130	yes	yes
Lead	TP6 -15-17.5CM	5	mg/kg	6	10	yes	108	48	152	yes	93	100	70	130	yes	yes
Manganese	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	97	85	115	yes	79	100	70	130	yes	yes
Manganese	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	109	85	115	yes	89	100	70	130	yes	yes
Molybdenum	TP1 -5-7.5CM	3	mg/kg	nd	6	yes	181	0	210	yes	166	200	140	260	yes	yes
Molybdenum	TP6 -15-17.5CM	3	mg/kg	nd	6	yes	206	0	210	yes	167	200	140	260	yes	yes
Nickel	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	86	116	yes	75	100	70	130	yes	yes
Nickel	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	104	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	110	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	95	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	152	37	174	yes	na	na	na	na	na	yes
Vanadium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	103	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	118	81	119	yes	96	100	70	130	yes	yes
Zinc	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	97	85	112	yes	89	100	70	130	yes	yes
Zinc	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	103	85	112	yes	87	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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nd = parameter not detected
TR = trace level less than EQL

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 21/2001
Lab Ref # : G214759
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP6 -5-7.5CM	TP6 -70-75CM	TP6 -10-12.5CM	TP6 -15-17.5CM	TP6 -15-17.5CM Replicate
Antimony	0.2	mg/kg	1.7	0.2	1.1	0.6	0.6
Arsenic	0.2	mg/kg	62.8	3.5	46.2	23.7	24.7
Selenium	0.2	mg/kg	12.0	nd	11.0	5.3	5.3
Aluminum	20	mg/kg	42000	24600	39000	34000	33600
Barium	5	mg/kg	280	152	243	203	203
Beryllium	0.2	mg/kg	2.2	1.1	1.9	1.4	1.4
Cadmium	0.5	mg/kg	3.0	0.6	2.9	0.8	1.2
Chromium	1	mg/kg	54	34	52	44	44
Cobalt	2	mg/kg	164	14	140	66	67
Copper	1	mg/kg	1350	34	1280	547	555
Iron	50	mg/kg	31700	37300	30200	22500	22800
Lead	5	mg/kg	85	17	78	51	56
Manganese	1	mg/kg	237	745	267	180	188
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	11300	66	9590	4350	4470
Phosphorus	20	mg/kg	2070	644	1460	804	809
Silver	1	mg/kg	3	nd	4	nd	2
Titanium	5	mg/kg	222	319	175	188	179
Vanadium	1	mg/kg	87	49	80	63	63
Zinc	5	mg/kg	241	73	235	157	165
pH	0.01	Units	6.44	7.58	6.65	6.92	6.93
Moisture Content	0.01	%	41.5	21.7	39.8	36.6	35.3

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	111	84	120	yes	6.4	5.0	3.5	6.5	yes	yes
Arsenic	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	116	84	120	yes	*	*	*	*	*	yes
Antimony	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Antimony	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.8	5.0	3.5	6.5	yes	yes
Selenium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.5	5.0	3.5	6.5	yes	yes
Aluminum	ns	20	mg/kg	27	40	yes	102	74	125	yes	na	na	na	na	na	yes
Aluminum	ns	20	mg/kg	nd	40	yes	104	74	125	yes	na	na	na	na	na	yes
Barium	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	93	82	113	yes	92	100	70	130	yes	yes
Barium	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	95	82	113	yes	93	100	70	130	yes	yes
Beryllium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.6	10	7	13	yes	yes
Beryllium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.4	yes	91	72	124	yes	9.1	10	7	13	yes	yes
Cadmium	TP1 -5-7.5CM	0.5	mg/kg	nd	0.6	yes	45	0	180	yes	90.3	100	70	130	yes	yes
Cadmium	TP6 -15-17.5CM	0.5	mg/kg	nd	0.6	yes	123	0	180	yes	95.5	100	70	130	yes	yes
Chromium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	104	72	124	yes	87	100	70	130	yes	yes
Chromium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	121	72	124	yes	97	100	70	130	yes	yes
Cobalt	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	85	123	yes	83	100	70	130	yes	yes
Cobalt	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	111	85	123	yes	93	100	70	130	yes	yes
Copper	TP1 -5-7.5CM	1	mg/kg	2	4	yes	95	78	122	yes	89	100	70	130	yes	yes
Copper	TP6 -15-17.5CM	1	mg/kg	nd	4	yes	114	78	122	yes	94	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	93	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	94	85	119	yes	na	na	na	na	na	yes
Lead	TP1 -5-7.5CM	5	mg/kg	5	10	yes	117	48	152	yes	88	100	70	130	yes	yes
Lead	TP6 -15-17.5CM	5	mg/kg	6	10	yes	108	48	152	yes	93	100	70	130	yes	yes
Manganese	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	97	85	115	yes	79	100	70	130	yes	yes
Manganese	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	109	85	115	yes	89	100	70	130	yes	yes
Molybdenum	TP1 -5-7.5CM	3	mg/kg	nd	6	yes	181	0	210	yes	166	200	140	260	yes	yes
Molybdenum	TP6 -15-17.5CM	3	mg/kg	nd	6	yes	206	0	210	yes	167	200	140	260	yes	yes
Nickel	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	86	116	yes	75	100	70	130	yes	yes
Nickel	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	104	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	110	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	95	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	152	37	174	yes	na	na	na	na	na	yes
Vanadium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	103	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	118	81	119	yes	96	100	70	130	yes	yes
Zinc	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	97	85	112	yes	89	100	70	130	yes	yes
Zinc	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	103	85	112	yes	87	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 21/2001
Lab Ref # : G214759
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP7 -5-7.5CM	TP7 -70-75CM	TP7 -10-12.5CM	TP7 -15-17.5CM	
Antimony	0.2	mg/kg	1.7	0.3	0.5	nd	
Arsenic	0.2	mg/kg	51.6	5.7	17.6	2.9	
Selenium	0.2	mg/kg	9.2	nd	3.3	0.2	
Aluminum	20	mg/kg	29600	22400	26700	22100	
Barium	5	mg/kg	203	138	153	116	
Beryllium	0.2	mg/kg	1.3	1.0	1.0	0.9	
Cadmium	0.5	mg/kg	1.9	nd	0.7	nd	
Chromium	1	mg/kg	59	31	42	32	
Cobalt	2	mg/kg	184	13	80	20	
Copper	1	mg/kg	1400	26	453	20	
Iron	50	mg/kg	26100	30800	24000	23700	
Lead	5	mg/kg	70	23	44	33	
Manganese	1	mg/kg	241	640	206	155	
Molybdenum	3	mg/kg	nd	nd	nd	nd	
Nickel	2	mg/kg	12600	43	4160	350	
Phosphorus	20	mg/kg	1130	585	530	266	
Silver	1	mg/kg	3	nd	nd	nd	
Titanium	5	mg/kg	174	307	164	282	
Vanadium	1	mg/kg	60	45	63	58	
Zinc	5	mg/kg	208	71	125	68	
pH	0.01	Units	6.46	7.95	6.26	6.23	
Moisture Content	0.01	%	17.8	17.0	20.5	12.7	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 27/2001
Date Reported:	October 26/2001
Lab Ref#:	G214771
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 27/2001
Date Reported:	October 26/2001
Lab Ref#:	G214771
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP10 70-75	0.2	mg/kg	nd	0.5	yes	107	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Arsenic	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	5.9	5.0	3.5	6.5	yes	yes
Arsenic	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	109	84	120	yes	*	*	*	*	*	yes
Antimony	TP10 70-75	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	4.8	5.0	3.5	6.5	yes	yes
Antimony	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP10 70-75	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.0	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	21	40	yes	99	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	94	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	98	74	125	yes	na	na	na	na	na	yes
Barium	TP10 70-75	5	mg/kg	nd	10	yes	92	82	113	yes	88	100	70	130	yes	yes
Barium	TP15 15- 17.5	5	mg/kg	nd	10	yes	89	82	113	yes	90	100	70	130	yes	yes
Barium	TP2 5-7.5	5	mg/kg	nd	10	yes	92	82	113	yes	90	100	70	130	yes	yes
Beryllium	TP10 70-75	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.4	10	7	13	yes	yes
Beryllium	TP15 15- 17.5	0.2	mg/kg	nd	0.4	yes	79	72	124	yes	8.7	10	7	13	yes	yes
Beryllium	TP2 5-7.5	0.2	mg/kg	nd	0.4	yes	86	72	124	yes	8.9	10	7	13	yes	yes
Cadmium	TP10 70-75	0.5	mg/kg	nd	0.6	yes	53	0	180	yes	88.6	100	70	130	yes	yes
Cadmium	TP15 15- 17.5	0.5	mg/kg	nd	0.6	yes	34	0	180	yes	91.4	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	93	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	94	85	119	yes	na	na	na	na	na	yes
Lead	TP1 -5-7.5CM	5	mg/kg	5	10	yes	117	48	152	yes	88	100	70	130	yes	yes
Lead	TP6 -15-17.5CM	5	mg/kg	6	10	yes	108	48	152	yes	93	100	70	130	yes	yes
Manganese	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	97	85	115	yes	79	100	70	130	yes	yes
Manganese	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	109	85	115	yes	89	100	70	130	yes	yes
Molybdenum	TP1 -5-7.5CM	3	mg/kg	nd	6	yes	181	0	210	yes	166	200	140	260	yes	yes
Molybdenum	TP6 -15-17.5CM	3	mg/kg	nd	6	yes	206	0	210	yes	167	200	140	260	yes	yes
Nickel	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	86	116	yes	75	100	70	130	yes	yes
Nickel	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	104	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	110	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	95	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	152	37	174	yes	na	na	na	na	na	yes
Vanadium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	103	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	118	81	119	yes	96	100	70	130	yes	yes
Zinc	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	97	85	112	yes	89	100	70	130	yes	yes
Zinc	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	103	85	112	yes	87	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP10 70-75	0.2	mg/kg	nd	0.5	yes	107	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Arsenic	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	5.9	5.0	3.5	6.5	yes	yes
Arsenic	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	109	84	120	yes	*	*	*	*	*	yes
Antimony	TP10 70-75	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	4.8	5.0	3.5	6.5	yes	yes
Antimony	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP10 70-75	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.0	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	21	40	yes	99	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	94	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	98	74	125	yes	na	na	na	na	na	yes
Barium	TP10 70-75	5	mg/kg	nd	10	yes	92	82	113	yes	88	100	70	130	yes	yes
Barium	TP15 15- 17.5	5	mg/kg	nd	10	yes	89	82	113	yes	90	100	70	130	yes	yes
Barium	TP2 5-7.5	5	mg/kg	nd	10	yes	92	82	113	yes	90	100	70	130	yes	yes
Beryllium	TP10 70-75	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.4	10	7	13	yes	yes
Beryllium	TP15 15- 17.5	0.2	mg/kg	nd	0.4	yes	79	72	124	yes	8.7	10	7	13	yes	yes
Beryllium	TP2 5-7.5	0.2	mg/kg	nd	0.4	yes	86	72	124	yes	8.9	10	7	13	yes	yes
Cadmium	TP10 70-75	0.5	mg/kg	nd	0.6	yes	53	0	180	yes	88.6	100	70	130	yes	yes
Cadmium	TP15 15- 17.5	0.5	mg/kg	nd	0.6	yes	34	0	180	yes	91.4	100	70	130	yes	yes

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Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Cadmium	TP2 5-7.5	0.5	mg/kg	nd	0.6	yes	121	0	180	yes	92.1	100	70	130	yes	yes
Chromium	TP10 70-75	1	mg/kg	nd	2	yes	105	72	124	yes	89	100	70	130	yes	yes
Chromium	TP15 15- 17.5	1	mg/kg	nd	2	yes	99	72	124	yes	90	100	70	130	yes	yes
Chromium	TP2 5-7.5	1	mg/kg	nd	2	yes	105	72	124	yes	90	100	70	130	yes	yes
Cobalt	TP10 70-75	2	mg/kg	nd	4	yes	95	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP15 15- 17.5	2	mg/kg	nd	4	yes	90	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP2 5-7.5	2	mg/kg	nd	4	yes	97	85	123	yes	99	100	70	130	yes	yes
Copper	TP10 70-75	1	mg/kg	nd	4	yes	97	78	122	yes	84	100	70	130	yes	yes
Copper	TP15 15- 17.5	1	mg/kg	nd	4	yes	86	78	122	yes	87	100	70	130	yes	yes
Copper	TP2 5-7.5	1	mg/kg	nd	4	yes	96	78	122	yes	*	*	*	*	*	yes
Iron	na	50	mg/kg	nd	100	yes	86	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	88	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	89	85	119	yes	na	na	na	na	na	yes
Lead	TP10 70-75	5	mg/kg	nd	10	yes	108	48	152	yes	86	100	70	130	yes	yes
Lead	TP15 15- 17.5	5	mg/kg	nd	10	yes	73	48	152	yes	86	100	70	130	yes	yes
Lead	TP2 5-7.5	5	mg/kg	nd	10	yes	113	48	152	yes	89	100	70	130	yes	yes
Manganese	TP10 70-75	1	mg/kg	nd	2	yes	97	85	115	yes	91	100	70	130	yes	yes
Manganese	TP15 15- 17.5	1	mg/kg	nd	2	yes	92	85	115	yes	78	100	70	130	yes	yes
Manganese	TP2 5-7.5	1	mg/kg	nd	2	yes	97	85	115	yes	82	100	70	130	yes	yes
Molybdenum	TP10 70-75	3	mg/kg	nd	6	yes	160	0	210	yes	175	200	140	260	yes	yes

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Certificate of Quality Control

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Date Reported: October 26/2001
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Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Molybdenum	TP15 15- 17.5	3	mg/kg	nd	6	yes	128	0	210	yes	174	200	140	260	yes	yes
Molybdenum	TP2 5-7.5	3	mg/kg	nd	6	yes	147	0	210	yes	176	200	140	260	yes	yes
Nickel	TP10 70-75	2	mg/kg	nd	4	yes	97	86	116	yes	87	100	70	130	yes	yes
Nickel	TP15 15- 17.5	2	mg/kg	nd	4	yes	92	86	116	yes	81	100	70	130	yes	yes
Nickel	TP2 5-7.5	2	mg/kg	nd	4	yes	96	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	114	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	109	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	141	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	147	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	132	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	TP15 15- 17.5	5	mg/kg	nd	10	yes	126	37	174	yes	120	100	70	130	yes	yes
Vanadium	TP10 70-75	1	mg/kg	nd	2	yes	102	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP15 15- 17.5	1	mg/kg	nd	2	yes	97	81	119	yes	88	100	70	130	yes	yes
Vanadium	TP2 5-7.5	1	mg/kg	nd	2	yes	102	81	119	yes	91	100	70	130	yes	yes
Zinc	TP10 70-75	5	mg/kg	nd	10	yes	95	85	112	yes	87	100	70	130	yes	yes
Zinc	TP15 15- 17.5	5	mg/kg	nd	10	yes	91	85	112	yes	84	100	70	130	yes	yes
Zinc	TP2 5-7.5	5	mg/kg	nd	10	yes	95	85	112	yes	98	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 26/2001
Lab Ref # : G214771
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP8 10-12.5	TP8 15-17.5	TP8 30-35	TP8 5-7.5	TP8 70-75
Antimony	0.2	mg/kg	0.7	1.3	0.5	0.5	nd
Arsenic	0.2	mg/kg	14.4	27.0	11.7	9.9	2.3
Selenium	0.2	mg/kg	0.9	2.5	0.7	0.7	nd
Aluminum	20	mg/kg	1620	2660	1900	1830	1210
Barium	5	mg/kg	26	62	31	20	23
Beryllium	0.2	mg/kg	nd	0.3	nd	nd	nd
Cadmium	0.5	mg/kg	nd	nd	0.6	nd	nd
Chromium	1	mg/kg	6	25	6	8	3
Cobalt	2	mg/kg	13	48	12	11	2
Copper	1	mg/kg	75	274	96	64	15
Iron	50	mg/kg	14300	44800	17000	15700	3670
Lead	5	mg/kg	27	105	54	33	nd
Manganese	1	mg/kg	292	636	171	160	119
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	735	2940	954	689	60
Phosphorus	20	mg/kg	459	767	681	556	302
Silver	1	mg/kg	nd	1	nd	nd	nd
Titanium	5	mg/kg	184	214	182	248	115
Vanadium	1	mg/kg	9	18	12	12	7
Zinc	5	mg/kg	113	406	120	119	12
pH	0.01	Units	7.83	7.60	7.47	7.84	6.10
Moisture Content	0.01	%	7.87	10.9	19.6	5.26	85.6

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution () Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 27/2001
Date Reported:	October 26/2001
Lab Ref#:	G214771
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

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1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received: September 27/2001
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Lab Ref#: G214771
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Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

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Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP10 70-75	0.2	mg/kg	nd	0.5	yes	107	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Arsenic	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	5.9	5.0	3.5	6.5	yes	yes
Arsenic	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	109	84	120	yes	*	*	*	*	*	yes
Antimony	TP10 70-75	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	4.8	5.0	3.5	6.5	yes	yes
Antimony	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP10 70-75	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.0	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	21	40	yes	99	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	94	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	98	74	125	yes	na	na	na	na	na	yes
Barium	TP10 70-75	5	mg/kg	nd	10	yes	92	82	113	yes	88	100	70	130	yes	yes
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Beryllium	TP2 5-7.5	0.2	mg/kg	nd	0.4	yes	86	72	124	yes	8.9	10	7	13	yes	yes
Cadmium	TP10 70-75	0.5	mg/kg	nd	0.6	yes	53	0	180	yes	88.6	100	70	130	yes	yes
Cadmium	TP15 15- 17.5	0.5	mg/kg	nd	0.6	yes	34	0	180	yes	91.4	100	70	130	yes	yes

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Chromium	TP15 15- 17.5	1	mg/kg	nd	2	yes	99	72	124	yes	90	100	70	130	yes	yes
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Copper	TP2 5-7.5	1	mg/kg	nd	4	yes	96	78	122	yes	*	*	*	*	*	yes
Iron	na	50	mg/kg	nd	100	yes	86	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	88	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	89	85	119	yes	na	na	na	na	na	yes
Lead	TP10 70-75	5	mg/kg	nd	10	yes	108	48	152	yes	86	100	70	130	yes	yes
Lead	TP15 15- 17.5	5	mg/kg	nd	10	yes	73	48	152	yes	86	100	70	130	yes	yes
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Nickel	TP2 5-7.5	2	mg/kg	nd	4	yes	96	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	114	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	109	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	141	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	147	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	132	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	TP15 15- 17.5	5	mg/kg	nd	10	yes	126	37	174	yes	120	100	70	130	yes	yes
Vanadium	TP10 70-75	1	mg/kg	nd	2	yes	102	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP15 15- 17.5	1	mg/kg	nd	2	yes	97	81	119	yes	88	100	70	130	yes	yes
Vanadium	TP2 5-7.5	1	mg/kg	nd	2	yes	102	81	119	yes	91	100	70	130	yes	yes
Zinc	TP10 70-75	5	mg/kg	nd	10	yes	95	85	112	yes	87	100	70	130	yes	yes
Zinc	TP15 15- 17.5	5	mg/kg	nd	10	yes	91	85	112	yes	84	100	70	130	yes	yes
Zinc	TP2 5-7.5	5	mg/kg	nd	10	yes	95	85	112	yes	98	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 26/2001
Lab Ref # : G214771
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP10 10-12.5	TP10 20-22.5	TP10 30-35	TP10 5-7.5	TP10 70-75
Antimony	0.2	mg/kg	1.0	1.0	0.9	1.0	nd
Arsenic	0.2	mg/kg	6.8	8.7	8.2	8.7	nd
Selenium	0.2	mg/kg	0.8	1.2	1.2	1.3	nd
Aluminum	20	mg/kg	22800	17500	14900	18600	2010
Barium	5	mg/kg	180	162	136	159	nd
Beryllium	0.2	mg/kg	1.2	1.3	1.1	1.0	nd
Cadmium	0.5	mg/kg	nd	0.8	nd	nd	nd
Chromium	1	mg/kg	28	19	15	23	3
Cobalt	2	mg/kg	20	18	14	26	nd
Copper	1	mg/kg	75	119	94	104	2
Iron	50	mg/kg	32300	21000	18100	26900	2090
Lead	5	mg/kg	85	105	74	105	nd
Manganese	1	mg/kg	728	493	430	677	25
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	410	760	614	684	9
Phosphorus	20	mg/kg	718	544	481	754	230
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	266	269	222	232	160
Vanadium	1	mg/kg	41	30	24	35	5
Zinc	5	mg/kg	138	163	130	153	11
pH	0.01	Units	7.53	7.73	7.75	7.42	7.55
Moisture Content	0.01	%	10.5	6.19	12.8	12.5	2.48

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 26/2001
Lab Ref # : G214771
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP10 70-75 Replicate				
Antimony	0.2	mg/kg	nd				
Arsenic	0.2	mg/kg	nd				
Selenium	0.2	mg/kg	nd				
Aluminum	20	mg/kg	1930				
Barium	5	mg/kg	nd				
Beryllium	0.2	mg/kg	nd				
Cadmium	0.5	mg/kg	nd				
Chromium	1	mg/kg	4				
Cobalt	2	mg/kg	nd				
Copper	1	mg/kg	5				
Iron	50	mg/kg	2030				
Lead	5	mg/kg	6				
Manganese	1	mg/kg	24				
Molybdenum	3	mg/kg	nd				
Nickel	2	mg/kg	10				
Phosphorus	20	mg/kg	241				
Silver	1	mg/kg	nd				
Titanium	5	mg/kg	173				
Vanadium	1	mg/kg	5				
Zinc	5	mg/kg	11				
pH	0.01	Units	7.53				
Moisture Content	0.01	%	2.49				

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 27/2001
Date Reported:	October 26/2001
Lab Ref#:	G214771
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

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Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP10 70-75	0.2	mg/kg	nd	0.5	yes	107	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Arsenic	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	5.9	5.0	3.5	6.5	yes	yes
Arsenic	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	109	84	120	yes	*	*	*	*	*	yes
Antimony	TP10 70-75	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	4.8	5.0	3.5	6.5	yes	yes
Antimony	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP10 70-75	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.0	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	21	40	yes	99	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	94	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	98	74	125	yes	na	na	na	na	na	yes
Barium	TP10 70-75	5	mg/kg	nd	10	yes	92	82	113	yes	88	100	70	130	yes	yes
Barium	TP15 15- 17.5	5	mg/kg	nd	10	yes	89	82	113	yes	90	100	70	130	yes	yes
Barium	TP2 5-7.5	5	mg/kg	nd	10	yes	92	82	113	yes	90	100	70	130	yes	yes
Beryllium	TP10 70-75	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.4	10	7	13	yes	yes
Beryllium	TP15 15- 17.5	0.2	mg/kg	nd	0.4	yes	79	72	124	yes	8.7	10	7	13	yes	yes
Beryllium	TP2 5-7.5	0.2	mg/kg	nd	0.4	yes	86	72	124	yes	8.9	10	7	13	yes	yes
Cadmium	TP10 70-75	0.5	mg/kg	nd	0.6	yes	53	0	180	yes	88.6	100	70	130	yes	yes
Cadmium	TP15 15- 17.5	0.5	mg/kg	nd	0.6	yes	34	0	180	yes	91.4	100	70	130	yes	yes

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Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
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Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Cadmium	TP2 5-7.5	0.5	mg/kg	nd	0.6	yes	121	0	180	yes	92.1	100	70	130	yes	yes
Chromium	TP10 70-75	1	mg/kg	nd	2	yes	105	72	124	yes	89	100	70	130	yes	yes
Chromium	TP15 15- 17.5	1	mg/kg	nd	2	yes	99	72	124	yes	90	100	70	130	yes	yes
Chromium	TP2 5-7.5	1	mg/kg	nd	2	yes	105	72	124	yes	90	100	70	130	yes	yes
Cobalt	TP10 70-75	2	mg/kg	nd	4	yes	95	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP15 15- 17.5	2	mg/kg	nd	4	yes	90	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP2 5-7.5	2	mg/kg	nd	4	yes	97	85	123	yes	99	100	70	130	yes	yes
Copper	TP10 70-75	1	mg/kg	nd	4	yes	97	78	122	yes	84	100	70	130	yes	yes
Copper	TP15 15- 17.5	1	mg/kg	nd	4	yes	86	78	122	yes	87	100	70	130	yes	yes
Copper	TP2 5-7.5	1	mg/kg	nd	4	yes	96	78	122	yes	*	*	*	*	*	yes
Iron	na	50	mg/kg	nd	100	yes	86	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	88	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	89	85	119	yes	na	na	na	na	na	yes
Lead	TP10 70-75	5	mg/kg	nd	10	yes	108	48	152	yes	86	100	70	130	yes	yes
Lead	TP15 15- 17.5	5	mg/kg	nd	10	yes	73	48	152	yes	86	100	70	130	yes	yes
Lead	TP2 5-7.5	5	mg/kg	nd	10	yes	113	48	152	yes	89	100	70	130	yes	yes
Manganese	TP10 70-75	1	mg/kg	nd	2	yes	97	85	115	yes	91	100	70	130	yes	yes
Manganese	TP15 15- 17.5	1	mg/kg	nd	2	yes	92	85	115	yes	78	100	70	130	yes	yes
Manganese	TP2 5-7.5	1	mg/kg	nd	2	yes	97	85	115	yes	82	100	70	130	yes	yes
Molybdenum	TP10 70-75	3	mg/kg	nd	6	yes	160	0	210	yes	175	200	140	260	yes	yes

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Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Molybdenum	TP15 15-17.5	3	mg/kg	nd	6	yes	128	0	210	yes	174	200	140	260	yes	yes
Molybdenum	TP2 5-7.5	3	mg/kg	nd	6	yes	147	0	210	yes	176	200	140	260	yes	yes
Nickel	TP10 70-75	2	mg/kg	nd	4	yes	97	86	116	yes	87	100	70	130	yes	yes
Nickel	TP15 15-17.5	2	mg/kg	nd	4	yes	92	86	116	yes	81	100	70	130	yes	yes
Nickel	TP2 5-7.5	2	mg/kg	nd	4	yes	96	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	114	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	109	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	141	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	147	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	132	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	TP15 15-17.5	5	mg/kg	nd	10	yes	126	37	174	yes	120	100	70	130	yes	yes
Vanadium	TP10 70-75	1	mg/kg	nd	2	yes	102	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP15 15-17.5	1	mg/kg	nd	2	yes	97	81	119	yes	88	100	70	130	yes	yes
Vanadium	TP2 5-7.5	1	mg/kg	nd	2	yes	102	81	119	yes	91	100	70	130	yes	yes
Zinc	TP10 70-75	5	mg/kg	nd	10	yes	95	85	112	yes	87	100	70	130	yes	yes
Zinc	TP15 15-17.5	5	mg/kg	nd	10	yes	91	85	112	yes	84	100	70	130	yes	yes
Zinc	TP2 5-7.5	5	mg/kg	nd	10	yes	95	85	112	yes	98	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 26/2001
Lab Ref # : G214771
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP11 10-12.5	TP11 30-35	TP11 5-7.5	TP11 70-75	
Antimony	0.2	mg/kg	1.3	nd	1.0	nd	
Arsenic	0.2	mg/kg	25.2	1.9	10.8	1.3	
Selenium	0.2	mg/kg	3.5	nd	2.6	nd	
Aluminum	20	mg/kg	12200	1650	11100	1350	
Barium	5	mg/kg	206	8	185	8	
Beryllium	0.2	mg/kg	1.7	nd	1.5	nd	
Cadmium	0.5	mg/kg	1.1	nd	1.1	nd	
Chromium	1	mg/kg	26	8	26	4	
Cobalt	2	mg/kg	74	nd	46	nd	
Copper	1	mg/kg	294	10	249	3	
Iron	50	mg/kg	72700	17000	46600	4760	
Lead	5	mg/kg	132	8	137	nd	
Manganese	1	mg/kg	1550	157	1280	120	
Molybdenum	3	mg/kg	nd	nd	nd	nd	
Nickel	2	mg/kg	2470	32	1560	5	
Phosphorus	20	mg/kg	579	439	490	289	
Silver	1	mg/kg	nd	nd	nd	nd	
Titanium	5	mg/kg	346	574	328	187	
Vanadium	1	mg/kg	28	35	24	8	
Zinc	5	mg/kg	460	34	270	17	
pH	0.01	Units	7.62	8	7.69	8.07	
Moisture Content	0.01	%	4.34	0.3	3.38	0.79	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 27/2001
Date Reported:	October 26/2001
Lab Ref#:	G214771
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

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Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP10 70-75	0.2	mg/kg	nd	0.5	yes	107	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Arsenic	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	5.9	5.0	3.5	6.5	yes	yes
Arsenic	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	109	84	120	yes	*	*	*	*	*	yes
Antimony	TP10 70-75	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	4.8	5.0	3.5	6.5	yes	yes
Antimony	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP10 70-75	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.0	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	21	40	yes	99	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	94	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	98	74	125	yes	na	na	na	na	na	yes
Barium	TP10 70-75	5	mg/kg	nd	10	yes	92	82	113	yes	88	100	70	130	yes	yes
Barium	TP15 15- 17.5	5	mg/kg	nd	10	yes	89	82	113	yes	90	100	70	130	yes	yes
Barium	TP2 5-7.5	5	mg/kg	nd	10	yes	92	82	113	yes	90	100	70	130	yes	yes
Beryllium	TP10 70-75	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.4	10	7	13	yes	yes
Beryllium	TP15 15- 17.5	0.2	mg/kg	nd	0.4	yes	79	72	124	yes	8.7	10	7	13	yes	yes
Beryllium	TP2 5-7.5	0.2	mg/kg	nd	0.4	yes	86	72	124	yes	8.9	10	7	13	yes	yes
Cadmium	TP10 70-75	0.5	mg/kg	nd	0.6	yes	53	0	180	yes	88.6	100	70	130	yes	yes
Cadmium	TP15 15- 17.5	0.5	mg/kg	nd	0.6	yes	34	0	180	yes	91.4	100	70	130	yes	yes

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Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Cadmium	TP2 5-7.5	0.5	mg/kg	nd	0.6	yes	121	0	180	yes	92.1	100	70	130	yes	yes
Chromium	TP10 70-75	1	mg/kg	nd	2	yes	105	72	124	yes	89	100	70	130	yes	yes
Chromium	TP15 15- 17.5	1	mg/kg	nd	2	yes	99	72	124	yes	90	100	70	130	yes	yes
Chromium	TP2 5-7.5	1	mg/kg	nd	2	yes	105	72	124	yes	90	100	70	130	yes	yes
Cobalt	TP10 70-75	2	mg/kg	nd	4	yes	95	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP15 15- 17.5	2	mg/kg	nd	4	yes	90	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP2 5-7.5	2	mg/kg	nd	4	yes	97	85	123	yes	99	100	70	130	yes	yes
Copper	TP10 70-75	1	mg/kg	nd	4	yes	97	78	122	yes	84	100	70	130	yes	yes
Copper	TP15 15- 17.5	1	mg/kg	nd	4	yes	86	78	122	yes	87	100	70	130	yes	yes
Copper	TP2 5-7.5	1	mg/kg	nd	4	yes	96	78	122	yes	*	*	*	*	*	yes
Iron	na	50	mg/kg	nd	100	yes	86	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	88	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	89	85	119	yes	na	na	na	na	na	yes
Lead	TP10 70-75	5	mg/kg	nd	10	yes	108	48	152	yes	86	100	70	130	yes	yes
Lead	TP15 15- 17.5	5	mg/kg	nd	10	yes	73	48	152	yes	86	100	70	130	yes	yes
Lead	TP2 5-7.5	5	mg/kg	nd	10	yes	113	48	152	yes	89	100	70	130	yes	yes
Manganese	TP10 70-75	1	mg/kg	nd	2	yes	97	85	115	yes	91	100	70	130	yes	yes
Manganese	TP15 15- 17.5	1	mg/kg	nd	2	yes	92	85	115	yes	78	100	70	130	yes	yes
Manganese	TP2 5-7.5	1	mg/kg	nd	2	yes	97	85	115	yes	82	100	70	130	yes	yes
Molybdenum	TP10 70-75	3	mg/kg	nd	6	yes	160	0	210	yes	175	200	140	260	yes	yes

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Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Molybdenum	TP15 15- 17.5	3	mg/kg	nd	6	yes	128	0	210	yes	174	200	140	260	yes	yes
Molybdenum	TP2 5-7.5	3	mg/kg	nd	6	yes	147	0	210	yes	176	200	140	260	yes	yes
Nickel	TP10 70-75	2	mg/kg	nd	4	yes	97	86	116	yes	87	100	70	130	yes	yes
Nickel	TP15 15- 17.5	2	mg/kg	nd	4	yes	92	86	116	yes	81	100	70	130	yes	yes
Nickel	TP2 5-7.5	2	mg/kg	nd	4	yes	96	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	114	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	109	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	141	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	147	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	132	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	TP15 15- 17.5	5	mg/kg	nd	10	yes	126	37	174	yes	120	100	70	130	yes	yes
Vanadium	TP10 70-75	1	mg/kg	nd	2	yes	102	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP15 15- 17.5	1	mg/kg	nd	2	yes	97	81	119	yes	88	100	70	130	yes	yes
Vanadium	TP2 5-7.5	1	mg/kg	nd	2	yes	102	81	119	yes	91	100	70	130	yes	yes
Zinc	TP10 70-75	5	mg/kg	nd	10	yes	95	85	112	yes	87	100	70	130	yes	yes
Zinc	TP15 15- 17.5	5	mg/kg	nd	10	yes	91	85	112	yes	84	100	70	130	yes	yes
Zinc	TP2 5-7.5	5	mg/kg	nd	10	yes	95	85	112	yes	98	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
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Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

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\+ = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 26/2001
Lab Ref # : G214771
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP14 10-12.5	TP14 15-17.5	TP14 30-35	TP14 5-7.5	TP14 70-75
Antimony	0.2	mg/kg	0.9	1.0	0.8	1.0	1.0
Arsenic	0.2	mg/kg	14.4	16.2	14.4	16.2	14.9
Selenium	0.2	mg/kg	4.5	4.9	4.5	4.4	1.7
Aluminum	20	mg/kg	43200	47200	44100	40400	10900
Barium	5	mg/kg	550	340	291	451	142
Beryllium	0.2	mg/kg	5.4	5.9	5.5	5.1	1.4
Cadmium	0.5	mg/kg	nd	nd	nd	0.6	nd
Chromium	1	mg/kg	27	26	23	29	26
Cobalt	2	mg/kg	7	7	6	8	9
Copper	1	mg/kg	61	53	45	58	72
Iron	50	mg/kg	81800	71800	59400	81900	64800
Lead	5	mg/kg	48	21	16	78	300
Manganese	1	mg/kg	6120	5920	5740	5870	1210
Molybdenum	3	mg/kg	nd	nd	nd	3	nd
Nickel	2	mg/kg	183	166	152	189	146
Phosphorus	20	mg/kg	344	348	293	338	372
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	695	733	655	620	332
Vanadium	1	mg/kg	27	27	22	27	16
Zinc	5	mg/kg	147	121	108	154	252
pH	0.01	Units	8.03	8.71	8.33	8.40	7.86
Moisture Content	0.01	%	3.3	3.37	3.07	3.84	10.8

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 27/2001
Date Reported:	October 26/2001
Lab Ref#:	G214771
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

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Markham, ON, CANADA
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Date Received:	September 27/2001
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Lab Ref#:	G214771
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Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
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Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP10 70-75	0.2	mg/kg	nd	0.5	yes	107	84	120	yes	5.4	5.0	3.5	6.5	yes	yes
Arsenic	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	114	84	120	yes	5.9	5.0	3.5	6.5	yes	yes
Arsenic	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	109	84	120	yes	*	*	*	*	*	yes
Antimony	TP10 70-75	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	4.8	5.0	3.5	6.5	yes	yes
Antimony	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.9	5.0	3.5	6.5	yes	yes
Antimony	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Selenium	TP10 70-75	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP15 15- 17.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP2 5-7.5	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.0	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	21	40	yes	99	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	94	74	125	yes	na	na	na	na	na	yes
Aluminum	na	20	mg/kg	nd	40	yes	98	74	125	yes	na	na	na	na	na	yes
Barium	TP10 70-75	5	mg/kg	nd	10	yes	92	82	113	yes	88	100	70	130	yes	yes
Barium	TP15 15- 17.5	5	mg/kg	nd	10	yes	89	82	113	yes	90	100	70	130	yes	yes
Barium	TP2 5-7.5	5	mg/kg	nd	10	yes	92	82	113	yes	90	100	70	130	yes	yes
Beryllium	TP10 70-75	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.4	10	7	13	yes	yes
Beryllium	TP15 15- 17.5	0.2	mg/kg	nd	0.4	yes	79	72	124	yes	8.7	10	7	13	yes	yes
Beryllium	TP2 5-7.5	0.2	mg/kg	nd	0.4	yes	86	72	124	yes	8.9	10	7	13	yes	yes
Cadmium	TP10 70-75	0.5	mg/kg	nd	0.6	yes	53	0	180	yes	88.6	100	70	130	yes	yes
Cadmium	TP15 15- 17.5	0.5	mg/kg	nd	0.6	yes	34	0	180	yes	91.4	100	70	130	yes	yes

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Chromium	TP10 70-75	1	mg/kg	nd	2	yes	105	72	124	yes	89	100	70	130	yes	yes
Chromium	TP15 15- 17.5	1	mg/kg	nd	2	yes	99	72	124	yes	90	100	70	130	yes	yes
Chromium	TP2 5-7.5	1	mg/kg	nd	2	yes	105	72	124	yes	90	100	70	130	yes	yes
Cobalt	TP10 70-75	2	mg/kg	nd	4	yes	95	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP15 15- 17.5	2	mg/kg	nd	4	yes	90	85	123	yes	87	100	70	130	yes	yes
Cobalt	TP2 5-7.5	2	mg/kg	nd	4	yes	97	85	123	yes	99	100	70	130	yes	yes
Copper	TP10 70-75	1	mg/kg	nd	4	yes	97	78	122	yes	84	100	70	130	yes	yes
Copper	TP15 15- 17.5	1	mg/kg	nd	4	yes	86	78	122	yes	87	100	70	130	yes	yes
Copper	TP2 5-7.5	1	mg/kg	nd	4	yes	96	78	122	yes	*	*	*	*	*	yes
Iron	na	50	mg/kg	nd	100	yes	86	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	88	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	89	85	119	yes	na	na	na	na	na	yes
Lead	TP10 70-75	5	mg/kg	nd	10	yes	108	48	152	yes	86	100	70	130	yes	yes
Lead	TP15 15- 17.5	5	mg/kg	nd	10	yes	73	48	152	yes	86	100	70	130	yes	yes
Lead	TP2 5-7.5	5	mg/kg	nd	10	yes	113	48	152	yes	89	100	70	130	yes	yes
Manganese	TP10 70-75	1	mg/kg	nd	2	yes	97	85	115	yes	91	100	70	130	yes	yes
Manganese	TP15 15- 17.5	1	mg/kg	nd	2	yes	92	85	115	yes	78	100	70	130	yes	yes
Manganese	TP2 5-7.5	1	mg/kg	nd	2	yes	97	85	115	yes	82	100	70	130	yes	yes
Molybdenum	TP10 70-75	3	mg/kg	nd	6	yes	160	0	210	yes	175	200	140	260	yes	yes

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Molybdenum	TP2 5-7.5	3	mg/kg	nd	6	yes	147	0	210	yes	176	200	140	260	yes	yes
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Nickel	TP2 5-7.5	2	mg/kg	nd	4	yes	96	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	114	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	109	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	141	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	147	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	132	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
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Vanadium	TP10 70-75	1	mg/kg	nd	2	yes	102	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP15 15- 17.5	1	mg/kg	nd	2	yes	97	81	119	yes	88	100	70	130	yes	yes
Vanadium	TP2 5-7.5	1	mg/kg	nd	2	yes	102	81	119	yes	91	100	70	130	yes	yes
Zinc	TP10 70-75	5	mg/kg	nd	10	yes	95	85	112	yes	87	100	70	130	yes	yes
Zinc	TP15 15- 17.5	5	mg/kg	nd	10	yes	91	85	112	yes	84	100	70	130	yes	yes
Zinc	TP2 5-7.5	5	mg/kg	nd	10	yes	95	85	112	yes	98	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 26/2001
Lab Ref # : G214771
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 26/2001
Lab Ref # : G214771
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP15 10-12.5	TP15 15-17.5	TP15 15-17.5 Replicate	TP15 30-35	TP15 5-7.5
Antimony	0.2	mg/kg	0.5	0.5	0.5	0.5	0.6
Arsenic	0.2	mg/kg	5.3	5.8	5.9	4.2	5.8
Selenium	0.2	mg/kg	0.6	0.7	0.7	0.5	0.7
Aluminum	20	mg/kg	11100	5950	10000	18600	11900
Barium	5	mg/kg	90	94	95	126	92
Beryllium	0.2	mg/kg	0.5	0.5	0.5	0.9	0.6
Cadmium	0.5	mg/kg	nd	0.8	nd	nd	nd
Chromium	1	mg/kg	19	18	17	24	17
Cobalt	2	mg/kg	7	8	8	12	11
Copper	1	mg/kg	38	42	41	39	55
Iron	50	mg/kg	17900	14600	14700	22700	18400
Lead	5	mg/kg	197	91	86	562	82
Manganese	1	mg/kg	302	301	304	406	345
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	155	250	258	164	444
Phosphorus	20	mg/kg	609	719	749	617	717
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	179	188	188	227	211
Vanadium	1	mg/kg	24	23	22	35	25
Zinc	5	mg/kg	107	150	158	97	125
pH	0.01	Units	8.72	7.41	7.41	7.43	7.40
Moisture Content	0.01	%	7.27	8.84	9.88	12.9	8.54

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

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Report Date: October 26/2001
Lab Ref # : G214771
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP15 70-75				
Antimony	0.2	mg/kg	nd				
Arsenic	0.2	mg/kg	3.6				
Selenium	0.2	mg/kg	nd				
Aluminum	20	mg/kg	23800				
Barium	5	mg/kg	145				
Beryllium	0.2	mg/kg	1.0				
Cadmium	0.5	mg/kg	nd				
Chromium	1	mg/kg	30				
Cobalt	2	mg/kg	15				
Copper	1	mg/kg	34				
Iron	50	mg/kg	31300				
Lead	5	mg/kg	18				
Manganese	1	mg/kg	415				
Molybdenum	3	mg/kg	nd				
Nickel	2	mg/kg	220				
Phosphorus	20	mg/kg	756				
Silver	1	mg/kg	nd				
Titanium	5	mg/kg	230				
Vanadium	1	mg/kg	43				
Zinc	5	mg/kg	81				
pH	0.01	Units	7.54				
Moisture Content	0.01	%	13.1				

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required
Moisture Content

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

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Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Methodology: (Cont'd)

6) Determination of the moisture content of soil by weight.
ASTM Method No. D2216-80

Instrumentation:

1) Varian VGA 76
2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
5) Orion Research Expandable Ion Analyzer EA940
6) Precision Mechanical Convention Oven/Sartorius Basic Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	111	84	120	yes	6.4	5.0	3.5	6.5	yes	yes
Arsenic	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	116	84	120	yes	*	*	*	*	*	yes
Antimony	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Antimony	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.8	5.0	3.5	6.5	yes	yes
Selenium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.5	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	27	40	yes	102	74	125	yes	na	na	na	na	na	yes
Aluminum	ns	20	mg/kg	nd	40	yes	104	74	125	yes	na	na	na	na	na	yes
Barium	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	93	82	113	yes	92	100	70	130	yes	yes
Barium	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	95	82	113	yes	93	100	70	130	yes	yes
Beryllium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.6	10	7	13	yes	yes
Beryllium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.4	yes	91	72	124	yes	9.1	10	7	13	yes	yes
Cadmium	TP1 -5-7.5CM	0.5	mg/kg	nd	0.6	yes	45	0	180	yes	90.3	100	70	130	yes	yes
Cadmium	TP6 -15-17.5CM	0.5	mg/kg	nd	0.6	yes	123	0	180	yes	95.5	100	70	130	yes	yes
Chromium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	104	72	124	yes	87	100	70	130	yes	yes
Chromium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	121	72	124	yes	97	100	70	130	yes	yes
Cobalt	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	85	123	yes	83	100	70	130	yes	yes
Cobalt	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	111	85	123	yes	93	100	70	130	yes	yes
Copper	TP1 -5-7.5CM	1	mg/kg	2	4	yes	95	78	122	yes	89	100	70	130	yes	yes
Copper	TP6 -15-17.5CM	1	mg/kg	nd	4	yes	114	78	122	yes	94	100	70	130	yes	yes

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Certificate of Quality Control

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Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	111	84	120	yes	6.4	5.0	3.5	6.5	yes	yes
Arsenic	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	116	84	120	yes	*	*	*	*	*	yes
Antimony	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	143	29	157	yes	3.6	5.0	3.5	6.5	yes	yes
Antimony	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	129	29	157	yes	3.8	5.0	3.5	6.5	yes	yes
Selenium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	5.3	5.0	3.5	6.5	yes	yes
Selenium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.5	yes	100	60	140	yes	4.5	5.0	3.5	6.5	yes	yes
Aluminum	na	20	mg/kg	27	40	yes	102	74	125	yes	na	na	na	na	na	yes
Aluminum	ns	20	mg/kg	nd	40	yes	104	74	125	yes	na	na	na	na	na	yes
Barium	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	93	82	113	yes	92	100	70	130	yes	yes
Barium	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	95	82	113	yes	93	100	70	130	yes	yes
Beryllium	TP1 -5-7.5CM	0.2	mg/kg	nd	0.4	yes	82	72	124	yes	8.6	10	7	13	yes	yes
Beryllium	TP6 -15-17.5CM	0.2	mg/kg	nd	0.4	yes	91	72	124	yes	9.1	10	7	13	yes	yes
Cadmium	TP1 -5-7.5CM	0.5	mg/kg	nd	0.6	yes	45	0	180	yes	90.3	100	70	130	yes	yes
Cadmium	TP6 -15-17.5CM	0.5	mg/kg	nd	0.6	yes	123	0	180	yes	95.5	100	70	130	yes	yes
Chromium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	104	72	124	yes	87	100	70	130	yes	yes
Chromium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	121	72	124	yes	97	100	70	130	yes	yes
Cobalt	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	85	123	yes	83	100	70	130	yes	yes
Cobalt	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	111	85	123	yes	93	100	70	130	yes	yes
Copper	TP1 -5-7.5CM	1	mg/kg	2	4	yes	95	78	122	yes	89	100	70	130	yes	yes
Copper	TP6 -15-17.5CM	1	mg/kg	nd	4	yes	114	78	122	yes	94	100	70	130	yes	yes

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Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	93	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	94	85	119	yes	na	na	na	na	na	yes
Lead	TP1 -5-7.5CM	5	mg/kg	5	10	yes	117	48	152	yes	88	100	70	130	yes	yes
Lead	TP6 -15-17.5CM	5	mg/kg	6	10	yes	108	48	152	yes	93	100	70	130	yes	yes
Manganese	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	97	85	115	yes	79	100	70	130	yes	yes
Manganese	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	109	85	115	yes	89	100	70	130	yes	yes
Molybdenum	TP1 -5-7.5CM	3	mg/kg	nd	6	yes	181	0	210	yes	166	200	140	260	yes	yes
Molybdenum	TP6 -15-17.5CM	3	mg/kg	nd	6	yes	206	0	210	yes	167	200	140	260	yes	yes
Nickel	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	86	116	yes	75	100	70	130	yes	yes
Nickel	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	104	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	110	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	95	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	152	37	174	yes	na	na	na	na	na	yes
Vanadium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	103	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	118	81	119	yes	96	100	70	130	yes	yes
Zinc	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	97	85	112	yes	89	100	70	130	yes	yes
Zinc	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	103	85	112	yes	87	100	70	130	yes	yes

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Certificate of Quality Control

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Contact: Mahaboob Alam

Date Reported: October 21/2001
Lab Ref # : G214759
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	93	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	94	85	119	yes	na	na	na	na	na	yes
Lead	TP1 -5-7.5CM	5	mg/kg	5	10	yes	117	48	152	yes	88	100	70	130	yes	yes
Lead	TP6 -15-17.5CM	5	mg/kg	6	10	yes	108	48	152	yes	93	100	70	130	yes	yes
Manganese	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	97	85	115	yes	79	100	70	130	yes	yes
Manganese	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	109	85	115	yes	89	100	70	130	yes	yes
Molybdenum	TP1 -5-7.5CM	3	mg/kg	nd	6	yes	181	0	210	yes	166	200	140	260	yes	yes
Molybdenum	TP6 -15-17.5CM	3	mg/kg	nd	6	yes	206	0	210	yes	167	200	140	260	yes	yes
Nickel	TP1 -5-7.5CM	2	mg/kg	nd	4	yes	95	86	116	yes	75	100	70	130	yes	yes
Nickel	TP6 -15-17.5CM	2	mg/kg	nd	4	yes	104	86	116	yes	*	*	*	*	*	yes
Phosphorus	na	20	mg/kg	nd	40	yes	111	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	115	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	110	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	95	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	134	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	152	37	174	yes	na	na	na	na	na	yes
Vanadium	TP1 -5-7.5CM	1	mg/kg	nd	2	yes	103	81	119	yes	87	100	70	130	yes	yes
Vanadium	TP6 -15-17.5CM	1	mg/kg	nd	2	yes	118	81	119	yes	96	100	70	130	yes	yes
Zinc	TP1 -5-7.5CM	5	mg/kg	nd	10	yes	97	85	112	yes	89	100	70	130	yes	yes
Zinc	TP6 -15-17.5CM	5	mg/kg	nd	10	yes	103	85	112	yes	87	100	70	130	yes	yes

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Certificate of Quality Control

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Date Reported: October 21/2001
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Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	98	90	110	yes	na	na	na	na	na	yes

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Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 21/2001
Lab Ref # : G214759
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP16 -45-50CM	TP16 -5-7.5CM	TP16 -70-75CM	TP16 -10-12.5CM	TP16 -15-17.5CM
Antimony	0.2	mg/kg	nd!(2.0)	nd	0.5	9.4	10.4
Arsenic	0.2	mg/kg	7.5	8.2	5.2	333	361
Selenium	0.2	mg/kg	nd!(2.0)	1.4	nd!(2.0)	19.2	7.8
Aluminum	20	mg/kg	9240	16700	5920	8350	10900
Barium	5	mg/kg	69	116	47	162	211
Beryllium	0.2	mg/kg	0.4	0.7	0.2	0.5	0.7
Cadmium	0.5	mg/kg	2.0	nd	1.3	2.9	nd
Chromium	1	mg/kg	17	29	13	47	52
Cobalt	2	mg/kg	478	31	209	909	874
Copper	1	mg/kg	15700	142	7670	7190	7390
Iron	50	mg/kg	17700	24900	11500	34700	94900
Lead	5	mg/kg	45	19	40	147	373
Manganese	1	mg/kg	317	489	182	304	283
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	39300	855	18300	48400	58300
Phosphorus	20	mg/kg	176	571	346	326	235
Silver	1	mg/kg	5	nd	2	9	10
Titanium	5	mg/kg	403	322	342	396	760
Vanadium	1	mg/kg	28	37	36	33	39
Zinc	5	mg/kg	133	69	56	111	163
pH	0.01	Units	8.46	7.77	9.56	7.59	7.53
Moisture Content	0.01	%	16.2	18.9	16.4	9.08	14.8

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 21/2001
Lab Ref # : G214759
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TP16 -25-27.5CM				
Antimony	0.2	mg/kg	0.8				
Arsenic	0.2	mg/kg	18.6				
Selenium	0.2	mg/kg	nd!(2.0)				
Aluminum	20	mg/kg	17600				
Barium	5	mg/kg	63				
Beryllium	0.2	mg/kg	0.7				
Cadmium	0.5	mg/kg	1.6				
Chromium	1	mg/kg	43				
Cobalt	2	mg/kg	294				
Copper	1	mg/kg	11300				
Iron	50	mg/kg	57800				
Lead	5	mg/kg	119				
Manganese	1	mg/kg	112				
Molybdenum	3	mg/kg	nd				
Nickel	2	mg/kg	27600				
Phosphorus	20	mg/kg	347				
Silver	1	mg/kg	6				
Titanium	5	mg/kg	1700				
Vanadium	1	mg/kg	62				
Zinc	5	mg/kg	78				
pH	0.01	Units	7.14				
Moisture Content	0.01	%	26.0				

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	September 26/2001
Date Reported:	October 21/2001
Lab Ref#:	G214759
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646
Sampled By:	ONT 34646

Certificate of Analysis

Additional Comments:

Selenium and Antimony Analysis of Soil:
Selenium EQLs for samples TP16-25-27.5CM, TP16-45-50CM, TP16-70-75CM were adjusted due to matrix interference. Antimony EQL for TP16-45-50CM also adjusted.

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order:

Comments: 621471

CHAIN OF CUSTODY RECORD

Client: JNEL MARKHAM

PAS Quote #: INCO-JNEL SPECIAL

Client P.O. #:

Client Project #: ONT 34646

Sampled by:

Page 1 of 1

SEP 26'01 PM 6:05

Contact:

Phone: Fax:

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date STRICT TAT
By Time OCT 1. only first 2 samples

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/AFAM-23 METALS (As, Se, Sb)	pH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP2 (0-2.5 cm)			✓	✓	SOIL	1	Follow Protocol
2	TP2 (2.5-5 cm)			✓	✓	"	1	
3	TP2 (5-7.5 cm)			✓	✓	"	1	
4	TP2 (10-12.5cm)			✓	✓	"	1	
5	TP2 (15-17.5cm)			✓	✓	"	1	
6	TP2 (70-75cm)			✓	✓	"	1	
7	DUP1 (70-75cm)	DUP2	94355	✓	✓	"	1	
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature) — Date: 01/09/26 — Time: 6:05 — Method of Shipment: Drop off

Samples Received in lab by: — Date: 01/09/26 — Time: 6:05 — Condition of samples upon receipt at lab: 15°C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

32

5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order: G2147711

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M. ALAM

Phone: Fax:

PAS Quote #: INCO-JWEL SPECIAL

Client P.O. #:

Client Project #: ONT 34646

Sampled by:

Please specify Guideline (if applicable) INCO PROTOCOL

Page 1 of 2

SEP 26'01 PM 6:06

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

(RUSH) Specify Date BY OCT 1 only first two samples STRICT TAT

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METALS (As, Sb, Se)	pH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP8(0-2.5cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP8(2.5-5cm)			✓	✓	"	1	
3	TP8(5-7.5cm)			✓	✓	"	1	
4	TP8(10-12.5cm)			✓	✓	"	1	
5	TP8(15-17.5cm)			✓	✓	"	1	
6	TP8(30-35cm)			✓	✓	"	1	
7	TP8(70-75cm)	DUP2	094355	✓	✓	"	1	
8	DUP1(70-75cm)	DUP8	094384	✓	✓	"	1	
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature): [signature] Date: 01/01/26 Time: 6:05 Method of Shipment: DROP OFF

Samples Received in lab by: [signature] Date: 01/09/26 Time: 6:05 Condition of samples upon receipt at lab: 18°C

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

№ [redacted] 8248

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214771

Comments:

CHAIN OF CUSTODY RECORD

Page 3 of 3

Client: JWEL MARKHAM

PAS Quote # : INCO-JWEL SPECIAL

Client P.O. # :

Client Project # : ONT 34646

SEP 26 '01 PM 1:06

Contact: M. ALAM

Sampled by:

Phone: Fax:

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date STRICT TAT BY OCT 1 Only first 2 sample Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METALS (AS, SE, SB)	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP10 (0-21.5 cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP10 (21.5-5 cm)			✓	✓	"	1	
3	TP10 (5-71.5 cm)			✓	✓	"	1	
4	TP10 (10-12.5 cm)			✓	✓	"	1	
5	TP10 (20-22.5 cm)			✓	✓	"	1	
6	TP10 (30-35 cm)			✓	✓	"	1	
7	TP10 (70-75 cm)			✓	✓	"	1	
8	DUP1 (70-75 cm) DUP TO 943976				✓	"	1	
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)		Date: 01/09/26	Time: 6:05	Method of Shipment: Drop Off
Samples Received in lab by:		Date: 01/09/26	Time: 6:05	Condition of samples upon receipt at lab:

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

3°C

32

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order: 6214771

Comments:

CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: JWEL
MARKHAM

PAS Quote #: INCO-JWEL SPECIAL

Client P.O. #: SEP 26'01 PM 6:06

Client Project #: ONT 34646

Contact: M. ALAM

Sampled by:

Phone: Fax:

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

(RUSH) Specify Date / Time STRICT TAT BY PLT 1, only first 2 sample

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/AFAM-23 METAL (AS, Se, Sb)	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP11 (0-2.5 cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP11 (2.5-5 cm)			✓	✓	"	1	
3	TP11 (5-7.5 cm)			✓	✓	"	1	
4	TP11 (10-12.5 cm)			✓	✓	"	1	
5	TP11 (30-35 cm)			✓	✓	"	1	
6	TP11 (70-75 cm)			✓	✓	"	1	
7	DUP1 (70-75 cm) DUP11			✓	✓	"	1	
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)		Date: 01/09/26	Time: 6:05	Method of Shipment: Delivery
Samples Received in lab by:		Date: 01/09/26	Time: 6:05	Condition of samples upon receipt at lab: 18°C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

№ [redacted] 8250

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order:

Comments: 6214771

CHAIN OF CUSTODY RECORD

Page 1 of 5

Client: JWEL MARKHAM

PAS Quote # : INCO-JWEL BRECIAL

Client P.O. # :

Client Project # : ONT 34646

Contact: M. ALAM

Sampled by:

SEP 26 '01 PM 6:06

Phone: Fax:

Please specify Guideline (if applicable) INCO PROTOCOL

Analysis Required:

Invoice to (if other than above):

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date STRICT TAT

Time BY OCT 2, first two sample only

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METALS (AS, SE, SB)	pH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP14 (0-2.5 cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP14 (2.5-5 cm)			✓	✓	"	1	
3	TP14 (5-7.5 cm)			✓	✓	"	1	
4	TP14 (10-12.5 cm)			✓	✓	"	1	
5	TP14 (15-17.5 cm)			✓	✓	"	1	
6	TP14 (30-35 cm)			✓	✓	"	1	
7	TP14 (70-75 cm)			✓	✓	"	1	
8	DUP1 (70-75 cm) DUP IH 94340			✓	✓	"	1	
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)		Date: 01/09/26	Time: 6:05	Method of Shipment: Drop off
Samples Received in lab by:		Date: 01/10/26	Time: 6:05	Condition of samples upon receipt at lab:

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

7°C

32

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order: 6214771

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M. ALAM

Phone: Fax:

PAS Quote #: INCO-JWEL SPECIAL

Client P.O. #:

Client Project #: ONT 34646

Sampled by:

Please specify Guideline (if applicable) INCO PROTOCOL

SEP 26 '01 PM 6:06

Page 1 of 1

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date STRICT TAT BY OCT 1, Only first 2 samples Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 Metals (As, Se, Sb)	pH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP15 (0-2.5cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP15 (2.5-5cm)			✓	✓	"	1	
3	TP15 (5-7.5cm)			✓	✓	"	1	
4	TP15 (10-12.5cm)			✓	✓	"	1	
5	TP15 (15-17.5cm)			✓	✓	"	1	
6	TP15 (30-35cm)			✓	✓	"	1	
7	TP15 (70-75cm)			✓	✓	"	1	
8	~~DUP~~ DUP 1 (70-75cm)	DUP 15 94379		✓	✓	"	1	
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)		Date: 01/09/26	Time: 6:05	Method of Shipment: Drop off
Samples Received in lab by:		Date: 01/09/26	Time: 6:05	Condition of samples upon receipt at lab: 18°C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

№ [redacted] 8252

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214759.

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

PAS Quote #: INCO-JWEL SPECIAL

Page ____ of ____

Client P.O. #:

Client Project #: ONT 34646

Contact: M. ALAM

Sampled by:

SEP 26 '01 PM 1:52

Phone: ____ Fax: ____

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required: ICP/GEAA-23 METALS (AS, SE, SB) | PH

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

(RUSH) Specify Date STRICT TAT By OCT 1, Time only first and last samples

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GEAA-23 METALS (AS, SE, SB)	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP16 (2.5-5cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP16 (5-7.5cm)			✓	✓	"	1	
3	TP16 (10-12.5cm)			✓	✓	"	1	
4	TP16 (15-17.5cm)			✓	✓	"	1	
5	TP16 (25-27.5cm)			✓	✓	"	1	
6	TP16 (45-50cm)			✓	✓	"	1	
7	TP16 (70-75cm)			✓	✓	"	1	
8	DUP1 (70-75cm)			✓	✓	"	1	—
9	TP16 (0-2.5cm)			✓	✓	"	1	
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Choi	Date: 01/OCT/26	Time: 13:53	Condition of samples upon receipt at lab:

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

32

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order:
Comments: 62147591

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM
Contact: MIALAM
Phone: Fax:

PAS Quote #: INCO-JWEL SPECIAL
Client P.O. #:
Client Project #: ONT 34646
Sampled by:
Please specify Guideline (if applicable): INCO-PROTOCOL

Page of

SEP 26 '01 PM 1:45

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

(RUSH) Specify Date / Time: STRICT TAT By OCT 1 only First 2 samples

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METALS (As, Se, Sb)	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP7 (0-2.5 cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP7 (2.5-5 cm)			✓	✓	"	1	
3	TP7 (5-7.5 cm)			✓	✓	"	1	
4	TP7 (10-12.5 cm)			✓	✓	"	1	
5	TP7 (15-17.5 cm)			✓	✓	"	1	
6	TP7 (70-75 cm)			✓	✓	"	1	
7	DUP1 (70-75 cm)			✓	✓	"	1	
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature) | Date: | Time: | Method of Shipment

Samples Received in lab by: A. Cloiner | Date: 01/09/26 | Time: 13:53 | Condition of samples upon receipt at lab: 15 C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 8247

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: 6214759

Comments:

CHAIN OF CUSTODY RECORD

Client: INCO-JWEL MARKHAM

Contact: M. ALAM

Phone: _____ Fax: _____

PAS Quote #: INCO-JWEL SPECIAL

Client P.O. #:

Client Project #: ONT 34646

Sampled by:

Page _____ of _____

SEP 26 '01 PM 1:52
SEP 26 '01 PM 1:45

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

(RUSH) Specify Date STRICT TAT
By OCT1 only first 2 samples
Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA 23 METAL	(As, Se, Sb)	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP6(0-2.5cm)			✓		✓	SOIL	1	FOLLOW PROTOCOL
2	TP6(2.5-5cm)			✓		✓	"	1	
3	TP6(5-7.5cm)			✓		✓	"	1	
4	TP6(10-12.5cm)			✓		✓	"	1	
5	TP6(15-17.5cm)			✓		✓	"	1	
6	TP6(70-75cm)			✓		✓	"	1	
7	DUP1(70-75cm)			✓		✓	"	1	
8									
9									
10									
11									
12									

Samples Relinquished to PAS by (Client Signature)		Date:	Time:	Method of Shipment
Samples Received in lab by:	A. Chois	Date: 01/09/26	Time: 13:53	Condition of samples upon receipt at lab: 15 C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

ILIF ...ALYT ... SEI... ES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order: G214759
Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM
Contact: M. ALAM
Phone: Fax:

PAS Quote #: INCO-JWEL SPECIAL
Client P.O. #:
Client Project #: ONT 34646
Sampled by:
SEP 26 '01 PM 1:52

Page ___ of ___

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days

(RUSH) Specify Date STRICT TAT
By OCT 1, Only first two sample
Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/AFAA-23 METALS (As, Se, Sb)	pH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP4 (0-2.5 cm)			✓	✓	SOIL	1	FOLLOW
2	TP4 (2.5-5 cm)			✓	✓	"	1	PROTOCOL
3	TP4 (5-7.5 cm)			✓	✓	"	1	
4	TP4 (10-12.5 cm)			✓	✓	"	1	
5	TP4 (15-17.5 cm)			✓	✓	"	1	
6	TP4 (25-27.5 cm)			✓	✓	"	1	
7	TP4 (45-50 cm)			✓	✓	"	1	
8	DUP1 (45-50 cm)			✓	✓	"	1	
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature) | Date: | Time: | Method of Shipment

Samples Received in lab by: A-Chuja | Date: 01/09/26 | Time: 13:57 | Condition of samples upon receipt at lab: 16 °C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 8243

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214759

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

PAS Quote # : INCO-JWEL SPECIAL

Page ____ of ____

Client P.O. # :

Client Project # : ONT34646

SEP 26 '01 PM 1:52

Contact: M. ALAM

Sampled by:

Phone: ____ Fax: ____

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date STRICT TAT BY OCT 1, 2001 only First two samples

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/AFAA-23 METALS (As, Se, Sb)	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	TP1 (0-2.5cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	TP1 (2.5-5cm)			✓	✓	"	1	
3	TP1 (5-7.5cm)			✓	✓	"	1	
4	TP1 (10-12.5cm)			✓	✓	"	1	1 x 60
5	TP1 (25-27.5cm)			✓	✓	"	1	
6	TP1 (45-50 cm)			✓	✓	"	1	
7	TP1 (70-75 cm)			✓	✓	"	1	
8	TP1 BEDROCK			✓	✓	"	1	
9	DUP1 (70-75 cm)			✓	✓	"	1	
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by: A. Chojo	Date: 01/09/26	Time: 13:53	Condition of samples upon receipt at lab: 15 C

Rev. COC15-11-00

White: Philin Yellow: Mail Pink: Receiver Goldenrod: Client

A10

32

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	October 4/2001
Date Reported:	October 11/2001
Lab Ref#:	G214965
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Analysis Performed:

Arsenic, Hydride Generation AA
Antimony, Hydride Generation, Digestion Required
Selenium, Hydride Generation
17 Element ICP Scan
pH, Hydrogen Ion Activity, Extraction Required

Methodology:

1) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061(Modifications)
2) Analysis of antimony in soil by hydride generation.
U.S. EPA Method No. 7042
3) Analysis of selenium in soil by hydride generation.
U.S. EPA Method No. 7741(Modification)
4) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 6010
(Ministry of Environment ELSCAN)
5) Analysis of pH in soil by electrode.
U.S. EPA Method No. 9045

ANALYTICAL SERVICES

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	October 4/2001
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Lab Ref#:	G214965
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Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Instrumentation:	1) Varian VGA 76 2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76 4) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer 5) Orion Research Expandable Ion Analyzer EA940
Sample Description:	Soil
QA/QC:	Refer to CERTIFICATE OF QUALITY CONTROL report.
Results:	Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Account Manager

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 11/2001
Lab Ref # : G214965
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Arsenic	DUP-TP1 70-75CM	0.2	mg/kg	nd	0.5	yes	106	84	120	yes	3.7	5.0	3.5	6.5	yes	yes
Arsenic	DUP-TP17 95-100CM	0.2	mg/kg	nd	0.5	yes	112	84	120	yes	4.2	5.0	3.5	6.5	yes	yes
Antimony	DUP-TP1 70-75CM	0.2	mg/kg	nd	0.5	yes	100	29	157	yes	5.8	5.0	3.5	6.5	yes	yes
Antimony	DUP-TP17 95-100CM	0.2	mg/kg	nd	0.5	yes	86	29	157	yes	3.8	5.0	3.5	6.5	yes	yes
Selenium	DUP-TP1 70-75CM	0.2	mg/kg	nd	0.5	yes	140	60	140	yes	4.7	5.0	3.5	6.5	yes	yes
Selenium	DUP-TP17 95-100CM	0.2	mg/kg	nd	0.5	yes	120	60	140	yes	4.9	5.0	3.5	6.5	yes	yes
Aluminum	ns	20	mg/kg	nd	40	yes	89	74	125	yes	na	na	na	na	na	yes
Aluminum	ns	20	mg/kg	nd	40	yes	94	74	125	yes	na	na	na	na	na	yes
Barium	DUP-TP1 70-75CM	5	mg/kg	nd	10	yes	98	82	113	yes	94	100	70	130	yes	yes
Barium	DUP-TP17 95-100CM	5	mg/kg	nd	10	yes	101	82	113	yes	94	100	70	130	yes	yes
Beryllium	DUP-TP1 70-75CM	0.2	mg/kg	nd	0.4	yes	92	72	124	yes	9.2	10	7	13	yes	yes
Beryllium	DUP-TP17 95-100CM	0.2	mg/kg	nd	0.4	yes	97	72	124	yes	9.4	10	7	13	yes	yes
Cadmium	DUP-TP1 70-75CM	0.5	mg/kg	nd	0.6	yes	175	0	180	yes	92.9	100	70	130	yes	yes
Cadmium	DUP-TP17 95-100CM	0.5	mg/kg	nd	0.6	yes	142	0	180	yes	92.1	100	70	130	yes	yes
Chromium	DUP-TP1 70-75CM	1	mg/kg	nd	2	yes	97	72	124	yes	92	100	70	130	yes	yes
Chromium	DUP-TP17 95-100CM	1	mg/kg	nd	2	yes	102	72	124	yes	94	100	70	130	yes	yes
Cobalt	DUP-TP1 70-75CM	2	mg/kg	nd	4	yes	100	85	123	yes	91	100	70	130	yes	yes
Cobalt	DUP-TP17 95-100CM	2	mg/kg	nd	4	yes	104	85	123	yes	92	100	70	130	yes	yes
Copper	DUP-TP1 70-75CM	1	mg/kg	nd	4	yes	101	78	122	yes	106	100	70	130	yes	yes
Copper	DUP-TP17 95-100CM	1	mg/kg	nd	4	yes	108	78	122	yes	90	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 11/2001
Lab Ref # : G214965
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
Iron	na	50	mg/kg	nd	100	yes	85	85	119	yes	na	na	na	na	na	yes
Iron	na	50	mg/kg	nd	100	yes	89	85	119	yes	na	na	na	na	na	yes
Lead	DUP-TP1 70-75CM	5	mg/kg	nd	10	yes	100	48	152	yes	91	100	70	130	yes	yes
Lead	DUP-TP17 95-100CM	5	mg/kg	nd	10	yes	105	48	152	yes	91	100	70	130	yes	yes
Manganese	DUP-TP1 70-75CM	1	mg/kg	nd	2	yes	101	85	115	yes	90	100	70	130	yes	yes
Manganese	DUP-TP17 95-100CM	1	mg/kg	nd	2	yes	104	85	115	yes	94	100	70	130	yes	yes
Molybdenum	DUP-TP1 70-75CM	3	mg/kg	nd	6	yes	206	0	210	yes	181	200	140	260	yes	yes
Molybdenum	DUP-TP17 95-100CM	3	mg/kg	nd	6	yes	138	0	210	yes	187	200	140	260	yes	yes
Nickel	DUP-TP1 70-75CM	2	mg/kg	nd	4	yes	97	86	116	yes	92	100	70	130	yes	yes
Nickel	DUP-TP17 95-100CM	2	mg/kg	nd	4	yes	102	86	116	yes	87	100	70	130	yes	yes
Phosphorus	na	20	mg/kg	nd	40	yes	109	73	130	yes	na	na	na	na	na	yes
Phosphorus	na	20	mg/kg	nd	40	yes	113	73	130	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	114	25	200	yes	na	na	na	na	na	yes
Silver	na	1	mg/kg	nd	2	yes	95	25	200	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	105	37	174	yes	na	na	na	na	na	yes
Titanium	na	5	mg/kg	nd	10	yes	98	37	174	yes	na	na	na	na	na	yes
Vanadium	DUP-TP1 70-75CM	1	mg/kg	nd	2	yes	92	81	119	yes	92	100	70	130	yes	yes
Vanadium	DUP-TP17 95-100CM	1	mg/kg	nd	2	yes	97	81	119	yes	92	100	70	130	yes	yes
Zinc	DUP-TP1 70-75CM	5	mg/kg	nd	10	yes	96	85	112	yes	101	100	70	130	yes	yes
Zinc	DUP-TP17 95-100CM	5	mg/kg	nd	10	yes	100	85	112	yes	91	100	70	130	yes	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Certificate of Quality Control

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Date Reported: October 11/2001
Lab Ref # : G214965
Lab Quote#: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
pH	na	0.01	Units	na	na	na	100	90	110	yes	na	na	na	na	na	yes
pH	na	0.01	Units	na	na	na	99	90	110	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 11/2001
Lab Ref # : G214965
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	DUP-TP1 70-75CM	DUP-TP1 70-75CM Replicate	DUP-TP10 70-75CM	DUP-TP11 70-75CM	DUP-TP12 5-10CM
Antimony	0.2	mg/kg	nd	nd	nd	nd	nd
Arsenic	0.2	mg/kg	1.9	1.9	0.5	1.3	1.6
Selenium	0.2	mg/kg	1.1	1.1	nd	nd	8.6
Aluminum	20	mg/kg	12500	12300	1550	929	49400
Barium	5	mg/kg	75	73	nd	8	182
Beryllium	0.2	mg/kg	0.7	0.7	nd	nd	7.1
Cadmium	0.5	mg/kg	0.7	1.0	nd	nd	nd
Chromium	1	mg/kg	14	13	2	2	13
Cobalt	2	mg/kg	4	3	nd	nd	nd
Copper	1	mg/kg	37	40	2	4	25
Iron	50	mg/kg	10700	10600	1810	3530	11600
Lead	5	mg/kg	15	13	nd	6	nd
Manganese	1	mg/kg	73	72	17	110	3000
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	59	58	10	3	32
Phosphorus	20	mg/kg	811	787	286	318	28
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	74	73	87	77	895
Vanadium	1	mg/kg	19	19	3	5	5
Zinc	5	mg/kg	47	47	11	14	9
pH	0.01	Units	7.06	-	7.51	8.26	10.5

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
- Not Requested
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 11/2001
Lab Ref # : G214965
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	DUP-TP13 70-75CM	DUP-TP14 70-75CM	DUP-TP15 70-75CM	DUP-TP16 70-75CM	DUP-TP17 95-100CM
Antimony	0.2	mg/kg	0.2	0.9	0.3	0.3	nd
Arsenic	0.2	mg/kg	5.7	12.0	3.2	4.0	0.3
Selenium	0.2	mg/kg	0.6	2.2	0.3	0.3	nd
Aluminum	20	mg/kg	3410	10800	15000	3520	1670
Barium	5	mg/kg	12	170	125	29	5
Beryllium	0.2	mg/kg	0.4	1.6	0.8	nd	nd
Cadmium	0.5	mg/kg	nd	2.8	1.0	0.6	nd
Chromium	1	mg/kg	8	25	20	6	3
Cobalt	2	mg/kg	6	11	18	145	nd
Copper	1	mg/kg	19	73	52	5390	16
Iron	50	mg/kg	9340	54700	25300	8040	2390
Lead	5	mg/kg	11	270	27	37	nd
Manganese	1	mg/kg	237	1250	511	138	19
Molybdenum	3	mg/kg	nd	5	3	nd	nd
Nickel	2	mg/kg	20	162	589	11400	34
Phosphorus	20	mg/kg	978	337	645	291	258
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	57	300	157	156	114
Vanadium	1	mg/kg	15	15	28	23	6
Zinc	5	mg/kg	25	277	83	45	12
pH	0.01	Units	8.38	8.88	7.85	9.41	7.66

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 11/2001
Lab Ref # : G214965
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	DUP-TP17 95-100CM Replicate	DUP-TP2 70-75CM	DUP-TP3 95-100CM	DUP-TP4 45-50CM	DUP-TP5 95-100CM
Antimony	0.2	mg/kg	nd	0.3	0.2	0.4	0.2
Arsenic	0.2	mg/kg	0.3	4.5	5.4	10.7	5.1
Selenium	0.2	mg/kg	nd	nd	0.2	3.5	nd
Aluminum	20	mg/kg	1480	16400	16700	8340	14700
Barium	5	mg/kg	nd	134	134	67	134
Beryllium	0.2	mg/kg	nd	0.7	0.7	0.5	0.6
Cadmium	0.5	mg/kg	nd	0.6	0.5	0.8	0.5
Chromium	1	mg/kg	2	22	23	14	21
Cobalt	2	mg/kg	nd	11	12	22	11
Copper	1	mg/kg	10	28	28	195	29
Iron	50	mg/kg	2080	32100	33600	19600	31300
Lead	5	mg/kg	nd	16	8	34	13
Manganese	1	mg/kg	16	499	426	185	561
Molybdenum	3	mg/kg	nd	nd	nd	nd	nd
Nickel	2	mg/kg	20	50	32	1840	41
Phosphorus	20	mg/kg	235	566	604	678	565
Silver	1	mg/kg	nd	nd	nd	nd	nd
Titanium	5	mg/kg	93	205	267	142	239
Vanadium	1	mg/kg	5	33	32	23	29
Zinc	5	mg/kg	11	70	71	202	67
pH	0.01	Units	7.66	7.95	7.82	7.32	7.80

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Jacques Whitford Environment Ltd.
Contact: Mahaboob Alam

Report Date: October 11/2001
Lab Ref # : G214965
Lab Quote #: EG009-0811
Client PO#: INCO
Client Ref#: ONT34646

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	DUP-TP6 70-75CM	DUP-TP7 70-75CM	DUP-TP8 70-75CM	DUP-TP9 95-100CM	
Antimony	0.2	mg/kg	0.2	0.3	nd	nd	
Arsenic	0.2	mg/kg	2.7	4.0	1.7	1.6	
Selenium	0.2	mg/kg	nd	nd	1.0	0.3	
Aluminum	20	mg/kg	16800	16200	1290	4580	
Barium	5	mg/kg	130	138	27	28	
Beryllium	0.2	mg/kg	0.7	0.7	nd	0.2	
Cadmium	0.5	mg/kg	0.7	nd	nd	nd	
Chromium	1	mg/kg	23	22	2	9	
Cobalt	2	mg/kg	12	11	2	3	
Copper	1	mg/kg	27	25	5	7	
Iron	50	mg/kg	37700	31400	3720	6610	
Lead	5	mg/kg	6	6	nd	nd	
Manganese	1	mg/kg	655	544	131	56	
Molybdenum	3	mg/kg	nd	nd	nd	nd	
Nickel	2	mg/kg	31	31	33	9	
Phosphorus	20	mg/kg	656	572	318	364	
Silver	1	mg/kg	nd	nd	nd	nd	
Titanium	5	mg/kg	231	223	58	159	
Vanadium	1	mg/kg	32	30	8	15	
Zinc	5	mg/kg	68	68	9	26	
pH	0.01	Units	7.50	7.90	6.13	7.09	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client: Jacques Whitford Environment Ltd.
1200 Denison Street
Markham, ON, CANADA
L3R 8G6

Fax: 905-479-9326

Attn: Mahaboob Alam

Date Received:	October 4/2001
Date Reported:	October 11/2001
Lab Ref#:	G214965
Lab Quote#:	EG009-0811
Client PO#:	INCO
Client Ref#:	ONT34646

Certificate of Analysis

Additional Comments:

pH Determination of Soil:
Sample DUP-TP870-75CM was extracted with a 1:4 soil:water ratio instead of the usual 1:2 ratio.
The high organic content of this sample absorbed all the water in the 1:2 ratio.

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9
Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

Work Order:
Comments: G 214965

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM
Contact: M. ALAM
Phone: Fax:

PAS Quote #: INCO - JWEL SPECIAL
Client P.O. #: ONT34646
Client Project #:
Sampled by:
Please specify Guideline (if applicable) INCO PROTOCOL

OCT 4'01 PM 6:18

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days - STRICT TAT

RUSH Specify Date BY OCT 10, 2001

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	TCP/GFAA-23 METALS (As, Se, Sb)	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	DUP-TP14 (70-75 cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	DUP-TP15 (70-75 cm)			✓	✓	"	1	
3	DUP-TP16 (70-75 cm)			✓	✓	"	1	
4	DUP-TP17 (95-100 cm)			✓	✓	"	1	
5	DUP-TP12 (5-10 cm)			✓	✓	"	1	
6								
7								
8								
9								
10								
11								
12								

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by:	Date: 01/10/4	Time: 18:17 21°C	Condition of samples upon receipt at lab:

Rev. COC15-11-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 8258

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G214965

Comments:

CHAIN OF CUSTODY RECORD

Client: JWEL MARKHAM

Contact: M. ALAM

Phone: Fax:

PAS Quote #: INCO-JWEL SPECIAL

Page 1 of 2

Client P.O. #:

Client Project #: ONT34646

OCT 4'01 PM 6:18

Sampled by:

Please specify Guideline (if applicable) INCO PROTOCOL

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

(STD) 5-7 Business Days STRICT TAT

RUSH Specify Date BY OCT 10, 2001

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ICP/GFAA-23 METALS (A, Se, Sb)	PH	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	DUP-TP1(70-75cm)			✓	✓	SOIL	1	FOLLOW PROTOCOL
2	DUP-TP2(70-75cm)			✓	✓	"	1	
3	DUP-TP3 (95-100cm)			✓	✓	"	1	
4	DUP-TP4 (45-50cm)			✓	✓	"	1	
5	DUP-TP5 (95-100cm)			✓	✓	"	1	
6	DUP-TP6(70-75cm)			✓	✓	"	1	
7	DUP-TP7(70-75cm)			✓	✓	"	1	
8	DUP-TP8(70-75cm)			✓	✓	"	1	
9	DUP-TP9(95-100cm)			✓	✓	"	1	
10	DUP-TP10(70-75cm)			✓	✓	"	1	
11	DUP-TP11(70-75cm)			✓	✓	"	1	
12	DUP-TP13(70-75cm)			✓	✓	"	1	

Samples Relinquished to PAS by (Client Signature)	Date:	Time:	Method of Shipment
Samples Received in lab by:	Date: 01/10/14	Time: 18:17	Condition of samples upon receipt at lab: 2°C

Rev. COC15-11-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

A10 32

APPENDIX I

TABLE 1: SOIL ANALYTICAL RESULTS QA/QC: JWEL AUGUST 2001

SOIL INVESTIGATION

TABLE 1
SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL
(Selected Metal Parameters)
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP1 (70-75 cm)	DUPLICATE[a] TP1 (70-75 cm)	PERCENTAGE DIFFERENCE	ORIGINAL[a] TP2 (70-75 cm)	DUPLICATE[a] TP2 (70-75 cm)	PERCENTAGE DIFFERENCE
Antimony	0.2	<0.2	NC	0.2	0.3	NC
Arsenic	2.0	1.9	5	4.8	4.5	6
Selenium	0.9	1.1	-20	<0.2	<0.2	NC
Aluminum	18600	12500	39	21000	16400	25
Barium	72	75	-4	141	134	5
Beryllium	0.8	0.7	13	0.9	0.7	25
Cadmium	<0.5	0.7	NC	<0.5	0.6	NC
Chromium	22	14	44	27	22	20
Cobalt	7.0	4.0	NC	12	11	9
Copper	41	37	10	32	28	13
Iron	13100	10700	20	30800	32100	-4
Lead	32	15	72	13	16	-21
Manganese	95	73	26	441	499	-12
Molybdenum	<3.0	<3.0	NC	<3.0	<3.0	NC
Nickel	81	59	31	103	50	69
Phosphorous	735	811	-10	583	566	3
Silver	<1.0	<1.0	NC	<1.0	<1.0	NC
Titanium	162	74	75	263	205	25
Vanadium	30	19	45	39	33	17
Zinc	69	47	38	72	70	3
PH (Unitless)	7.23	7.06	2	7.94	7.95	0

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL
(Selected Metal Parameters)
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP3 (95-100 cm)	DUPLICATE[a] TP3 (95-100 cm)	PERCENTAGE DIFFERENCE	ORIGINAL[a] TP4 (45-50 cm)	DUPLICATE[a] TP4 (45-50 cm)	PERCENTAGE DIFFERENCE
Antimony	0.3	0.2	NC	0.6	0.4	NC
Arsenic	7.1	5.4	27	17.1	10.7	46
Selenium	<0.2	0.2	NC	4.3	3.5	21
Aluminum	18200	16700	9	13900	8340	50
Barium	159	134	17	85	67	24
Beryllium	0.8	0.7	13	0.7	0.5	33
Cadmium	<0.5	0.5	NC	1.2	0.8	NC
Chromium	27	23	16	26	14	60
Cobalt	13	12	8	39	22	56
Copper	26	28	-7	274	195	34
Iron	32300	33600	-4	24500	19600	22
Lead	12	8.0	NC	70	34	69
Manganese	422	426	-1	258	185	33
Molybdenum	<3.0	<3.0	NC	<3.0	<3.0	NC
Nickel	32	32	0	3520	1840	63
Phosphorous	578	604	-4	688	678	1
Silver	<1.0	<1.0	NC	<1.0	<1.0	NC
Titanium	295	267	10	334	142	81
Vanadium	37	32	14	40	23	54
Zinc	65	71	-9	282	202	33
PH (Unitless)	7.93	7.82	1	7.34	7.32	0

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL
(Selected Metal Parameters)
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP5 (95-100 cm)	DUPLICATE[a] TP5 (95-100 cm)	PERCENTAGE DIFFERENCE	ORIGINAL[a] TP6 (70-75 cm)	DUPLICATE[a] TP6 (70-75 cm)	PERCENTAGE DIFFERENCE
Antimony	0.3	0.2	NC	0.2	0.2	NC
Arsenic	5.7	5.1	3	3.5	2.7	26
Selenium	<0.2	<0.2	NC	<0.2	<0.2	NC
Aluminum	17900	14700	20	24600	16800	38
Barium	156	134	15	152	130	16
Beryllium	0.8	0.6	29	1.1	0.7	44
Cadmium	<0.5	0.5	NC	0.6	0.7	NC
Chromium	25	21	17	34	23	39
Cobalt	12	11	9	14	12	15
Copper	26	29	-11	34	27	23
Iron	31900	31300	2	37300	37700	-1
Lead	11	13	NC	17	6.0	NC
Manganese	552	561	-2	745	655	13
Molybdenum	<3.0	<3.0	NC	<3.0	<3.0	NC
Nickel	30	41	-31	66	31	72
Phosphorous	600	565	6	644	656	-2
Silver	<1.0	<1.0	NC	<1.0	<1.0	NC
Titanium	320	239	29	319	231	32
Vanadium	34	29	16	49	32	42
Zinc	69	67	3	73	68	-7
PH (Unitless)	7.94	7.80	2	7.58	7.50	1

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL
(Selected Metal Parameters)
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP7 (70-75 cm)	DUPLICATE[a] TP7 (70-75 cm)	PERCENTAGE DIFFERENCE	ORIGINAL[a] TP8 (70-75 cm)	DUPLICATE[a] TP8 (70-75 cm)	PERCENTAGE DIFFERENCE
Antimony	0.3	0.3	NC	<0.2	<0.2	NC
Arsenic	5.7	4.0	35	2.3	1.7	30
Selenium	<0.2	<0.2	NC	<0.2	1.0	NC
Aluminum	22400	16200	32	1210	1290	-6
Barium	138	138	0	23	27	-16
Beryllium	1.0	0.7	47	<0.2	<0.2	NC
Cadmium	<0.5	<0.5	NC	<0.5	<0.5	NC
Chromium	31	22	34	3.0	2.0	NC
Cobalt	13	11	17	2.0	2.0	NC
Copper	26	25	4	15	5.0	100
Iron	30800	31400	-2	3670	3720	-1
Lead	23	6.0	NC	<5.0	<5.0	NC
Manganese	640	544	16	119	131	-10
Molybdenum	<3.0	<3.0	NC	<3.0	<3.0	NC
Nickel	43	31	37	60	33	58
Phosphorous	585	572	2	302	318	-5
Silver	<1.0	<1.0	NC	<1.0	<1.0	NC
Titanium	307	223	32	115	58	66
Vanadium	45	30	40	7.0	8.0	-13
Zinc	71	68	4	12	9.0	29
PH (Unitless)	7.95	7.90	1	6.10	6.13	0

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL
(Selected Metal Parameters)
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP9 (95-100 cm)	DUPLICATE[a] TP9 (95-100 cm)	PERCENTAGE DIFFERENCE	ORIGINAL[a] TP10 (70-75 cm)	DUPLICATE[a] TP10 (70-75 cm)	PERCENTAGE DIFFERENCE
Antimony	<0.2	<0.2	NC	<0.2	<0.2	NC
Arsenic	2.4	1.6	40	<0.2	0.5	NC
Selenium	<0.2	0.3	NC	<0.2	<0.2	NC
Aluminum	5690	4580	22	2010	1550	26
Barium	30	28	7	<5.0	<5.0	NC
Beryllium	<0.2	0.2	NC	<0.2	<0.2	NC
Cadmium	<0.5	<0.5	NC	<0.5	<0.5	NC
Chromium	10	9.0	11	3.0	2.0	NC
Cobalt	3.0	3.0	NC	<2.0	<2.0	NC
Copper	5.0	7.0	-33	2.0	2.0	NC
Iron	7810	6610	17	2090	1810	14
Lead	5.0	<5.0	NC	<5.0	<5.0	NC
Manganese	71	56	24	25	17	38
Molybdenum	<3.0	<3.0	NC	<3.0	<3.0	NC
Nickel	14	9.0	43	9.0	10	-11
Phosphorous	350	364	-4	230	286	-22
Silver	<1.0	<1.0	NC	<1.0	<1.0	NC
Titanium	284	159	56	160	87	59
Vanadium	20	15	29	5.0	3.0	50
Zinc	27	26	4	11	11	NC
PH (Unitless)	6.80	7.09	-4	7.55	7.51	1

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL
(Selected Metal Parameters)
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP11 (70-75 cm)	DUPLICATE[a] TP11 (70-75 cm)	PERCENTAGE DIFFERENCE	ORIGINAL[a] TP12 (5-10 cm)	DUPLICATE[a] TP12 (5-10 cm)	PERCENTAGE DIFFERENCE
Antimony	<0.2	<0.2	NC	0.2	<0.2	NC
Arsenic	1.3	1.3	0	4.9	1.6	102
Selenium	<0.2	<0.2	NC	9.1	8.6	6
Aluminum	1350	929	37	36600	49400	-30
Barium	8.0	8.0	0	160	182	-13
Beryllium	<0.2	<0.2	NC	7.4	7.1	4
Cadmium	<0.5	<0.5	NC	1.0	<0.5	NC
Chromium	4.0	2.0	67	21	13	47
Cobalt	<2.0	<2.0	NC	<2.0	<2.0	NC
Copper	3.0	4.0	-29	20	25	-22
Iron	4760	3530	30	18300	11600	45
Lead	<5.0	6.0	NC	<5.0	<5.0	NC
Manganese	120	110	9	2960	3000	-1
Molybdenum	<3.0	<3.0	NC	<3.0	<3.0	NC
Nickel	5.0	3.0	50	33	32	3
Phosphorous	289	318	-10	271	28	NC
Silver	<1.0	<1.0	NC	<1.0	<1.0	NC
Titanium	187	77	83	226	895	-119
Vanadium	8.0	5.0	46	6.0	5.0	18
Zinc	17	14	NC	21	9.0	NC
PH (Unitless)	8.07	8.26	-2	10.5	10.5	0

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL
(Selected Metal Parameters)
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP13 (70-75 cm)	DUPLICATE[a] TP13 (70-75 cm)	PERCENTAGE DIFFERENCE	ORIGINAL[a] TP14 (70-75 cm)	DUPLICATE[a] TP14 (70-75 cm)	PERCENTAGE DIFFERENCE
Antimony	<0.2	0.2	NC	1.0	0.9	11
Arsenic	6.9	5.7	19	14.9	12	22
Selenium	0.3	0.6	NC	1.7	2.2	-26
Aluminum	5290	3410	43	10900	10800	1
Barium	17	12	NC	142	170	-18
Beryllium	0.4	0.4	NC	1.4	1.6	-13
Cadmium	0.7	<0.5	NC	<0.5	2.8	NC
Chromium	14	8.0	55	26	25	4
Cobalt	8.0	6.0	29	9.0	11	-20
Copper	20	19	5	72	73	-1
Iron	11300	9340	19	64800	54700	17
Lead	5.0	11	NC	300	270	11
Manganese	293	237	21	1210	1250	-3
Molybdenum	<3.0	<5.0	NC	<3.0	5.0	NC
Nickel	25	20	22	146	162	-10
Phosphorous	919	978	-6	372	337	10
Silver	<1.0	<1.0	NC	<1.0	<1.0	NC
Titanium	105	57	59	332	300	10
Vanadium	22	15	38	16	15	6
Zinc	29	25	15	252	277	-9
PH (Unitless)	8.41	8.38	0	7.86	8.88	-12

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

TABLE 1 (Continued)
SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL
(Selected Metal Parameters)
INCO, Port Colborne, Ontario
(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP15 (70-75 cm)	DUPLICATE[a] TP15 (70-75 cm)	PERCENTAGE DIFFERENCE	ORIGINAL[a] TP16 (70-75 cm)	DUPLICATE[a] TP16 (70-75 cm)	PERCENTAGE DIFFERENCE
Antimony	<0.2	0.3	NC	0.5	0.3	NC
Arsenic	3.6	3.2	12	5.2	4.0	26
Selenium	<0.2	0.3	NC	<2.0	0.3	NC
Aluminum	23800	15000	45	5920	3520	51
Barium	145	125	15	47	29	47
Beryllium	1.0	0.8	33	0.2	<0.2	NC
Cadmium	<0.5	1.0	NC	1.3	0.6	NC
Chromium	30	20	40	13	6.0	74
Cobalt	15	18	-18	209	145	36
Copper	34	52	-42	7670	5390	35
Iron	31300	25300	26	11500	8040	35
Lead	18	27	-40	40	37	8
Manganese	415	511	21	182	138	27
Molybdenum	<3.0	3.0	NC	<3.0	<3.0	NC
Nickel	220	589	-91	18300	11400	46
Phosphorous	756	645	16	346	291	17
Silver	<1.0	<1.0	NC	2.0	<1.0	NC
Titanium	230	157	38	342	156	75
Vanadium	43	28	42	36	23	44
Zinc	81	83	-2	56	45	22
PH (Unitless)	7.54	7.85	-4	9.56	9.41	2

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

TABLE 1 (Continued)

SOIL ANALYTICAL RESULTS QUALITY ASSURANCE AND QUALITY CONTROL

(Selected Metal Parameters)

INCO, Port Colborne, Ontario

(mg/kg or ppm except as noted)

PARAMETER	ORIGINAL[a] TP17 (95-100 cm)	DUPLICATE[a] TP17 (95-100 cm)	PERCENTAGE DIFFERENCE
Antimony	<0.2	<0.2	NC
Arsenic	0.5	0.3	50
Selenium	<0.2	<0.2	NC
Aluminum	1450	1670	-14
Barium	5.0	5.0	NC
Beryllium	<0.2	<0.2	NC
Cadmium	<0.5	<0.5	NC
Chromium	3.0	3.0	0
Cobalt	<2.0	<2.0	NC
Copper	2.0	16	NC
Iron	2290	2390	-4
Lead	<5.0	<5.0	NC
Manganese	17	19	-11
Molybdenum	<3.0	<3.0	NC
Nickel	4.0	34	NC
Phosphorous	246	258	-5
Silver	<1.0	<1.0	NC
Titanium	97	114	-16
Vanadium	5.0	6.0	-18
Zinc	11	12	NC
PH (Unitless)	7.44	7.66	-3

Notes:

a Original analysis results are considered as Test 1 and Duplicate results are considered as Test 2 in the Calculation of Percentage Differences.

NC Percentage difference not calculated due to low concentration

APPENDIX J

TABLE 1 TO TABLE 4: SOIL ANALYTICAL RESULTS: TORONTO LEAD STUDY BY MOE 1971 TO 1991

TABLE 1
TORONTO LEAD STUDY BY MOE 1971 TO 1992
(Lead in soil 0 to 2.5 cm depth, 7.5 m distance from Road)[a]
(Concentration in mg/kg or ppm)

SITE NO.	LEAD CONCENTRATION IN 1971	LEAD CONCENTRATION 1981	LEAD CONCENTRATION 1991
SITE NO. 4	270	260	210
SITE NO. 5	55	60	135
SITE NO. 6	37	80	200
SITE NO. 12	96	192	120
SITE NO. 14	760	712	185
SITE NO. 16	315	292	305
SITE NO. 23	132	190	130
SITE NO. 24	117	270	28
SITE NO. 25	336	310	205
SITE NO. 28	185	230	160
SITE NO. 29	306	228	130
SITE NO. 32	145	280	220
SITE NO. 33	345	350	280
SITE NO. 38	208	230	300
SITE NO. 39	105	80	315
SITE NO. 41	20	238	180
SITE NO. 45	125	172	135
SITE NO. 50	170	310	200
SITE NO. 58	48	75	115
SITE NO. 59	250	135	270
SITE NO. 60	163	270	365
SITE NO. 62	200	165	120
SITE NO. 63	275	380	275
Maximum	**760**	**712**	**365**
Mean	**203**	**240**	**199**

Notes:
a - Sites remained constant from 1971 to 1991

TABLE 2
TORONTO LEAD STUDY BY MOE 1971 TO 1992
(Lead in soil 0 to 2.5 cm depth, 25 m distance from Road)[a]
(Concentration in mg/kg or ppm)

SITE NO.	LEAD CONCENTRATION IN 1971	LEAD CONCENTRATION 1981	LEAD CONCENTRATION 1991
SITE NO. 4	196	160	110
SITE NO. 5	41	35	94
SITE NO. 6	290	38	62
SITE NO. 12	222	245	115
SITE NO. 14	850	712	405
SITE NO. 16	243	288	290
SITE NO. 23	310	82	58
SITE NO. 24	112	25	119
SITE NO. 25	375	390	580
SITE NO. 28	52	121	75
SITE NO. 29	148	158	145
SITE NO. 32	90	195	110
SITE NO. 33	280	132	190
SITE NO. 38	95	205	125
SITE NO. 39	115	225	140
SITE NO. 41	38	175	110
SITE NO. 45	120	145	105
SITE NO. 50	108	210	135
SITE NO. 58	275	145	64
SITE NO. 59	225	258	535
SITE NO. 60	55	315	430
SITE NO. 62	150	65	125
SITE NO. 63	120	135	135
Maximum	**850**	**712**	**580**
Mean	**196**	**194**	**185**

Notes:
a - Sites remained constant from 1971 to 1991

TABLE 3
TORONTO LEAD STUDY BY MOE 1971 TO 1992
(Lead in soil 10 to 15 cm depth, 7.5 m distance from Road)[a]
(Concentration in mg/kg or ppm)

SITE NO.	LEAD CONCENTRATION IN 1971	LEAD CONCENTRATION 1981	LEAD CONCENTRATION 1991
SITE NO. 4	154	130	150
SITE NO. 5	17	25	86
SITE NO. 6	25	38	125
SITE NO. 12	136	88	150
SITE NO. 16	305	238	245
SITE NO. 23	55	38	47
SITE NO. 24	70	355	86
SITE NO. 25	250	470	290
SITE NO. 28	70	52	110
SITE NO. 29	195	150	135
SITE NO. 32	38	40	106
SITE NO. 33	288	90	106
SITE NO. 38	60	40	23
SITE NO. 39	60	990	84
SITE NO. 41	33	62	62
SITE NO. 45	98	118	100
SITE NO. 50	70	35	80
SITE NO. 58	23	22	83
SITE NO. 60	33	25	33
SITE NO. 62	50	172	84
SITE NO. 63	150	205	195
Maximum	**305**	**990**	**290**
Mean	**104**	**161**	**113**

Notes:
a - Sites remained constant from 1971 to 1991

TABLE 4
TORONTO LEAD STUDY BY MOE 1971 TO 1992
(Lead in soil 10 to 15 cm depth, 25 m distance from Road)[a]
(Concentration in mg/kg or ppm)

SITE NO.	LEAD CONCENTRATION IN 1971	LEAD CONCENTRATION 1981	LEAD CONCENTRATION 1991
SITE NO. 4	68	50	50
SITE NO. 5	102	15	50
SITE NO. 6	212	20	63
SITE NO. 12	190	185	190
SITE NO. 14	670	535	3150
SITE NO. 16	190	128	290
SITE NO. 23	151	30	15
SITE NO. 24	70	90	94
SITE NO. 25	336	330	445
SITE NO. 28	62	45	75
SITE NO. 29	67	100	115
SITE NO. 32	35	35	81
SITE NO. 33	100	40	98
SITE NO. 38	35	12	34
SITE NO. 39	23	58	58
SITE NO. 41	38	30	34
SITE NO. 45	168	140	93
SITE NO. 50	95	10	100
SITE NO. 58	63	205	43
SITE NO. 59	113	145	1900
SITE NO. 60	30	110	220
SITE NO. 61	25	43	68
SITE NO. 62	38	60	70
SITE NO. 63	125	105	135
Maximum	**670**	**535**	**3150**
Mean	**125**	**105**	**311**

Notes:
a - Sites remained constant from 1971 to 1991

APPENDIX K

LITERATURE REVIEW ON BERYLLIUM OCCURRENCES IN SOIL

OCCURRENCES OF BERYLLIUM IN SOIL AND ROCKS

Properties and Abundance

Beryllium is a hard gray metal of atomic weight 9.013, specific gravity 1.8 at 20°C and high melting point (1283°C) and high boiling point of about 2500°C. In compounds, beryllium forms bivalent ions of relatively small radius.

The most common beryllium minerals are beryl (beryllium aluminosilicate) and Chrysoberyl (beryllium aluminumoxide). Beryllium is found in a variety of rocks, and is apparently concentrated in certain veins and pegmatite bodies. The following abundance data are by Sill and Willis (1962):

Rock	*Beryllium Concentration in ppm*
Iron Meteorite	<1
Granite (G-1)	2.74
Diabase (W-1)	0.623
Shale	6.14
Basalt	1.00

The average concentration of beryllium in the earth's crust is estimated to be 2.5 ppm. During the weathering of crystalline rocks, and during sedimentation processes, beryllium appears to follow the course of aluminum, and is enriched in some bauxite deposits, clays, and deep-sea deposits (Fairbridge, 1972).

Beryllium Concentration in Coal

Beryllium is abundant in coal with other metals. A review of the metal composition of coal indicates that U.S. coal deposits range in beryllium concentrations from 0.23 to 4.0 ppm (Gluskoter *et al*, 1980). Table 1 shows the abundance of beryllium together with other metals in U.S. coal (Gluskoter *et al*, 1980).

TABLE 1
TRACE ELEMENT CONCENTRATIONS IN U.S. COAL[1]
(Selected Metal Parameters, mg/kg or ppm except as noted)

PARAMETER	ILLINOIS BASIN COAL[2]	APPALACHIAN COAL[2]
Mercury	0.03 – 1.6 (0.2)	0.05 – 0.47 (0.2)
Arsenic	1.0 – 120 (14)	1.8 – 100 (25)
Selenium	0.4 – 7.7 (2.2)	1.1 – 8.1 (4.0)
Barium	5.0 – 750 (100)	72 – 420 (200)
Boron	12 – 230 (110)	5.0 – 120 (42)
Beryllium	0.5 – 4.0 (1.7)	0.23 – 2.6 (1.3)
Cadmium	0.1 – 65 (2.2)	0.1 – 0.6 (0.24)
Chromium	4.0 – 60 (18)	10 – 90 (20)
Cobalt	2.0 – 34 (7.3)	1.5 – 33 (9.8)
Copper	5.0 – 44 (14)	5.1 – 30 (18)
Lead	0.8 – 220 (32)	1.0 – 18 (5.9)
Manganese	6.0 – 210 (53)	2.4 – 61 (18)
Molybdenum	0.3 – 29 (8.1)	0.1 – 22 (4.6)
Nickel	7.6 – 68 (21)	6.3 – 28 (15)
Phosphorus	10 – 340 (64)	15 –1500 (150)
Silver	0.02 – 0.08 (0.03)	0.01 – 0.06 (0.02)
Strontium	10 – 130 (35)	28 – 550 (130)
Vanadium	11 – 90 (32)	14 – 73 (38)
Zinc	10 – 5300 (250)	2.0 – 120 (25)

Note:
1 - Gluskoter H.J., Ruch R.R., Cahill R.A. Drecher G.B. and Kuhn J.K., (1977 updated in 1980), *Trace Elements in Coal: Occurrence and Distribution*, Illinois State Geological Survey Circular No. 499.
2 - Number in the parenthesis indicates arithmetic mean.

Hence, it is evident from the above-noted table that U.S. coal contains significant concentrations of beryllium ranging from 0.23 ppm to 4.0 ppm.

Beryllium Concentration of Slag, Shales and Soils in Ontario

Review of the MOE (2001) report on *Soil Investigation and Human Health Risk Assessment for the Rodney Street Community: Port Colborne* dated October 2001 revealed that beryllium contamination in the Rodney Street area of Port Colborne could be related to slag and/or natural resources. MOE (2001) reported that beryllium concentration in slag routinely range from 1 to 3 ppm and concluded that slag which may have originated from former Algoma steel plant was a common material for road bed construction in the Rodney Street community. MOE (2001) also concluded that slag is present in the surface soil in the Rodney Street community, and this presence most likely account for the generally higher concentration of beryllium in soils.

As mentioned by Sill and Willis (1962), shales contain about 6.14 ppm of beryllium. Shales are defined as detrital rocks whose particles have a diameter of less than 1/16 mm (Clark 1954) or simply as lithified mud (Bates and Sweet, 1966)

Subsequent to the publication of the 1997 *Guidelines for Use at Contaminated Sites in Ontario*, the Ontario Ministry of Environment (MOE) became aware of circumstances where elevated concentrations of beryllium were found to be associated with shale deposits. In 1997, the Phytotoxicology and Soil Standard Section of the MOE undertook a preliminary program of sampling some representative shale deposits in the province of Ontario. This report (MOE, 1998) was reviewed by JWEL.

Review of the MOE (1998) report indicates that nine (9) of the twenty seven (27) shale samples contained beryllium concentrations that exceeded MOE 1997 (Table A) Guideline of 1.2 ug/g for any land uses. The review also indicates that 5 of the 14 rocks, 1 of the 12 surface soils (0 to 5 cm) and 1 of the 15 C Horizon soil samples contained beryllium concentrations exceeding the MOE 1997 Table A Guideline.

Table 2 shows the MOE's chemical test results for beryllium concentrations in soil, rock and shale deposits in Ontario. As shown in Table 2, the highest beryllium concentration found in the province wide shale study was 3.4 ppm detected in samples from the Animikie-Gunflint formation in the Thunder Bay area. The Queenston and Rockcliffe formations, closer to Port Colborne, showed beryllium concentration ranging up to 2.3 ppm (Table 2).

MOE (2001) concluded that elevated soil beryllium levels in the Rodney Street community of Port Colborne are consistent with naturally occurring beryllium in soils derived from shale. Review of the MOE (2001) report also revealed that the soil beryllium concentrations in the Rodney Street community are highly correlated with soil aluminum levels suggesting a primarily natural origin of beryllium.

TABLE 2
CONCENTRATIONS OF BERYLLIUM IN SHALE AND ASSOCIATED SOIL MATERIAL[1]
(Samples collected from Ontario shale deposits, results in mg/kg)

Formation	Location	Shale	Rock	Soil (0-5 cm)	Soil, C Horizon	MOE TABLE A GUIDELINE CRITERIA [2]
Animikie – Gunflint	Oliver Road	3.2	2.7	N/D	0.8	1.2
Animiki – Gunflint	West Timber (fresh)	2.9	2.7	1.7	1.0	1.2
Animiki – Gunflint	West Timber (weathered)	3.4	3.2	N/D	N/D	1.2
Animiki – Rove	Middle Falls	0.9	0.8	0.6	0.7	1.2
Animiki – Rove	Sibley (fresh)	0.7	0.7	0.6	N/D	1.2
Animiki – Rove	Sibley (weathered)	0.8	0.7	0.7	1.1	1.2
Blue Mountain	Camperdown	1.3	1.1	1.1	1.3	1.2
Blue Mountain	Sheguindah 2	1.2	1.2	1.1	N/D	1.2
Cabot Head	Cataract	1.0	N/D	N/D	0.9	1.2
Cabot Head	Ice lake	1.1	N/D	N/D	N/D	1.2
Collingwood	Sheguindah 1	1.2	N/D	1.1	1.2	1.2
Gloucester	Pickering	1.3	1.2	0.5	0.6	1.2
Hamilton	Arkona	0.9	N/D	N/D	N/D	1.2
Queenston	Chaltenham Green	1.0	N/D	N/D	N/D	1.2
Queenston	Cheltenham Red	1.1	N/D	N/D	N/D	1.2
Queenston	Homing's Mills	1.1	N/D	N/D	0.7	1.2
Queenston	Milton	1.0	N/D	N/D	0.9	1.2
Queenston	Owen Sound	1.0	N/D	0.7	0.7	1.2
Rockcliffe	Rockcliffe 1	1.8	1.6	N/D	0.7	1.2
Rockcliffe	Rockcliffe 2	2.3	N/D	N/D	N/D	1.2
Salina	Ayton	0.5	N/D	N/D	N/D	1.2
Salina	Neustadt	0.6	N/D	N/D	0.9	1.2
Shadow Lake	Coboconk Lower	0.7	0.7	N/D	N/D	1.2
Shadow Lake	Coboconk Upper	0.7	0.6	0.6	N/D	1.2
Uncertain	Creemore	1.3	N/D	N/D	N/D	1.2
Georgian Bay	Kagawong Lower	0.5	0.5	1.0	1.0	1.2
Georgian Bay	Woodbridge	1.5	1.3	0.8	0.9	1.2

Notes:

1 - Ministry of Environment's 1998 Phytotoxicology Technical Memorandum *Investigation Into the Chemical Composition of Shales in Ontario 1997*, Report No. SDB-023-3511-1998.

2 - Ministry of Environment's *Guideline For Use At Contaminated Sites in Ontario*, revised February, 1997, (Table A) potable groundwater use at residential/parkland sites with all types of soils.

Bold Exceeds Table A Guideline Value

N/D No Data

CONCLUSIONS

It is evident from the above-mentioned literature data and chemical test results as shown in Table 1 and Table 2 that natural rocks, coal, shale and associated soil samples can exceed the MOE 1997 Table A Guideline criteria of 1.2 ppm for beryllium in soil.

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