REPORT

POTENTIAL CoC IDENTIFICATION USING STATISTICAL ANALYSIS

VALE INCO LIMITED

PORT COLBORNE COMMUNITY BASED RISK ASSESSSMENT

PROJECT NO. ONT 34647

REPORT ON

POTENTIAL CoC IDENTIFICATION
USING STATISTICAL ANALYSIS

PORT COLBORNE
COMMUNITY BASED RISK ASSESSMENT
PORT COLBORNE, ONTARIO

Prepared For

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The MOE provided the soil data from their 1999 and 2000 soil sampling programs for part of the data based used in the statistical analysis.

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Philip Analytical Services provided all of the analysis for the soil samples. Mahaboob Alam, Kevin Wong and Wai Chi Kwan of JWL handled the quality control for the lab data, statistical modeling and analysis, and report preparation. Senior technical review and analysis was provided by Cecile Willert, Senior Engineer and Risk Assessor, JWL.

Dr. Beverly Hale (University of Guelph) and Bruce Kilgour (JWL) both provided technical advice and review regarding statistical methodology and analysis results.

The CBRA Project Manager is Eric Veska, Senior Consultant and the CBRA Senior Advisor is Bill Stiebel, Vice President.

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 the statistical evaluation of soil chemical concentration data for the Port Colborne area. The purpose of this report on statistical analyses and that of an accompanying report on air dispersion modeling, were address CBRA Condition Number 3 - ie. those chemicals whose presence in soil show a scientific linkage to the historical operations of Inco. Additional statistical analyses were conducted to investigate the scientific linkages to other nearby industrial sources of CoCs in the area, i.e. the former steel plant directly southwest of the Inco refinery, on the East side of the Welland Canal.

As a result of the statistical analysis presented in this report and the air dispersion modeling results presented in another accompanying report, chemicals that are scientifically linked to the historical operations of the Inco nickel refinery in accordance with CBRA Condition Number 3 are nickel, copper, cobalt, arsenic and selenium.

Those chemicals that can be scientifically attributed to the former steel plant's iron ore smelting operation are iron, barium, beryllium, aluminum, chromium, manganese, molybdenum, zinc, selenium and lead.

1.0 INTRODUCTION

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 a study involving various statistical analyses in finding scientific linkages between measured surface soil chemical concentrations in samples taken from Port Colborne between 1998 and 2001 and the two potential industrial sources, as either from Inco or its neighbouring former Algoma steel plant. This statistical analyses of this study was done to address CBRA Condition Number 3.

In 2001, a draft JWL report on the statistical analyses was released, entitled *"Potential CoC Identification using Statistical Analyses"* and dated November 16, 2001, as well as other supporting documents on potential CoC identification. The Ministry of the Environment (MOE) conducted a technical review of this report and the 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 that *nickel, copper, cobalt* and *arsenic* were CoCs for the Port Colborne CBRA. 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 JWL's 2001 draft CBRA CoC reports, additional Port Colborne soil lead data that became available to JWL after 2001 to 2003, as well as existing soil lead data set up to and including 2001, 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 even with the additional post-2001 information 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 16, 2001 report *"Potential CoC Identification using Statistical Analyses"*.

Other supporting reports have been prepared on additional CoC studies that relate from soil mapping and establishing empirical relationships, to emission inventories/dispersion modeling to address CBRA Condition Numbers 1, 2 and 3; details of those studies are found in the following documents:

- *JWL,2008a. "Potential CoC Identification using Emission Inventories and Dispersion Modelling of INCO and ALGOMA Operations" dated March 28, 2008.*

- JWL, 2008b. *Potential CoC Identification using Soil Chemical Concentration Data in Exceedance of MOE Generic Guidelines.* Jacques Whitford Limited. March 28, 2008.

2.0 APPROACH

2.1 Statistical Methodology

MOE phytotoxicity studies of the Port Colborne area (MOE, 2000 a,b) demonstrated that elevated soil chemical concentrations occurred to the north-to-east quadrant of the Inco refinery and former steel plant. This finding coincided with the fact that the predominant wind direction for the Port Colborne area is from the southwest to the northeast.

The Inco refinery was not the sole source of chemicals found in the Port Colborne area. Historically other industrial sources of chemicals existed, such as the former Algoma steel plant. The former steel plant (demolished in 1977) was located approximately 500 m southwest and upwind of the Inco refinery.

JWL's March 28, 2008 report on *Potential CoC Identification using Soil Chemical Concentration Data in Exceedance of MOE Generic Guidelines* grouped the soil chemical database for Port Colborne into 3 major groups of identifiable chemicals. The *first group* was associated with Inco's former nickel refinery, and included nickel, copper and cobalt. This first group was referred to as the Nickel group since nickel was most the predominant chemical in this group and nickel raw material had been used in the refinery process.

The *second group* was referred to as the Iron group connected with the sintering and smelting of iron ore in the historical operations of the former Algoma Steel and Canada Blast. The former Algoma Steel and Canada Blast Furnace, hereinafter referred to as the former steel plant, operated on the lands directly south to southwest of Rodney Street from 1913 to 1977. This steel plant had reportedly sintered and smelted iron ore to form pig iron, which was then used to fabricate steel products. The former steel plant would have been the major source of iron to the local environment. Metals within the Iron group included iron, zinc, lead and beryllium.

The *third group* were those metals such as arsenic, selenium and cadmium that appeared to have been aerially deposited by both stacks, with the stack from the former steel plant depositing much of their material downwind in the Rodney Street area and the stacks from the Inco refinery depositing their material principally out to the North and East of the refinery.

JWL's report entitled *"CoC Identification using Emission Inventories and Dispersion Modelling of INCO and ALGOMA Operations"* and dated March 28, 2008 presented results and findings of an emission inventory and dispersion modelling study in finding scientific linkages between measured surface soil nickel and iron concentrations in samples taken from Port Colborne and the two potential industrial sources of these chemicals, as originating either from Inco or its neighbouring former steel plant, Algoma.

Depositions of soil chemical concentrations over Port Colborne from historical fallout of particulates from emissions were predicted during the operating life of each of the Inco and Algoma facilities. Predictions was calculated over a 7-km by 7-km domain covering the Port Colborne area for particulate matter, nickel (chemical indicator of Inco as the source) and iron (chemical indicator of Algoma as the source). Findings and conclusions of the dispersion/deposition modelling analysis were as follows:

- *Algoma particulate matter (PM) emissions resulted in significantly higher PM depositions in the Rodney Street area than those from Inco. In the Rodney Street area, PM depositions due to Algoma were predicted to be between 11-12 times greater than those from Inco.*

- *Emissions of nickel by Inco resulted in significantly higher nickel depositions to the north-east of the refinery than in the Rodney Street area.*

- *Algoma was responsible for the majority of the iron deposition in the Port Colborne area. Algoma emissions resulted in significantly greater iron depositions in the Rodney Street area than those from Inco.*

Scientific linkage of other potential CoCs, other than nickel and iron, was addressed through a study involving statistical analyses. A burden of proof was required to resolve which soil chemical is scientifically related to the historical emissions from which of the two industrial sources, ie. Inco or Algoma. The methodology of the statistical analyses for this study had to be designed in such a manner such that the outcome of this study would answer the following questions:

1. Is there a relationship between soil chemical concentrations and distance from each industrial source?
2. Are there relationships between soil nickel (indicator chemical from Inco's historic nickel operation) concentrations and other soil chemical concentrations, and between soil iron (indicator chemical from the former steel plant's iron ore smelting operation) concentrations and any other soil chemical concentrations?

To address these questions, the following statistical methods were applied:

Method 1 — Regression analysis of a chemical concentration in soil versus distance from an industrial source using Analysis of Variance (ANOVA) and

Method 2 — Regression analysis of soil chemical concentrations with industrial source indicator chemical concentrations in soil using Analysis of Variance (ANOVA). Soil Nickel was the indicator chemical for Inco's historic nickel operation and soil Iron was the indicator chemical related to the former Algoma steel plant's iron ore sintering and smelting operation.

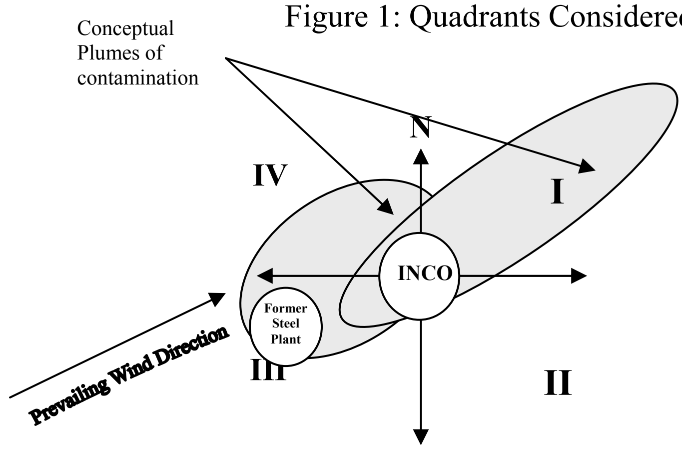
For this study, linear regressions were assumed. Although the relationship between concentrations and distance from the source is generally lognormal in nature, for concentrations close to a large source of fugitive emissions, a linear model can be expected to provide a reasonable approximation of the actual distribution. This would not be true at larger distances from the source; however, concentrations proximate to the source have been selected for this analysis and the linear model is therefore reasonable.

Statistical Methods 1 and 2 were carried out under two separate scenarios. Scenario 1 involved consideration only of soils chemical data within a 90-degree arc North to East along the theoretical plume lines downwind of each of the two industrial sources (i.e., Inco and the former steel plant). Consideration of other soils chemical data to the southeast, northwest or southwest of either Inco or the former steel plant would only weaken any derived relationship as these statistical methods cannot determine the effects of 'co-mingling' of metals from both industrial sources.

Since a typical plume is not a 90-degree arc, Scenario 2 involved a smaller data set, comprised of only those soil data points at locations in the arc corresponding to the central 45 degrees in that 90-degree arc, (i.e., 22 to 67 degrees).

In summary, the quadrants considered within the Port Colborne community, with the Inco refinery at the center, were Quadrant I in the statistical analyses of the atmospheric deposition from the Inco refinery and Quadrants III and IV in the statistical analyses of the atmospheric deposition from the former steel plant. A conceptual drawing showing these quadrants is shown below in Figure 1.

Figure 1: Quadrants Considered



2.2 Data set Selection

In selecting datasets for the evaluation, samples proximate to the two former facility locations (i.e., 1 km from the former steel facility and up to 3 km from the Inco Refinery) were selected as being the most significant and expected to show the greatest trends in concentration versus distance. Much of the natural variability in wind patterns and dispersion was eliminated by the omission of more distant points from the data set.

2.2.1 Inco Refinery as the Assumed Industrial Source

The data set considered for the statistical analysis assuming Inco is the only source included analytical results of aluminum, arsenic, barium, beryllium, calcium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, selenium, strontium, vanadium, and zinc in 161 MOE-collected surface soil samples (0-5cm) as provided from the MOE (2000 a,b) reports. The locations of these data points are shown on Drawing 1. The MOE 0-5cm soil data set was used because it was the only complete data set that spanned the whole plume area and the MOE data set for soils at depths below 5 cm were incomplete. The data set used for these statistical analyses did not include the data set from MOE investigations on woodlots, school yards or the Rodney Street community as UTM coordinates were not provided for the MOE soil sampling locations.

2.2.2 Former Steel Plant as the Assumed Industrial Source

The data set northeast of the former steel plant in Quadrants III and IV (refer to Figure 1) consisted of 23 data points of concentrations of aluminum, arsenic, barium, beryllium, calcium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, selenium, strontium, vanadium, and zinc in 10 MOE- and 13 JWL-collected surface soil samples (0-5cm) as documented in the MOE (2000a,b) and JWL (2001) reports. The locations of these data points can be found on Drawing 2.

2.3 Decision Sequence

Statistical analyses for both Methods 1 and 2 were done using Excel Spreadsheets. Relationships between soil chemical concentration and distance, as well as relationships between soil chemical concentration and soil industrial source indicator chemical concentration were considered significant at the p= 0.05 level (95% confidence interval) This means that one can be 95% confident that two parameters are directly related. For Method 1, this implies a 95% confidence that concentration changes with increasing distance from the source. For Method 2, this implies a 95% confidence that the subject soil chemical concentrations changes with increasing concentrations of the indicator metal.

Significant coefficient of correlation 'r' values2 are determined by the ANOVA test. The coefficient of correlation "r" values estimate the percentage of variation in the data that is explained by the model. A larger absolute value of this coefficient indicates a better fit of the model to the data. There is no single critical r-value that can be used as a reference guide. A negative r-value (or negative slope factor) indicates that one parameter increases as the other decreases. A positive r-value indicates that both parameters are increasing at the same time. All data presented in the appendices are from the Excel worksheets.

Statistical Method 1 involving an ANOVA test of the soil chemical relationship to distance, was constrained to within the affected plume and to where the soil chemical contamination was above the MOE Table A generic effects based guidelines (MOE,

[2] `r' values denote the linear correlation coefficient also called Pearson product moment correlation coefficient

1997). Once the ANOVA test was completed for each soil chemical concentration versus distance from the industrial source, the p-values and r-values were examined. A p- value is defined as a function of the value of the coefficient of correlation, and the number of degrees of freedom. If the resulting p-value was less than 0.05 AND the coefficient of correlation -'r' value was negative, then there was a high probability that the soil chemical had a relationship with distance from the industrial source and thus placed in a 'Pass' category. If the resulting p-value was more than 0.05 and/or the coefficient of correlation 'r' value was positive, then there was a high probability that the soil chemical had no relationship with distance from the industrial source and thus placed in a 'Fail' category.

The same logical approach as described above was used to evaluate the results from Statistical Method 2 in determining the relationships between soil industrial source indicator chemical concentrations and other soil chemical concentrations. Once the regression analysis was completed, the p-values and r-values were examined. If the resulting p-value was less than 0.05 AND there was a significant coefficient of correlation 'r' value, then the soil chemical had a positive relationship with the soil industrial source indicator chemical.

It should be noted for both Methods 1 and 2, a p- value is NOT an indication of the 'perfection' of the relationship. Instead, the coefficient of correlation or the r- value does this, by estimating the percentage of the variation in the data which is explained by the model. The p-value indicates the validity of the observed r-value.

ANOVA tests were conducted using Scenario 1 (ie. soils chemical data within a 90 degree northeast arc) for both statistical methodologies. From these results if the p-values or r-values were borderline/ marginal, then the ANOVA test was repeated using a refined dataset for Scenario 2 (ie. soils chemical data within a 45 degree northeast arc).

The findings of the statistical analyses for Methods 1 and 2 would fall into either the 'Pass' or 'Fail' categories and the decision sequence of whether or not it became a possible CoC is given below in Table 1.

Table 1: Decision Sequence

Method 1	Method 2	Possible CoC	Notes
Pass	Pass	Yes	If a soil chemical has a relationship with distance from an industrial source and a relationship to the soil source indicator chemical concentration, it is a potential CoC.
Pass	Fail	No	If soil chemical concentration shows a distance relationship to an industrial source but has no relationship to the soil source indicator chemical concentration, then that metal was likely derived from another source and thus is not a potential CoC.
Fail	Pass	Yes	If a soil chemical shows a relationship to the soil source indicator chemical but a poor distance relationship from the source possibly due to variability in the plume exhaust over time, then it is a potential CoC because there is evidence of a possible connection.
Fail	Fail	No	If a soil chemical fails for both statistical methods, then it is not a possible CoC.

3.0 RESULTS AND FINDINGS

The results and findings of the two Statistical Methods are presented below. The data sets and full statistical interpretation are found in Appendices 1, 2 and 3 respectively.

3.1 Statistical Method 1 - Regression of Soil Chemical Concentrations versus Distance from an Industrial Source

Ideally, the relationship between soil chemical concentration and distance from an industrial source would be mathematically relatable, with the maximum soil concentrations being found near the source and decreasing to some background concentration at some distance away from the source. If this were the case then the soil chemical concentrations would have a very strong mathematical relationship with distance from the source.

3.1.1 Inco Refinery as the Assumed Industrial Source

The actual ANOVA results for scenario 1 (ie. soils chemical data within a 90 degree northeast arc) and for scenario 2 (ie. soils chemical data within a 45 degree northeast arc) between soil chemical concentrations and distance from the Inco Refinery as the assumed industrial source is found in Appendices 1 and 2.

Under scenario 1, metals in the 'Pass' category were nickel, copper and cobalt (Table 2) which followed a general trend with distance away from the refinery with both strong negative coefficients of correlation (r) reflecting a negative slope as well as significant p-values. Arsenic and magnesium, although both in the 'Fail' category (Table 2), showed marginally significant r- and p- values with distance.

Under scenario 2, nickel, copper, cobalt, arsenic and magnesium showed relationships which were significantly related to distance from the refinery and thus placed in the 'Pass' category. Results for scenario 2 are considered the most appropriate for this statistical analyses as they represent further refinement (i.e., a second iteration) in the treatment of the data set that more closely represents the actual atmospheric depositional conditions from the source.

Table 2: Summary of the Regression Analyses with Distance

Soil chemical	P value 90^o Arc (0^o -90^o)	P value 45^o Arc (22^o -67^o)	Maximum Acceptable P-value	Negative Slope (Yes/No) for the 90^o Arc**	(r-value) coefficient of correlation for the 90^o Arc	Possible CoC (Yes/No)
Barium	0.6533344	0.5392758	0.05	Yes	-0.0870736	No
Beryllium	0.9716036	0.2792056	0.05	No	0.0069143	No
Nickel	**0.0002378**	**0.0000801**	0.05	**Yes**	**-0.6316654**	**Yes**
Cobalt	**0.0010018**	**0.0003157**	0.05	**Yes**	**-0.5788809**	**Yes**
Copper	**0.0001996**	**0.0001821**	0.05	**Yes**	**-0.637495**	**Yes**
Aluminum	0.9685005	0.287515	0.05	No	0.0076702	No
Cadmium	0.5650980	0.0551549	0.05	No	0.1113944	No
Calcium	0.9611447	0.1300882	0.05	Yes	-0.338138	No

Soil chemical	P value 90^o Arc (0^o -90^o)	P value 45^o Arc (22^o -67^o)	Maximum Acceptable P-value	Negative Slope (Yes/No) for the 90^o Arc**	(r-value) coefficient of correlation for the 90^o Arc	Possible CoC (Yes/No)
Chromium	0.9611446	0.25570017	0.05	Yes	-0.0094626	No
Iron	0.4085479	0.05123836	0.05	Yes	-0.159498	No
Magnesium	**0.1039351**	**0.01818062**	0.05	**Yes**	**-0.3081085**	**Yes***
Manganese	0.9642651	0.53588847	0.05	No	0.0087022	No
Molybdenum	0.9673010	0.67170601	0.05	Yes	-0.0079625	No
Strontium	0.2411229	0.24533371	0.05	No	0.2247569	No
Vanadium	0.5626487	0.0744952	0.05	Yes	-0.1120921	No
Zinc	0.6415078	0.2533101	0.05	No	0.0902513	No
Arsenic	**0.0655543**	**0.00940641**	0.05	**Yes**	**-0.3739434**	**Yes***
Selenium	0.1259008	0.1351792	0.05	Yes	-0.3143676	N
Lead	0.3005242	0.86455044	0.05	Yes	-0.1990762	N

*denotes the chemicals that failed the test in the 90 degree arc along the plume line yet passed the test in the 45 degree arc along the plume line

**the negative r-value indicates concentration decreasing with distance. The r-value gives the goodness of fit of the regression line and the p-value indicates the significance.

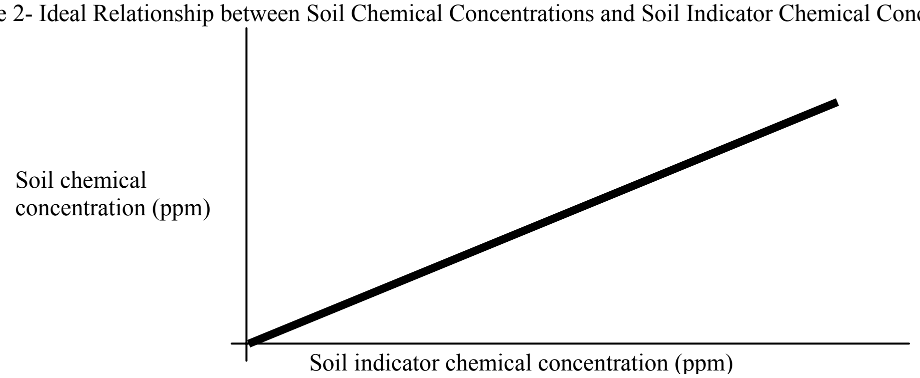
3.1.2 Former Steel Plant as the Assumed Industrial Source

No soil chemical concentration–distance relationships were developed from the former steel plant because there were not enough data points to do this type of analysis. Since the data points northeast of the former steel plant and west of Davis street fell within 500 meters coupled with a relatively small data set, any derived soil chemical concentration–distance relationship would have been greatly subject to the variations in the data and thus would not have been representative.

3.2 Statistical Method 2 - Regression of Soil Chemical Concentrations versus Soil Industrial Source Indicator Chemical Concentrations

If there was a relationship between a soil chemical and the soil industrial source indicator chemical, then the concentrations of each would idealy be found in the same ratio at any given distance away from the industrial source and ideally should therefore have a positive relationship (Figure 2).

Figure 2- Ideal Relationship between Soil Chemical Concentrations and Soil Indicator Chemical Concentrations



3.2.1 Inco Refinery as the Assumed Industrial Source

Soil nickel is assumed in this example as the industrial source indicator chemical in Port Colborne soils derived from the former Inco nickel refinery. To remove the clutter of background concentration data points of the industrial source indicator chemical- nickel, and to restrict the analysis to the effective plume, a datum of 200 ppm nickel concentration level (MOE's Generic Effects Based Level for nickel) was selected for this method which involved screening out those concentration data points of nickel below this datum.

The results for the ANOVA analysis can be found in Appendix 2 along with the data set used. The results are summarized in Table 3.

Chemicals with significant relationships found with soil nickel and thus in the "Pass' category in Table 3 were copper, cobalt, arsenic, selenium, barium, zinc and lead.

As there were no chemicals that marginally failed the ANOVA test in Scenario 1 using the 90 degree arc data set, statistical analyses for a Scenario 2 using a 45 degree arc data set was not performed.

Table 3: Relationship between Soil Nickel and other Soil Chemical Concentrations

Soil Metal	P value 90^o Arc (0^o -90^o)	Acceptable P-value	Positive Slope (Yes/No)	r- coefficient of correlation	Possible Association with Nickel (Yes/No)
Barium	**0.044055**	**0.05**	**Yes**	**0.3765825**	**Yes**
Beryllium	0.652666	0.05	No	0.0872526	No
Nickel	----	0.05	--	--	--
Cobalt	**1.15E-16**	0.05	**Yes**	**0.9897543**	**Yes**
Copper	**2.3E-24**	0.05	**Yes**	**0.9614415**	**Yes**
Aluminum	0.824086	0.05	No	0.0431578	No
Cadmium	0.223861	0.05	No	-0.2329901	No
Calcium	0.452606	0.05	Yes	0.1451141	No
Chromium	0.905909	0.05	No	0.0229561	No
Iron	0.448443	0.05	No	0.1464397	No
Magnesium	0.844245	0.05	Yes	-0.0381477	No
Manganese	0.768929	0.05	No	0.0570165	No
Molybdenum	0.539551	0.05	No	0.1187415	No
Strontium	0.328705	0.05	Yes	-0.1880195	No
Vanadium	0.327758	0.05	No	0.1883812	No
Zinc	**0.039534**	**0.05**	**Yes**	**0.384352**	**Yes**
Arsenic	**1.01E-08**	0.05	**Yes**	**0.8754954**	**Yes**
Selenium	**1.94E-07**	0.05	**Yes**	**0.8361535**	**Yes**
Lead	**0.001017**	**0.05**	**Yes**	**0.5782991**	**Yes**

3.2.2 Former Steel Plant as the Assumed Industrial Source

Soil iron is assumed in this example as the industrial source indicator chemical in soil from Port Colborne derived from the iron ore smelting operation of the former steel plant.

The results for the ANOVA analysis can be found in Appendix 3 along with the data set used. The results are summarized in Table 4.

Chemicals with significant relationships found with soil iron and thus in the "Pass' category in Table 4 were barium, beryllium, aluminum, chromium, manganese, molybdenum, zinc, selenium and lead.

As there were no chemicals that marginally failed the ANOVA test in Scenario 1 using the 90 degree arc data set, statistical analyses for a Scenario 2 using a 45 degree arc data set was not performed.

Table 4: Relationship between Soil Iron and other Soil Chemical Concentrations

Soil chemical	P value 90° Arc (0° -90°)	Acceptable P-value	Positive Slope (Yes/No)*	r-coefficient of correlation	Possible Association with Iron (Yes/No)
Barium	**4.63E-07**	**5.0E-02**	**YES**	**8.42E-01**	**YES**
Beryllium	**5.15E-07**	**5.0E-02**	**YES**	**8.41E-01**	**YES**
Nickel	8.74E-01	5.0E-02	YES	3.51E-02	NO
Cobalt	8.74E-01	5.0E-02	YES	3.49E-02	NO
Copper	4.36E-01	5.0E-02	YES	1.71E-01	NO
Aluminum	**4.46E-03**	**5.0E-02**	**YES**	**5.71E-01**	**YES**
Cadmium	6.42E-02	5.0E-02	YES	3.92E-01	NO
Calcium	NA	5.0E-02	NA	NA	NA
Chromium	**1.69E-08**	**5.0E-02**	**YES**	**8.87E-01**	**YES**
Iron	--	5.0E-02	--	--	--
Magnesium	NA		NA	NA	NA
Manganese	**2.88E-16**	**5.0E-02**	**YES**	**9.80E-01**	**YES**
Molybdenum	**2.40E-13**	**5.0E-02**	**YES**	**9.62E-01**	**YES**
Strontium	NA	5.0E-02	NA	NA	NA
Vanadium	5.81E-01	5.0E-02	YES	1.22E-01	NO
Zinc	**2.08E-02**	**5.0E-02**	**YES**	**4.79E-01**	**YES**
Arsenic	7.02E-02	5.0E-02	YES	3.84E-01	NO
Selenium	**9.37E-03**	**5.0E-02**	**YES**	**5.29E-01**	**YES**
Lead	**2.45E-08**	**5.0E-02**	**YES**	**8.83E-01**	**YES**

na- not enough data point to do the statistical analysis
*-see the sign on the Adjusted R Square for slope differentiation

4.0 DISCUSSION

4.1 Potential CoCs Attributable to Former Inco Nickel Refinery

Based on the findings of the soil chemical concentration-distance relationship and the relationship of soil chemicals to soil nickel (ie. the industrial source indicator chemical), those chemicals associated with the former Inco nickel refinery are *nickel, copper, cobalt, arsenic, barium, zinc, lead and selenium*. A summary of the findings is found below in Table 5.

Table 5: Relationship between Soil Chemical Concentrations and the Inco Refinery

Soil chemical	Method 1	Method 2	Possible CoC to Inco (Yes/No)
Barium	**Fail**	**Pass**	**Yes**
Beryllium	Fail	Fail	No
Nickel	**Pass**	**--**	**Yes**
Cobalt	**Pass**	**Pass**	**Yes**
Copper	**Pass**	**Pass**	**Yes**
Aluminum	Fail	Fail	No
Cadmium	Fail	Fail	No
Calcium	Fail	Fail	No
Chromium	Fail	Fail	No
Iron	Fail	Fail	No
Magnesium	Pass*	Fail	No
Manganese	Fail	Fail	No
Molybdenum	Fail	Fail	No
Strontium	Fail	Fail	No
Vanadium	Fail	Fail	No
Zinc	**Fail**	**Pass**	**Yes**
Arsenic	**Pass***	**Pass**	**Yes**
Selenium	**Fail**	**Pass**	**Yes**
Lead	**Fail**	**Pass**	**Yes**

*denotes the chemicals that failed the test in the 90 degree arc along the plume line yet passed the test in the 45 degree arc along the plume line

4.2 Potential CoCs Attributable to Former Steel Plant Iron Ore Smelting Operation

Based on the findings of the statistical relationship of soil chemicals to soil iron (ie. the industrial source indicator chemical), those chemicals associated with the former steel plant's iron ore smelting operation were *iron, barium, beryllium, aluminum, chromium, manganese, molybdenum, zinc, selenium* and *lead*. A summary of the findings is found below in Table 6.

Table 6: Relationship between Soil Chemical Concentrations and Former Steel Plant

Soil chemical	Method 1	Method 2	Possible CoC to Former Steel Plant (Yes/No)
Barium	na	**Pass**	**Yes**
Beryllium	na	**Pass**	**Yes**
Nickel	na	Fail	N
Cobalt	na	Fail	N
Copper	na	Fail	N
Aluminum	**na**	**Pass**	**Yes**
Cadmium	na	Fail	N
Calcium	na	Fail	N
Chromium	**na**	**Pass**	**Yes**
Iron	**na**	**Pass**	**Yes**
Magnesium	na	Fail	N
Manganese	**na**	**Pass**	**Yes**
Molybdenum	**na**	**Pass**	**Yes**
Strontium	na	Fail	N
Vanadium	na	Fail	N
Zinc	**na**	**Pass**	**Yes**
Arsenic	na	Fail	N
Selenium	**na**	**Pass**	**Yes**
Lead	**na**	**Pass**	**Yes**

na- not enough data point to do the statistical analysis

4.3 Lead, Barium and Zinc

For lead, barium and zinc, where there are significant correlations to both the industrial sources, one has to look closely at the relationships indicated by the results of the analyses.

For all three, the r-values show a stronger relationship to iron than to nickel. The p- value is NOT an indication of the 'perfection' of the relationship. Instead, the coefficient of correlation or the r- value does this, by estimating the percentage of the variation in the data which is explained by the model. The p-value indicates the validity of the observed r-value.

Additionally, in the cases of these three metals the stronger r-values also correlate to more indicative p-values, where the relationship to iron appears more significant. This can be found below in Table 7. The results for barium, zinc and lead show very definite, strong correlations with iron, leaving no reasonable doubt in the relationship between barium, zinc, lead, and iron, and Algoma as their source.

Table 7: Comparitive Statistics between the relationships to the Two Indicator Metals

Soil chemical	Relationship to Nickel P value	Relationship to Iron P value	Nickel r- value coefficient of correlation	Iron r- value coefficient of correlation	Is the Iron Relationship Stronger than the Nickel Relationship?
Barium	**4.41 E-02**	**4.63E-07**	**0.377**	**0.842**	**Yes**
Zinc	**3.95E-02**	**2.08E-02**	**0.384**	**0.479**	**Yes**
Lead	**1.02E-03**	**2.45E-08**	**0.578**	**0.883**	**Yes**

Under the constraints of the TSOW Condition 3, the potential CoC must show a scientific linkage with the industrial source. The intention of this study was to scientifically and spatially link soil chemical concentration in the surface soils to an industrial source, namely Inco. This report has investigated two possible sources of contamination on the east side of Port Colborne. Lead, barium and zinc show significant relationships with both indicator metals, but a stronger relationship to iron associated with the former Algoma steel facility. Given the additional fact that the former Algoma steel plant predates Inco and is upwind of Inco, these metals lead, barium and zinc should be grouped with those metals linked to the iron group representative of the former Algoma steel plant. The evidence is not sufficient to show a definite scientific linkage of lead, barium and zinc with Inco's operations.

5.0 CONCLUSIONS

This report presented the results and findings on the statistical evaluation of soil chemical concentration data for the Port Colborne area in accordance with TSOW Condition No. 3. The potential CoCs that can be scientifically attributed to Inco's historical nickel refinery operations are ***nickel, copper, cobalt, arsenic and selenium.***

The potential CoCs that can be scientifically attributed to the former steel plant's iron ore smelting operation are ***iron, barium, beryllium, aluminum, chromium, manganese, molybdenum, zinc, selenium*** and ***lead***.

6.0 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.

Yours very truly,

JACQUES WHITFORD LIMITED

Original Signed By:

Cecile Willert, P.Eng.
Principal

Original Signed By:

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

Encl.

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APPENDIX 1

Regression of Soil Chemical Concentrations versus Distance from an Industrial Source

INCO Refinery as the Assumed Industrial Source

APPENDIX 1A
Data Set

site	year	use	dist	dir	Ba	Be	Ni	Co	Cu
MOLAR MASS					137.33	9.01218	58.7	58.9332	63.546
1	1998	res	372	318	120	0.7	4250	195	325
2	1998	boul	463	301	105	0.6	1400	33.5	165
3	1998	res	442	275	39	0.5	1650	31	150
4	1998	res	675	342	210	1	2050	39	205
5	1998	boul	852	332	120	0.9	585	19.5	115
6	1998	res	1083	329	82	0.6	560	16	81
7	1998	boul	882	6	67	0.5	210	9.4	45
8	1998	res	1130	5	108	0.6	595	18.5	79
9	1998	res	908	16	104	0.6	2250	56	240
10	1998	boul	1387	32	55	0.5	21	5.1	17
11	1998	school	2072	51	130	1	980	25.5	125
12	1998	row	3396	30	160	1.1	78	14	30
14	1998	res	1030	113	54	0.5	585	17.5	69
15	1998	row	2134	83	92	0.6	1400	42.5	165
16	1998	res	2930	87	140	1	310	11	51
17	1998	row	245	243	39	0.5	520	14	56
19	1998	row	6557	33	79	0.7	104	9.1	22
20	1998	lawn	4593	91	130	1	130	12	29
23	1998	row	5457	3	110	1	50	14.5	20
24	1998	boul	304	323	99	0.6	5050	105	350
25	1998	boul	1043	338	80	0.6	270	12.5	63
26	1998	boul	926	299	110	0.8	215	9.5	55
27	1998	boul	1279	306	39	0.5	15	4.3	19
28	1998	row	364	185	51	0.5	940	33.5	180
29	1998	boul	1278	337	91	0.6	470	21	160
30	1998	lawn	3602	289	86	0.7	65	8.2	26
31	1998	row	2450	8	76	0.6	66	6.9	27
32	1998	park	2654	357	105	1.1	155	8.6	34
33	1998	park	1991	341	140	1	160	13	32
34	1998	boul	1215	293	125	1	175	9.4	72
35	1998	park	3308	287	190	0.8	185	15.5	39
36	1998	park	1755	314	87	0.7	125	10.5	28
37	1998	park	1253	275	63	0.5	1100	22.5	96
38	1998	boul	2013	288	64	0.6	58	5.6	35
39	1998	res	9547	276	59	0.5	18	4.5	15
40	1998	lawn	9438	262	99	0.7	30	8.1	18
41	1998	row	6114	264	91	0.7	37	8	19
42	1998	res	4465	268	42	0.5	23	4.9	9
43	1998	row	2244	107	47	0.5	580	13	63
44	1998	res	6206	89	67	0.6	74	6.3	18
45	1998	row	9522	93	83	0.7	46	5.9	26
46	1998	row	10254	81	105	0.8	31	9.5	21
47	1998	res	7131	78	66	0.5	63	6	20
48	1998	lawn	6244	77	105	0.8	115	8.9	25
49	1998	res	4868	71	100	0.7	130	8.5	34
50	1998	res	3192	66	92	0.8	145	9.7	38
51	1998	res	1973	42	115	0.8	2750	51.5	275

site	year	use	dist	dir	Ba	Be	Ni	Co	Cu
MOLAR MASS					137.33	9.01218	58.7	58.9332	63.546
52	1998	lawn	3058	294	86	0.8	74	9	22
53	1998	lawn	4527	286	74	0.6	54	7.5	17
54	1998	row	6224	281	115	0.9	38	9.7	22
55	1998	res	7933	278	140	0.7	41	6.1	28
56	1998	res	9818	288	91	0.5	20	8.2	17
58	1998	res	5305	300	100	0.8	48	8.9	20
59	1998	res	4487	319	98	0.8	89	8.5	29
60	1998	res	3571	338	74	0.6	92	7.4	21
61	1998	res	3576	11	96	0.8	190	9.6	35
62	1998	res	5602	55	87	0.6	345	13	56
63	1998	cemet	5292	50	67	0.6	305	12.5	46
64	1998	lawn	6361	57	120	0.9	115	9.1	33
65	1998	res	7040	63	65	0.5	195	9.3	35
66	1998	res	8295	65	66	0.5	77	5.3	19
67	1998	res	9516	68	93	0.7	78	10	20
68	1998	res	11265	73	92	0.6	68	8.5	19
69	1998	res	11911	63	110	1	65	13.5	23
70	1998	res	10747	52	115	0.9	97	11	30
71	1998	res	7587	44	91	0.7	83	7	19
72	1998	res	5894	21	81	0.9	73	8.1	23
73	1998	lawn	4939	345	140	1.1	195	12.5	50
74	1998	res	6872	330	110	0.8	38	10.4	33
75	1998	res	7579	321	140	1.2	44	11	47
76	1998	res	8640	305	20	0.5	20	7.3	17
77	1998	res	10824	296	87	0.5	24	7.3	22
78	1998	row	11373	308	71	0.5	17	6.3	15
79	1998	row	10218	315	98	0.6	24	9.7	25
80	1998	res	8825	325	89	0.5	33	7.4	21
81	1998	res	7795	344	86	0.5	29	7.4	17
82	1998	res	7603	10	105	0.9	55	9.6	21
83	1998	res	8085	21	240	0.8	55	10.5	34
84	1998	lawn	8736	31	130	1	69	11	30
85	1998	res	9911	40	90	0.7	96	10.5	23
86	1998	res	11331	47	140	1	52	15	28
87	1998	res	13009	55	96	0.8	69	10.5	23
88	1998	row	13274	45	82	0.6	48	6.7	26
89	1998	res	11406	35	110	0.6	42	6.2	25
90	1998	res	9879	21	145	1.1	42	10	38
91	1998	res	9385	11	130	0.9	49	6.4	27
150	1998	res	1745	21	225	0.8	3900	74.5	355
151	1998	woodl	2351	19	120	0.9	1500	29	160
157	1998	res	1749	21	99	0.7	1100	27	140
158	1998	tilled	1775	23	140	1	1100	22.5	130
159	1998	lawn	7665	29	94	0.6	103	8.1	30
160	1998	untilled	7695	29	120	0.8	140	12.5	39
161	1998	tilled	7594	30	115	0.9	82	9.3	29
162	1998	row	4601	26	70	0.5	110	6.1	25

site	year	use	dist	dir	Ba	Be	Ni	Co	Cu
MOLAR MASS					137.33	9.01218	58.7	58.9332	63.546
163	1998	tilled	4604	26	89	0.6	105	6.4	24
164	1998	res	11360	36	130	0.7	51	6.6	27
165	1998	tilled	11356	36	105	0.8	42	9.7	17
170	1999	row	3621	260	24.5	0.5	185	6	21
171	1999	row	3260	267	85	0.7	115	8	36
172	1999	vaclot	3091	249	30	0.5	110	5	20
173	1999	vaclot	2527	263	35.5	0.5	43	5	11
174	1999	res	2311	271	92.5	0.8	91	8	26
175	1999	res	1879	278	93	0.7	103	9	26
176	1999	park	1374	274	87.5	0.5	20	5	42
177	1999	lawn	818	269	105	0.8	430	14	69
178	1999	woodlot	2946	280	115	1	145	12	31
179	1999	res	2637	283	81	0.8	83	7	19
180	1999	school	1727	291	88.5	0.7	70	10	21
181	1999	boul	1504	291	71	0.7	92	7	25
182	1999	lawn	1331	344	130	1.1	350	16	63
183	1999	boul	1295	23	99	0.6	1050	30	135
184	1999	row	1471	58	125	1	1250	33	170
185	1999	woodlot	3927	105	45.5	1	120	5	19
186	1999	woodlot	5080	131	155	1.1	320	11	63
187	1999	res	1826	351	110	0.9	370	17	55
188	1999	woodlot	1850	14	150	1.2	550	21	81
189	1999	res	2271	360	110	0.9	180	13	42
190	1999	boul	2722	28	130	1.1	490	18	70
191	1999	res	3229	41	100	0.8	285	14	48
192	1999	field	3801	50	110	0.8	430	14	57
193	1999	field	4506	56	94	0.6	265	10	44
194	1999	woodlot	5104	64	110	0.6	535	17	66
195	1999	woodlot	5879	67	130	0.9	195	16	32
196	1999	woodlot	11941	91	48.5	1.1	43	7	27
197	1999	boul	3496	348	140	1.1	290	11	49
198	1999	row	3341	357	66	0.5	145	8	58
199	1999	row	3659	20	98.5	0.8	180	10	39
200	1999	woodlot	4465	41	170	1.3	525	17	89
201	1999	lawn	5060	48	110	0.7	305	14	50
202	1999	lawn	5017	335	99	0.7	105	9	27
203	1999	lawn	4581	343	90	0.7	71	8	28
204	1999	res	6016	347	120	0.8	91	10	42
205	1999	row	4997	351	89	0.7	65	8	18
206	1999	park	5647	356	97.5	0.9	185	13	40
207	1999	boul	3928	359	93.5	0.9	255	12	64
208	1999	row	4268	17	155	1.2	130	18	30
209	1999	row	4772	26	120	1	165	15	33
210	1999	field	5246	34	59.5	0.7	340	11	48
211	1999	field	5992	38	76	0.5	160	8	42
212	1999	field	6305	46	150	1.1	215	16	41
213	1999	woodlot	7521	56	150	0.8	330	14	52

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
MOLAR MASS		26.98154	112.41	40.08	51.996	55.847	207.2	24.305	54.938
1	1998	11500	0.9	27500	26	27000	155	12500	485
2	1998	9750	1	64000	21	21500	130	34500	560
3	1998	2700	0.2	27500	15	29500	57	6600	585
4	1998	20000	2.5	20500	54	22500	108	7950	405
5	1998	17000	1.1	17000	24	21500	64	9150	280
6	1998	12500	4.4	14000	19	18500	73	7400	415
7	1998	12000	0.7	18000	20	15500	32	9500	310
8	1998	14000	0.9	31500	23	17000	62	5700	325
9	1998	13000	0.6	13000	20	17500	59	5400	415
10	1998	6500	0.2	29000	12	12500	9	5800	460
11	1998	22500	0.3	8500	31	30500	32	6750	580
12	1998	24000	0.3	34500	31	31000	19	13500	555
14	1998	8950	0.3	15500	17	15000	29	6250	245
15	1998	15000	0.9	9200	21	16500	48	3750	235
16	1998	23500	1	6150	28	15500	26	4950	190
17	1998	9350	0.4	6650	12	14500	27	3250	195
19	1998	17500	0.4	5000	22	20000	25	5150	445
20	1998	23500	0.6	4650	28	18500	27	5500	235
23	1998	24500	0.3	6900	32	28000	22	6350	715
24	1998	9900	0.2	29000	21	22500	98	12500	465
25	1998	12500	1.1	25500	21	17000	73	12000	365
26	1998	15500	0.9	23000	24	14000	79	11000	275
27	1998	5550	0.2	39500	12	12000	15	13500	455
28	1998	7500	0.6	19000	14	16500	57	7900	345
29	1998	10350	0.5	45000	34	17500	170	20000	530
30	1998	17000	0.7	9900	22	19000	53	6750	510
31	1998	13500	0.5	16500	21	16500	50	10400	360
32	1998	23000	0.8	7950	28	18000	37	5600	245
33	1998	25500	0.7	6300	30	29500	22	5300	460
34	1998	18500	1.1	22000	27	15000	78	10500	260
35	1998	16500	1.8	5750	39	21000	62	5450	650
36	1998	16500	0.6	7350	24	20500	32	5150	435
37	1998	4550	0.5	7300	14	15000	86	2800	270
38	1998	11000	0.6	16500	22	14000	29	6950	430
39	1998	11500	0.3	10350	15	14000	46	6200	330
40	1998	15500	0.5	2700	22	20000	22	12500	495
41	1998	15000	0.4	8500	20	18000	48	6350	670
42	1998	9550	0.3	7200	14	14500	21	3750	250
43	1998	7600	0.3	19500	16	17500	24	7550	260
44	1998	14500	0.5	4150	17	11500	27	2800	158
45	1998	16500	0.9	5950	21	19500	36	4050	485
46	1998	18000	0.8	23500	22	18500	34	7100	400
47	1998	11000	0.4	9000	15	13500	52	5150	265
48	1998	19000	0.3	5450	24	22500	36	5050	330
49	1998	18000	0.6	16000	23	20000	50	10500	320
50	1998	17000	0.6	6250	24	19500	27	5150	370
51	1998	18500	0.4	7650	26	21000	54	5450	365

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
MOLAR MASS		26.98154	112.41	40.08	51.996	55.847	207.2	24.305	54.938
52	1998	15000	0.5	4950	20	18000	58	4100	615
53	1998	16500	0.7	5050	23	20000	36	4800	205
54	1998	18500	0.5	9000	24	23000	30	6550	620
55	1998	20000	0.5	15500	24	15500	61	6450	230
56	1998	14500	0.2	22000	21	15000	16	8800	300
58	1998	17500	0.5	7500	23	21000	28	6600	440
59	1998	16500	0.9	12000	22	18500	80	6000	560
60	1998	16000	0.4	5800	20	17000	23	4150	235
61	1998	19250	0.4	15000	24	19500	30	9750	340
62	1998	14000	0.7	7450	21	19000	101	4800	440
63	1998	14500	0.5	5000	18	19000	38	5000	590
64	1998	22500	1	5400	27	21000	25	5150	405
65	1998	11500	0.4	13500	17	14500	62	5400	345
66	1998	13000	0.3	15000	16	13500	23	5050	190
67	1998	20000	0.5	6800	26	25000	102	5750	440
68	1998	16500	0.6	4450	21	18500	43	4050	495
69	1998	21500	0.3	12500	29	28000	27	8300	525
70	1998	24000	0.6	7600	30	26500	46	5950	330
71	1998	15000	0.4	6100	21	12000	21	3950	165
72	1998	22000	0.3	6750	37	24000	22	5200	270
73	1998	23500	1.2	12000	32	23000	45	7100	525
74	1998	18000	0.9	17500	24	18500	32	5450	430
75	1998	24500	1.3	6750	34	15000	28	4650	255
76	1998	13500	0.2	21000	23	14000	20	6450	280
77	1998	13000	0.2	18000	21	14500	91	6700	355
78	1998	15000	0.2	19000	20	16000	62	9750	270
79	1998	17500	0.2	42000	25	20000	25	11500	515
80	1998	14500	0.2	20000	21	16500	19	8900	375
81	1998	16500	0.4	12500	22	17500	26	5300	355
82	1998	18500	0.5	16500	27	21500	30	7000	395
83	1998	18000	1	26000	30	24000	210	9250	470
84	1998	24500	0.4	5650	41	28500	24	5600	350
85	1998	20500	0.4	4650	26	23500	29	5200	610
86	1998	25000	0.6	18500	33	30000	34	11000	740
87	1998	20000	0.4	7200	26	25500	32	6400	440
88	1998	16000	0.5	7750	21	16500	36	5000	295
89	1998	17000	0.4	10500	21	17500	58	4350	295
90	1998	23500	0.6	8900	31	26500	42	6150	385
91	1998	25500	0.8	6100	32	16000	56	4350	310
150	1998	14000	0.2	11500	26	22000	380	4750	910
151	1998	24500	0.5	4600	28	16000	62	3450	220
157	1998	16000	1	6000	23	20000	100	4400	400
158	1998	24500	0.2	32250	33	26000	34	5600	465
159	1998	14500	0.4	9850	22	19000	89	5350	320
160	1998	20000	0.8	14000	29	23500	115	9000	455
161	1998	26000	0.4	7300	33	19500	23	6150	235
162	1998	13000	0.3	8000	21	16000	32	5550	260

site	year	Mo	Sr	V	Zn	As	Se
MOLAR MASS		95.94	87.62	50.9415	65.38	74.9216	78.96
52	1998	0.5	18	33	92	4.8	0.3
53	1998	0.5	40	36	63	3.1	0.1
54	1998	0.5	31	41	92	4.1	0.3
55	1998	0.5	74	35	125	2.4	0.3
56	1998	0.5	66	32	66	2	0.2
58	1998	0.5	72	38	87	3.5	0.3
59	1998	0.7	36	37	155	3.9	0.4
60	1998	0.5	39	35	66	2.4	0.2
61	1998	0.5	44	40	82	4.1	0.4
62	1998	0.5	65	36	165	4.4	0.8
63	1998	0.7	23	33	130	5.1	0.6
64	1998	0.5	300	37	100	10	1.1
65	1998	0.5	38	30	84	4.2	0.4
66	1998	0.5	57	29	61	2.1	0.1
67	1998	0.5	35	44	104	4.2	0.3
68	1998	0.8	38	39	90	4	0.3
69	1998	0.5	75	46	96	4.2	0.1
70	1998	0.5	52	48	115	4	0.4
71	1998	0.5	35	29	53	1.3	0.1
72	1998	0.9	120	41	104	4.2	0.3
73	1998	0.5	105	47	140	2.9	0.2
74	1998	0.5	100	34	225	3.1	0.3
75	1998	0.5	49	47	150	4.3	0.6
76	1998	0.5	47	30	59	2.2	0.1
77	1998	0.5	42	29	98	3	0.3
78	1998	0.5	62	34	73	2.7	0.1
79	1998	0.5	88	37	94	3.5	0.1
80	1998	0.5	42	33	63	3.3	0.1
81	1998	0.5	36	36	63	3.3	0.1
82	1998	0.5	51	40	78	3.8	0.2
83	1998	0.7	81	37	215	4	0.2
84	1998	2.8	67	42	105	4	0.2
85	1998	0.5	32	42	92	4	0.2
86	1998	0.5	64	47	185	4.4	0.2
87	1998	0.6	47	45	115	3.9	0.3
88	1998	0.5	26	32	99	2.8	0.2
89	1998	0.5	49	32	115	.	.
90	1998	0.8	48	44	115	3.9	0.2
91	1998	0.5	34	40	105	3.1	0.2
150	1998	0.8	38	37	235	.	.
151	1998	0.6	44	41	120	.	.
157	1998	0.9	23	35	140	.	.
158	1998	0.8	23	50	100	.	.
159	1998	0.5	37	32	160	.	.
160	1998	0.7	76	39	275	.	.
161	1998	0.5	59	44	135	.	.
162	1998	0.5	31	30	91	.	.

site	year	Mo	Sr	V	Zn	As	Se
MOLAR MASS		95.94	87.62	50.9415	65.38	74.9216	78.96
1	1998	0.5	75	33	315	16.1	3.8
2	1998	1.1	175	29	250	12.2	2.2
3	1998	1.1	43	20	215	12.2	1.4
4	1998	0.7	59	43	230	14.4	2.7
5	1998	0.6	85	37	145	5	1.2
6	1998	0.5	33	30	99	5.1	0.8
7	1998	0.5	55	26	90	3.1	0.5
8	1998	0.6	230	32	130	5.5	1.4
9	1998	0.5	41	32	145	14.4	2.4
10	1998	0.5	61	22	35	2.2	0.1
11	1998	0.5	41	50	89	7.6	1.6
12	1998	0.5	105	45	84	3.9	0.1
14	1998	0.5	29	31	65	3.8	0.9
15	1998	0.5	36	31	150	8	3.4
16	1998	0.5	72	40	92	3	0.8
17	1998	0.5	16	26	64	4	0.5
19	1998	0.6	17	39	106	3	0.2
20	1998	0.5	49	42	87	2.8	0.5
23	1998	0.6	51	49	87	4.2	0.3
24	1998	0.6	68	29	255	10.1	2.8
25	1998	0.5	67	30	130	3.5	0.6
26	1998	0.5	81	32	115	3.1	1
27	1998	0.6	100	20	72	1.9	0.1
28	1998	0.6	39	20	160	7.4	2.3
29	1998	1.4	90	29	175	5.6	0.8
30	1998	0.5	36	37	95	4.2	0.3
31	1998	0.5	70	32	101	2.4	0.3
32	1998	0.5	30	42	100	3	0.8
33	1998	0.5	34	47	90	4	0.4
34	1998	0.5	87	37	135	3.7	1.2
35	1998	0.5	18	42	135	7.1	0.5
36	1998	0.5	27	38	125	4.2	0.3
37	1998	0.5	22	21	160	4.9	1
38	1998	0.5	53	25	115	2.4	0.3
39	1998	0.5	27	27	99	2	0.1
40	1998	0.5	72	34	78	3.6	0.2
41	1998	0.5	31	31	105	3.2	0.3
42	1998	0.5	32	31	45	1.8	0.2
43	1998	0.5	35	40	72	5.7	0.8
44	1998	0.5	46	26	65	1.8	0.3
45	1998	0.6	27	37	115	3.8	0.3
46	1998	0.5	175	37	98	2.5	0.2
47	1998	0.5	115	26	98	2.4	0.3
48	1998	0.6	45	42	82	3.4	0.3
49	1998	0.5	101	35	110	4	0.3
50	1998	0.5	25	36	110	3.3	0.4
51	1998	0.7	46	38	150	10.7	2.5

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
MOLAR MASS		26.98154	112.41	40.08	51.996	55.847	207.2	24.305	54.938
163	1998	15500	0.3	11500	20	17500	27	5550	300
164	1998	18000	0.9	6650	25	19500	69	4050	280
165	1998	23000	0.4	2850	28	28500	17	4950	355
170	1999	3550	0.4	5550	13	13000	28	1150	410
171	1999	14000	0.7	31000	21	15000	45	12000	350
172	1999	3450	0.4	15000	11	12000	27.5	5750	180
173	1999	7400	0.3	10500	12	10000	16	5300	160
174	1999	17000	0.5	10450	23	17000	31.5	5450	310
175	1999	16500	0.5	9150	24.5	18500	35	5200	385
176	1999	6850	0.5	48000	13.5	12500	31.5	9500	520
177	1999	16000	0.7	26500	24.5	18500	76.5	12500	370
178	1999	20500	0.8	12000	32	22500	29	4950	625
179	1999	16500	0.4	9550	21	17000	41	5500	255
180	1999	17000	0.5	6650	22.5	19000	35	4850	420
181	1999	15000	0.6	12500	20.5	16000	39	6900	280
182	1999	23000	0.6	12500	34	27500	43	7700	630
183	1999	13000	0.4	34000	23	17000	63.5	16000	460
184	1999	19500	0.6	27500	29.5	21000	37.5	15500	320
185	1999	12000	0.5	5850	17	9950	19	2300	145
186	1999	24500	1.3	6350	30.5	12000	37.5	3350	155
187	1999	21000	0.7	12000	31	23500	38.5	7000	415
188	1999	26000	0.6	15500	39	24500	47.5	10250	405
189	1999	18000	0.7	15000	29.5	20500	54	7900	350
190	1999	23000	0.7	10250	39	27000	44.5	7650	440
191	1999	16500	0.4	5200	24	22000	29.5	5100	625
192	1999	18500	0.3	2950	26.5	21500	30	4000	450
193	1999	17000	0.3	9400	24	18500	30.5	5500	335
194	1999	17000	0.4	6800	26	14000	39	4600	270
195	1999	19500	0.8	4100	30.5	26500	33.5	4950	725
196	1999	12500	0.5	3850	18.5	19000	26	3750	420
197	1999	26000	0.7	12350	36	17500	40.5	5900	220
198	1999	7400	0.4	95500	18	12500	97.5	50500	415
199	1999	18000	0.4	21000	24.5	19000	29	12500	295
200	1999	30000	1.3	9350	39.5	23000	57.5	6800	200
201	1999	16000	0.4	15500	23.5	20000	40.5	8100	520
202	1999	14500	0.6	46500	23.5	17000	44.5	24000	425
203	1999	18000	0.3	5800	27	20500	21	4850	285
204	1999	17000	0.5	13000	26.5	17500	115	4350	265
205	1999	19500	0.4	4950	25.5	21500	22	4650	275
206	1999	18500	0.9	9400	25.5	18500	45	4450	365
207	1999	14000	0.6	36500	24.5	18500	103.5	20000	450
208	1999	25000	0.4	6300	42	32000	25.5	8100	690
209	1999	20500	0.4	5700	32.5	27500	33.5	6400	595
210	1999	13000	0.6	7050	21	15000	32	3350	590
211	1999	11500	0.4	33500	20.5	15500	44.5	17500	370
212	1999	23000	0.5	7050	33.5	28500	34.5	7450	670
213	1999	19500	0.6	9150	29.5	18000	51	4600	325

site	year	Mo	Sr	V	Zn	As	Se
MOLAR MASS		95.94	87.62	50.9415	65.38	74.9216	78.96
214	1999	0.7	135	30	79	4.9	1.6
215	1999	0.6	71	40	79.5	3.5	0.5
216	1999	1.1	86	28.5	150	4.5	1.3
217	1999	0.8	94	45.5	135	3.1	0.3
218	1999	0.5	64	35.5	87	3.3	0.3
219	1999	1.2	57	35.5	190	5.3	0.2
220	1999	1.1	34	55	185	6.1	0.7
221	1999	1.1	25	29.5	74	3.1	1.1
222	1999	1.1	45	41.5	120	3.9	0.8
223	1999	1.1	30	57.5	94	5.1	0.4
224	1999	7.2	32	45.5	130	4.7	0.4
225	1999	1.2	33	48.5	99.5	4.9	0.5
226	1999	1.1	32	60	165	6.4	0.4
227	1999	1.1	61	44	105	3.8	0.3
228	1999	0.8	41	45	96	4.2	0.3
229	1999	1.2	78	35.5	135	4.2	0.8
230	1999	0.9	140	46.5	170	9.4	2.5
231	1999	0.5	46	33	110	3.7	0.3
232	1999	0.5	101	29.5	99.5	3	0.3
233	1999	1	105	40	135	4.3	0.5

site	year	Mo	Sr	V	Zn	As	Se
MOLAR MASS		95.94	87.62	50.9415	65.38	74.9216	78.96
163	1998	0.5	32	33	79	.	.
164	1998	0.5	40	33	295	.	.
165	1998	0.5	23	44	90	.	.
170	1999	0.5	14	28	62	2.5	0.3
171	1999	0.5	135	28.5	93.5	5.2	0.7
172	1999	0.5	34	25	66.5	1.3	0.2
173	1999	0.5	35	19.5	58.5	1.5	0.1
174	1999	0.5	36	32	77	3.1	0.4
175	1999	0.5	30	33.5	145	4.2	0.5
176	1999	0.5	105	17	160	1.9	0.1
177	1999	0.6	74	33	140	5.8	1
178	1999	0.5	25	40.5	97	5.8	0.8
179	1999	0.5	26	30.5	81	3	0.4
180	1999	0.5	22	35.5	82.5	3.8	0.2
181	1999	0.5	36	29.5	100	2.9	0.6
182	1999	0.9	67	45	130	6.9	0.8
183	1999	0.6	78	32.5	125	5.9	1.2
184	1999	1.4	170	39.5	135	9	2.4
185	1999	0.5	27	26	72	1.9	0.4
186	1999	0.8	110	38.5	95.5	3.2	1.6
187	1999	0.8	61	40.5	105	4.7	0.8
188	1999	1.3	92	45.5	130	4.9	1
189	1999	0.8	55	41	115	4.7	0.8
190	1999	1.2	39	45.5	125	5.1	0.9
191	1999	0.5	26	36.5	105	4.3	0.4
192	1999	0.5	29	34.5	100	4.6	1
193	1999	0.5	42	33	160	4.2	0.7
194	1999	0.5	215	30	100	5.3	1.4
195	1999	0.9	33	45.5	100	5.3	0.8
196	1999	0.5	32	37.5	97.5	3.5	0.3
197	1999	0.9	165	37.5	180	3.3	0.6
198	1999	1.2	165	23	110	4	0.4
199	1999	0.7	59	36.5	115	3.7	0.4
200	1999	0.7	115	48.5	160	5.3	1.6
201	1999	0.6	104	36.5	98.5	4.1	0.7
202	1999	0.5	195	32	95	3.1	0.3
203	1999	0.9	38	36.5	70.5	2.9	0.1
204	1999	0.7	71	32.5	235	4.2	0.8
205	1999	0.6	37	37.5	66	2.6	0.1
206	1999	0.5	78	36	130	4.2	0.7
207	1999	0.8	79	34	125	4	0.6
208	1999	1.2	42	53	87	4.3	0.1
209	1999	0.9	44	44	94	5.6	0.4
210	1999	0.5	30	30	135	4.6	1
211	1999	0.5	150	28	110	4.1	0.5
212	1999	0.7	140	48	125	5.3	0.6
213	1999	0.8	130	34	130	4.1	0.8

site	year	use	dist	dir	Ba	Be	Ni	Co	Cu
MOLAR MASS					137.33	9.01218	58.7	58.9332	63.546
214	1999	woodlot	10337	57	125	0.9	170	13	42
215	1999	woodlot	9033	52	115	1	81	14	29
216	1999	field	8338	48	95	0.7	225	11	49
217	1999	res	6181	12	140	1.1	95	15	32
218	1999	res	7097	357	89.5	0.8	72	8	27
219	1999	field	11806	10	130	0.8	60	12	32
220	1999	woodlot	12819	24	150	0.9	75	14	20
221	1999	woodlot	14596	36	105	0.9	102	6	18
222	1999	woodlot	15348	44	145	1.6	93	12	41
223	1999	woodlot	15743	52	105	1.1	71	18	25
224	1999	woodlot	18854	52	110	0.9	78	12	22
225	1999	woodlot	14433	63	100	1	85	14	24
226	1999	field	16218	67	115	1.2	60	18	25
227	1999	woodlot	13595	74	115	0.9	40	12	18
228	1999	lawn	5221	69	88.5	0.9	43	13	15
229	1999	res	2580	56	100.5	0.8	515	19	83
230	1999	woodlot	3896	72	155	1.2	735	24	105
231	1999	school	5591	75	85.5	0.6	71	8	29
232	1999	woodlot	3071	104	88.5	0.9	108	9	31
233	1999	row	4244	342	135	0.6	390	16	67

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
MOLAR MASS		26.98154	112.41	40.08	51.996	55.847	207.2	24.305	54.938
214	1999	15000	0.5	18500	25.5	19500	27.5	5400	365
215	1999	19000	0.6	19000	31	22000	21.5	8000	430
216	1999	13000	0.8	17000	25	14000	42.5	5250	290
217	1999	26500	0.7	12500	43	26000	26.5	7550	375
218	1999	19000	0.5	11950	28.5	17500	35.5	6450	275
219	1999	17000	0.6	21500	35.5	24500	85.5	10250	715
220	1999	22500	0.9	6500	36.5	30000	50.5	4400	1250
221	1999	21000	0.7	2750	24.5	9250	46	2900	126
222	1999	26000	1.3	5300	36	18000	54	4800	370
223	1999	22500	0.6	4750	40.5	35500	39.5	6000	750
224	1999	22000	0.7	5200	37	28500	41	5300	475
225	1999	21500	0.5	4950	36.5	28500	36.5	5650	650
226	1999	24500	0.7	7650	40.5	33500	45	7000	1900
227	1999	20000	0.5	6600	34.5	25000	25	7100	635
228	1999	19000	0.5	2900	29	26500	37.5	5300	675
229	1999	16500	0.4	25500	46	20500	59	13000	445
230	1999	27500	1	8800	36	25000	46.5	5800	405
231	1999	14500	0.6	15000	22.5	18500	46.5	9200	575
232	1999	12000	0.7	19000	22.5	15500	82	9100	270
233	1999	19500	0.4	34500	35.5	23500	60	16500	460

APPENDIX 1B
Results
Scenario 1
0-90° Arc Plume

Relationship between Distance and Soil Metal Concenrtations and Distance in the 0-90 degree arc within the plume
Method 1

SUMMARY OUTPUT Ni

Regression Statistics	
Multiple R	6.32E-01
R Square	3.99E-01
Adjusted R Square	3.77E-01
Standard Error	2.74E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.35E+00	1.35E+00	1.79E+01	2.38E-04
Residual	2.70E+01	2.03E+00	7.51E-02		
Total	2.80E+01	3.37E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	3.15E+00	1.00E-01	3.14E+01	8.88E-23	2.94E+00	3.36E+00	2.94E+00	3.36E+00
X Variable 1	-1.09E-04	2.56E-05	-4.23E+00	2.38E-04	-1.61E-04	-5.59E-05	-1.61E-04	-5.59E-05

SUMMARY OUTPUT Co

Regression Statistics	
Multiple R	5.79E-01
R Square	3.35E-01
Adjusted R Square	3.10E-01
Standard Error	1.95E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	5.16E-01	5.16E-01	1.36E+01	1.00E-03
Residual	2.70E+01	1.02E+00	3.79E-02		
Total	2.80E+01	1.54E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.53E+00	7.14E-02	2.14E+01	1.85E-18	1.38E+00	1.67E+00	1.38E+00	1.67E+00
dist	-6.72E-05	1.82E-05	-3.69E+00	1.00E-03	-1.05E-04	-2.98E-05	-1.05E-04	-2.98E-05

SUMMARY OUTPUT Cu

Regression Statistics	
Multiple R	6.37E-01
R Square	4.06E-01
Adjusted R Square	3.84E-01
Standard Error	2.10E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	8.11E-01	8.11E-01	1.85E+01	2.00E-04
Residual	2.70E+01	1.19E+00	4.39E-02		
Total	2.80E+01	2.00E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.22E+00	7.68E-02	2.89E+01	7.50E-22	2.06E+00	2.38E+00	2.06E+00	2.38E+00
dist	-8.43E-05	1.96E-05	-4.30E+00	2.00E-04	-1.24E-04	-4.40E-05	-1.24E-04	-4.40E-05

Relationship between Distance and Soil Metal Concenrtations and Distance in the 0-90 degree arc within the plume
Method 1

SUMMARY OUTPUT Pb

Regression Statistics	
Multiple R	1.99E-01
R Square	3.96E-02
Adjusted R Square	4.06E-03
Standard Error	2.27E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	5.75E-02	5.75E-02	1.11E+00	3.01E-01
Residual	2.70E+01	1.39E+00	5.16E-02		
Total	2.80E+01	1.45E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.76E+00	8.32E-02	2.11E+01	2.51E-18	1.59E+00	1.93E+00	1.59E+00	1.93E+00
X Variable 1	-2.24E-05	2.12E-05	-1.06E+00	3.01E-01	-6.60E-05	2.12E-05	-6.60E-05	2.12E-05

SUMMARY OUTPUT As

Regression Statistics	
Multiple R	3.74E-01
R Square	1.40E-01
Adjusted R Square	1.02E-01
Standard Error	1.55E-01
Observations	2.50E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	8.98E-02	8.98E-02	3.74E+00	6.56E-02
Residual	2.30E+01	5.52E-01	2.40E-02		
Total	2.40E+01	6.42E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	8.42E-01	6.30E-02	1.34E+01	2.56E-12	7.11E-01	9.72E-01	7.11E-01	9.72E-01
dist	-2.94E-05	1.52E-05	-1.93E+00	6.56E-02	-6.08E-05	2.05E-06	-6.08E-05	2.05E-06

SUMMARY OUTPUT Se

Regression Statistics	
Multiple R	3.14E-01
R Square	9.88E-02
Adjusted R Square	5.96E-02
Standard Error	2.36E-01
Observations	2.50E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.40E-01	1.40E-01	2.52E+00	1.26E-01
Residual	2.30E+01	1.28E+00	5.57E-02		
Total	2.40E+01	1.42E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.77E-01	9.60E-02	1.84E+00	7.88E-02	-2.20E-02	3.75E-01	-2.20E-02	3.75E-01
dist	-3.67E-05	2.31E-05	-1.59E+00	1.26E-01	-8.46E-05	1.11E-05	-8.46E-05	1.11E-05

Relationship between Distance and Soil Metal Concenrtations and Distance in the 0-90 degree arc within the plume
Method 1

SUMMARY OUTPUT Cr

Regression Statistics	
Multiple R	9.46E-03
R Square	8.95E-05
Adjusted R Square	-3.69E-02
Standard Error	1.05E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	2.66E-05	2.66E-05	2.42E-03	9.61E-01
Residual	2.70E+01	2.97E-01	1.10E-02		
Total	2.80E+01	2.97E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.43E+00	3.84E-02	3.73E+01	9.40E-25	1.35E+00	1.51E+00	1.35E+00	1.51E+00
dist	-4.82E-07	9.81E-06	-4.92E-02	9.61E-01	-2.06E-05	1.96E-05	-2.06E-05	1.96E-05

Relationship between Distance and Soil Metal Concenrtations and Distance in the 0-90 degree arc within the plume
Method 1

SUMMARY OUTPUT Ba

Regression Statistics	
Multiple R	8.71E-02
R Square	7.58E-03
Adjusted R Square	-2.92E-02
Standard Error	1.27E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	3.34E-03	3.34E-03	2.06E-01	6.53E-01
Residual	2.70E+01	4.37E-01	1.62E-02		
Total	2.80E+01	4.40E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.07E+00	4.66E-02	4.44E+01	8.81E-27	1.97E+00	2.17E+00	1.97E+00	2.17E+00
dist	-5.40E-06	1.19E-05	-4.54E-01	6.53E-01	-2.98E-05	1.90E-05	-2.98E-05	1.90E-05

SUMMARY OUTPUT Sr

Regression Statistics	
Multiple R	2.25E-01
R Square	5.05E-02
Adjusted R Square	1.53E-02
Standard Error	2.99E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.28E-01	1.28E-01	1.44E+00	2.41E-01
Residual	2.70E+01	2.41E+00	8.93E-02		
Total	2.80E+01	2.54E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.67E+00	1.10E-01	1.53E+01	8.17E-15	1.45E+00	1.90E+00	1.45E+00	1.90E+00
dist	3.35E-05	2.80E-05	1.20E+00	2.41E-01	-2.39E-05	9.09E-05	-2.39E-05	9.09E-05

SUMMARY OUTPUT Al

Regression Statistics	
Multiple R	7.67E-03
R Square	5.88E-05
Adjusted R Square	-3.70E-02
Standard Error	1.16E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	2.14E-05	2.14E-05	1.59E-03	9.69E-01
Residual	2.70E+01	3.63E-01	1.35E-02		
Total	2.80E+01	3.63E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.25E+00	4.25E-02	1.00E+02	3.09E-36	4.16E+00	4.34E+00	4.16E+00	4.34E+00
dist	4.32E-07	1.08E-05	3.99E-02	9.69E-01	-2.18E-05	2.27E-05	-2.18E-05	2.27E-05

Relationship between Distance and Soil Metal Concenrtations and Distance in the 0-90 degree arc within the plume
Method 1

SUMMARY OUTPUT Mn

Regression Statistics	
Multiple R	8.70E-03
R Square	7.57E-05
Adjusted R Square	-3.70E-02
Standard Error	1.65E-01
Observations	2.90E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	5.57E-05	5.57E-05	2.04E-03	9.64E-01
Residual	2.70E+01	7.36E-01	2.73E-02		
Total	2.80E+01	7.36E-01			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	2.59E+00	6.05E-02	4.29E+01	2.29E-26	2.47E+00	2.72E+00	2.47E+00	2.72E+00
dist	6.98E-07	1.54E-05	4.52E-02	9.64E-01	-3.10E-05	3.24E-05	-3.10E-05	3.24E-05

SUMMARY OUTPUT Mo

Regression Statistics	
Multiple R	7.96E-03
R Square	6.34E-05
Adjusted R Square	-3.70E-02
Standard Error	1.49E-01
Observations	2.90E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	3.78E-05	3.78E-05	1.71E-03	9.67E-01
Residual	2.70E+01	5.96E-01	2.21E-02		
Total	2.80E+01	5.96E-01			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1.62E-01	5.44E-02	-2.97E+00	6.21E-03	-2.73E-01	-4.99E-02	-2.73E-01	-4.99E-02
dist	-5.75E-07	1.39E-05	-4.14E-02	9.67E-01	-2.91E-05	2.79E-05	-2.91E-05	2.79E-05

SUMMARY OUTPUT V

Regression Statistics	
Multiple R	1.12E-01
R Square	1.26E-02
Adjusted R Square	-2.40E-02
Standard Error	7.86E-02
Observations	2.90E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	2.12E-03	2.12E-03	3.44E-01	5.63E-01
Residual	2.70E+01	1.67E-01	6.18E-03		
Total	2.80E+01	1.69E-01			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.58E+00	2.88E-02	5.49E+01	3.10E-29	1.52E+00	1.64E+00	1.52E+00	1.64E+00
dist	-4.31E-06	7.35E-06	-5.86E-01	5.63E-01	-1.94E-05	1.08E-05	-1.94E-05	1.08E-05

Relationship between Distance and Soil Metal Concenrtations and Distance in the 0-90 degree arc within the plume
Method 1

SUMMARY OUTPUT Ca

Regression Statistics	
Multiple R	9.46E-03
R Square	8.95E-05
Adjusted R Square	-3.69E-02
Standard Error	1.05E-01
Observations	2.90E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	2.66E-05	2.66E-05	2.42E-03	9.61E-01
Residual	2.70E+01	2.97E-01	1.10E-02		
Total	2.80E+01	2.97E-01			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.43E+00	3.84E-02	3.73E+01	9.40E-25	1.35E+00	1.51E+00	1.35E+00	1.51E+00
dist	-4.82E-07	9.81E-06	-4.92E-02	9.61E-01	-2.06E-05	1.96E-05	-2.06E-05	1.96E-05

SUMMARY OUTPUT Mg

Regression Statistics	
Multiple R	3.08E-01
R Square	9.49E-02
Adjusted R Square	6.14E-02
Standard Error	1.72E-01
Observations	2.90E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	8.42E-02	8.42E-02	2.83E+00	1.04E-01
Residual	2.70E+01	8.03E-01	2.97E-02		
Total	2.80E+01	8.87E-01			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3.87E+00	6.32E-02	6.13E+01	1.60E-30	3.74E+00	4.00E+00	3.74E+00	4.00E+00
dist	-2.71E-05	1.61E-05	-1.68E+00	1.04E-01	-6.03E-05	5.95E-06	-6.03E-05	5.95E-06

SUMMARY OUTPUT Cd

Regression Statistics	
Multiple R	1.11E-01
R Square	1.24E-02
Adjusted R Square	-2.42E-02
Standard Error	2.10E-01
Observations	2.90E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	1.50E-02	1.50E-02	3.39E-01	5.65E-01
Residual	2.70E+01	1.19E+00	4.42E-02		
Total	2.80E+01	1.21E+00			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-3.11E-01	7.70E-02	-4.04E+00	3.98E-04	-4.69E-01	-1.53E-01	-4.69E-01	-1.53E-01
dist	1.15E-05	1.97E-05	5.82E-01	5.65E-01	-2.89E-05	5.18E-05	-2.89E-05	5.18E-05

EcoLogo Paper Papier Éco-Logo

Relationship between Distance and Soil Metal Concenrtations and Distance in the 0-90 degree arc within the plume
Method 1

SUMMARY OUTPUT Fe

Regression Statistics	
Multiple R	1.59E-01
R Square	2.54E-02
Adjusted R Square	-1.07E-02
Standard Error	9.20E-02
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	5.97E-03	5.97E-03	7.05E-01	4.09E-01
Residual	2.70E+01	2.29E-01	8.47E-03		
Total	2.80E+01	2.35E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.32E+00	3.37E-02	1.28E+02	3.90E-39	4.25E+00	4.39E+00	4.25E+00	4.39E+00
dist	-7.23E-06	8.61E-06	-8.40E-01	4.09E-01	-2.49E-05	1.04E-05	-2.49E-05	1.04E-05

SUMMARY OUTPUT Be

Regression Statistics	
Multiple R	6.91E-03
R Square	4.78E-05
Adjusted R Square	-3.70E-02
Standard Error	1.16E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.74E-05	1.74E-05	1.29E-03	9.72E-01
Residual	2.70E+01	3.64E-01	1.35E-02		
Total	2.80E+01	3.64E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.04E-01	4.25E-02	-2.44E+00	2.17E-02	-1.91E-01	-1.64E-02	-1.91E-01	-1.64E-02
dist	3.90E-07	1.09E-05	3.59E-02	9.72E-01	-2.19E-05	2.27E-05	-2.19E-05	2.27E-05

SUMMARY OUTPUT Zn

Regression Statistics	
Multiple R	9.03E-02
R Square	8.15E-03
Adjusted R Square	-2.86E-02
Standard Error	9.79E-02
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	2.13E-03	2.13E-03	2.22E-01	6.42E-01
Residual	2.70E+01	2.59E-01	9.59E-03		
Total	2.80E+01	2.61E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.09E+00	3.59E-02	5.84E+01	5.90E-30	2.02E+00	2.17E+00	2.02E+00	2.17E+00
dist	4.31E-06	9.16E-06	4.71E-01	6.42E-01	-1.45E-05	2.31E-05	-1.45E-05	2.31E-05

Relationship between Distance and Soil Metal Concenrtations and Distance in the 0-90 degree arc within the plume
Method 1

lultiple R

	dist	dir	Ba	Be	Ni	Co	Cu	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn	Mo	Sr	V	Zn	As	Se
ist	1.00E+00																				
ir	4.42E-01	1.00E+00																			
a	-8.71E-02	4.51E-02	1.00E+00																		
e	6.91E-03	1.29E-01	7.20E-01	1.00E+00																	
i	-6.32E-01	-2.23E-01	3.77E-01	8.73E-02	1.00E+00																
o	-5.79E-01	-1.91E-01	4.27E-01	1.09E-01	9.61E-01	1.00E+00															
u	-6.37E-01	-2.27E-01	3.93E-01	1.12E-01	9.90E-01	9.66E-01	1.00E+00														
l	7.67E-03	2.13E-01	6.64E-01	9.04E-01	4.32E-02	2.13E-02	4.52E-02	1.00E+00													
d	1.11E-01	1.37E-01	-1.25E-01	8.71E-02	-2.33E-01	-1.97E-01	-1.79E-01	9.32E-02	1.00E+00												
a	-3.38E-01	-3.30E-01	6.56E-02	-7.61E-02	1.45E-01	1.66E-01	2.09E-01	-1.85E-01	-5.51E-02	1.00E+00											
r	-9.46E-03	1.06E-01	6.56E-01	8.33E-01	2.30E-02	4.99E-02	5.60E-02	7.77E-01	-5.62E-03	1.71E-01	1.00E+00										
e	-1.59E-01	-5.80E-02	5.41E-01	6.92E-01	1.46E-01	2.17E-01	1.60E-01	6.04E-01	-2.67E-01	-8.14E-03	5.96E-01	1.00E+00									
b	-1.99E-01	-3.21E-01	3.61E-01	-9.64E-02	5.78E-01	5.97E-01	5.88E-01	-2.28E-01	-7.20E-02	1.16E-01	-4.15E-02	1.83E-02	1.00E+00								
lg	-3.08E-01	-1.51E-01	1.08E-01	1.74E-01	-3.81E-02	4.79E-02	3.87E-02	5.60E-02	-4.63E-02	6.90E-01	3.81E-01	2.78E-01	-7.28E-02	1.00E+00							
ln	8.70E-03	-2.60E-01	9.77E-03	-1.64E-02	5.70E-02	1.42E-01	2.84E-02	-2.46E-01	-5.80E-01	-8.53E-03	-7.53E-02	4.89E-01	2.48E-01	9.06E-02	1.00E+00						
lo	-7.96E-03	-1.03E-01	3.62E-01	5.01E-01	1.19E-01	1.73E-01	1.78E-01	3.11E-01	1.21E-01	4.04E-01	6.12E-01	3.45E-01	2.03E-01	4.83E-01	5.46E-02	1.00E+00					
r	2.25E-01	1.75E-01	3.18E-01	1.63E-01	-1.88E-01	-1.05E-01	-1.52E-01	1.83E-01	3.36E-01	3.70E-01	3.18E-01	-1.12E-01	-2.54E-02	3.97E-01	-3.38E-01	2.29E-01	1.00E+00				
	-1.12E-01	6.10E-02	6.93E-01	8.95E-01	1.88E-01	1.99E-01	1.97E-01	8.77E-01	-8.81E-02	-4.81E-02	7.24E-01	8.38E-01	-2.92E-02	1.69E-01	1.25E-01	3.33E-01	4.12E-02	1.00E+00			
n	9.03E-02	-1.92E-02	2.34E-01	1.28E-02	3.84E-01	4.38E-01	4.13E-01	-1.29E-01	1.35E-01	5.48E-02	1.17E-02	1.85E-02	7.10E-01	-1.16E-01	1.29E-01	3.08E-01	3.23E-02	-2.84E-02	1.00E+00		
s	-3.74E-01	-2.27E-02	2.00E-01	1.14E-01	8.75E-01	9.01E-01	8.72E-01	8.14E-02	8.11E-03	1.03E-01	-1.63E-02	2.53E-01	3.05E-01	3.01E-02	7.05E-02	1.04E-01	1.04E-02	2.11E-01	4.12E-01	1.00E+00	
e	-3.14E-01	1.83E-01	2.62E-01	1.38E-01	8.36E-01	7.90E-01	8.42E-01	1.43E-01	2.83E-01	1.95E-01	7.46E-02	-8.69E-03	3.27E-01	-4.63E-02	-3.86E-01	1.37E-01	2.07E-01	1.13E-01	4.22E-01	8.19E-01	1.00E+00

APPENDIX IC
Results
Scenario 2
22.5-66.5° Arc Plume

Relationship bewteen Soil Metal Concentrations and Distance in the 22 to 67 Degree Arc within the Plume
Method 1
Scenario 2

SUMMARY OUTPUT Ni

Regression Statistics	
Multiple R	7.81E-01
R Square	6.09E-01
Adjusted R Square	5.86E-01
Standard Error	1.91E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	9.67E-01	9.67E-01	2.65E+01	8.01E-05
Residual	1.70E+01	6.20E-01	3.65E-02		
Total	1.80E+01	1.59E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	3.16E+00	1.01E-01	3.14E+01	1.69E-16	2.95E+00	3.37E+00	2.95E+00	3.37E+00
dist	-1.13E-04	2.20E-05	-5.15E+00	8.01E-05	-1.59E-04	-6.68E-05	-1.59E-04	-6.68E-05

SUMMARY OUTPUT Co

Regression Statistics	
Multiple R	7.37E-01
R Square	5.44E-01
Adjusted R Square	5.17E-01
Standard Error	1.28E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	3.31E-01	3.31E-01	2.03E+01	3.16E-04
Residual	1.70E+01	2.77E-01	1.63E-02		
Total	1.80E+01	6.08E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.51E+00	6.73E-02	2.25E+01	4.46E-14	1.37E+00	1.65E+00	1.37E+00	1.65E+00
X Variable 1	-6.61E-05	1.47E-05	-4.50E+00	3.16E-04	-9.71E-05	-3.51E-05	-9.71E-05	-3.51E-05

SUMMARY OUTPUT Cu

Regression Statistics	
Multiple R	7.56E-01
R Square	5.71E-01
Adjusted R Square	5.46E-01
Standard Error	1.58E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	5.65E-01	5.65E-01	2.26E+01	1.82E-04
Residual	1.70E+01	4.24E-01	2.49E-02		
Total	1.80E+01	9.89E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.22E+00	8.32E-02	2.67E+01	2.56E-15	2.05E+00	2.40E+00	2.05E+00	2.40E+00
X Variable 1	-8.64E-05	1.82E-05	-4.76E+00	1.82E-04	-1.25E-04	-4.81E-05	-1.25E-04	-4.81E-05

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SUMMARY OUTPUT Cd

Regression Statistics	
Multiple R	4.47E-01
R Square	2.00E-01
Adjusted R Square	1.53E-01
Standard Error	1.72E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.25E-01	1.25E-01	4.24E+00	5.52E-02
Residual	1.70E+01	5.00E-01	2.94E-02		
Total	1.80E+01	6.25E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-4.95E-01	9.04E-02	-5.47E+00	4.12E-05	-6.85E-01	-3.04E-01	-6.85E-01	-3.04E-01
X Variable 1	4.06E-05	1.97E-05	2.06E+00	5.52E-02	-1.00E-06	8.22E-05	-1.00E-06	8.22E-05

SUMMARY OUTPUT Cr

Regression Statistics	
Multiple R	2.74E-01
R Square	7.53E-02
Adjusted R Square	2.09E-02
Standard Error	1.04E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.49E-02	1.49E-02	1.38E+00	2.56E-01
Residual	1.70E+01	1.83E-01	1.08E-02		
Total	1.80E+01	1.98E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.50E+00	5.47E-02	2.74E+01	1.65E-15	1.38E+00	1.61E+00	1.38E+00	1.61E+00
X Variable 1	-1.40E-05	1.19E-05	-1.18E+00	2.56E-01	-3.92E-05	1.11E-05	-3.92E-05	1.11E-05

SUMMARY OUTPUT Pb

Regression Statistics	
Multiple R	4.20E-02
R Square	1.76E-03
Adjusted R Square	-5.70E-02
Standard Error	1.43E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	6.18E-04	6.18E-04	3.00E-02	8.65E-01
Residual	1.70E+01	3.50E-01	2.06E-02		
Total	1.80E+01	3.51E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.62E+00	7.56E-02	2.14E+01	1.01E-13	1.46E+00	1.77E+00	1.46E+00	1.77E+00
X Variable 1	2.86E-06	1.65E-05	1.73E-01	8.65E-01	-3.20E-05	3.77E-05	-3.20E-05	3.77E-05

Relationship bewteen Soil Metal Concentrations and Distance in the 22 to 67 Degree Arc within the Plume
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SUMMARY OUTPUT — Ba

Regression Statistics	
Multiple R	1.50E-01
R Square	2.26E-02
Adjusted R Square	-3.49E-02
Standard Error	1.17E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	5.39E-03	5.39E-03	3.93E-01	5.39E-01
Residual	1.70E+01	2.33E-01	1.37E-02		
Total	1.80E+01	2.39E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.07E+00	6.17E-02	3.36E+01	5.54E-17	1.94E+00	2.20E+00	1.94E+00	2.20E+00
X Variable 1	-8.44E-06	1.35E-05	-6.27E-01	5.39E-01	-3.69E-05	2.00E-05	-3.69E-05	2.00E-05

SUMMARY OUTPUT — Be

Regression Statistics	
Multiple R	2.62E-01
R Square	6.85E-02
Adjusted R Square	1.37E-02
Standard Error	1.04E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.36E-02	1.36E-02	1.25E+00	2.79E-01
Residual	1.70E+01	1.85E-01	1.09E-02		
Total	1.80E+01	1.99E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-4.26E-02	5.50E-02	-7.75E-01	4.49E-01	-1.59E-01	7.34E-02	-1.59E-01	7.34E-02
X Variable 1	-1.34E-05	1.20E-05	-1.12E+00	2.79E-01	-3.88E-05	1.19E-05	-3.88E-05	1.19E-05

SUMMARY OUTPUT — Al

Regression Statistics	
Multiple R	2.57E-01
R Square	6.62E-02
Adjusted R Square	1.13E-02
Standard Error	1.02E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.25E-02	1.25E-02	1.21E+00	2.88E-01
Residual	1.70E+01	1.77E-01	1.04E-02		
Total	1.80E+01	1.89E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.31E+00	5.37E-02	8.02E+01	2.29E-23	4.19E+00	4.42E+00	4.19E+00	4.42E+00
X Variable 1	-1.29E-05	1.17E-05	-1.10E+00	2.88E-01	-3.76E-05	1.19E-05	-3.76E-05	1.19E-05

Relationship bewteen Soil Metal Concentrations and Distance in the 22 to 67 Degree Arc within the Plume
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SUMMARY OUTPUT Ca

Regression Statistics	
Multiple R	3.60E-01
R Square	1.30E-01
Adjusted R Square	7.84E-02
Standard Error	2.82E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	2.01E-01	2.01E-01	2.53E+00	1.30E-01
Residual	1.70E+01	1.35E+00	7.93E-02		
Total	1.80E+01	1.55E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.23E+00	1.48E-01	2.85E+01	8.52E-16	3.92E+00	4.54E+00	3.92E+00	4.54E+00
X Variable 1	-5.15E-05	3.24E-05	-1.59E+00	1.30E-01	-1.20E-04	1.68E-05	-1.20E-04	1.68E-05

SUMMARY OUTPUT Fe

Regression Statistics	
Multiple R	4.53E-01
R Square	2.06E-01
Adjusted R Square	1.59E-01
Standard Error	8.82E-02
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	3.42E-02	3.42E-02	4.40E+00	5.12E-02
Residual	1.70E+01	1.32E-01	7.78E-03		
Total	1.80E+01	1.66E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.40E+00	4.65E-02	9.46E+01	1.38E-24	4.30E+00	4.49E+00	4.30E+00	4.49E+00
X Variable 1	-2.13E-05	1.01E-05	-2.10E+00	5.12E-02	-4.27E-05	1.28E-07	-4.27E-05	1.28E-07

SUMMARY OUTPUT Mg

Regression Statistics	
Multiple R	5.35E-01
R Square	2.87E-01
Adjusted R Square	2.45E-01
Standard Error	1.64E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.84E-01	1.84E-01	6.83E+00	1.82E-02
Residual	1.70E+01	4.58E-01	2.69E-02		
Total	1.80E+01	6.41E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.01E+00	8.64E-02	4.64E+01	2.41E-19	3.83E+00	4.19E+00	3.83E+00	4.19E+00
X Variable 1	-4.93E-05	1.89E-05	-2.61E+00	1.82E-02	-8.91E-05	-9.50E-06	-8.91E-05	-9.50E-06

Relationship bewteen Soil Metal Concentrations and Distance in the 22 to 67 Degree Arc within the Plume
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SUMMARY OUTPUT Mn

Regression Statistics	
Multiple R	1.51E-01
R Square	2.29E-02
Adjusted R Square	-3.45E-02
Standard Error	1.43E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	8.14E-03	8.14E-03	3.99E-01	5.36E-01
Residual	1.70E+01	3.47E-01	2.04E-02		
Total	1.80E+01	3.55E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.67E+00	7.52E-02	3.54E+01	2.23E-17	2.51E+00	2.83E+00	2.51E+00	2.83E+00
X Variable 1	-1.04E-05	1.64E-05	-6.32E-01	5.36E-01	-4.50E-05	2.43E-05	-4.50E-05	2.43E-05

SUMMARY OUTPUT Mo

Regression Statistics	
Multiple R	1.04E-01
R Square	1.08E-02
Adjusted R Square	-4.74E-02
Standard Error	1.53E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	4.37E-03	4.37E-03	1.86E-01	6.72E-01
Residual	1.70E+01	3.99E-01	2.35E-02		
Total	1.80E+01	4.04E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.28E-01	8.07E-02	-1.58E+00	1.33E-01	-2.98E-01	4.28E-02	-2.98E-01	4.28E-02
X Variable 1	-7.60E-06	1.76E-05	-4.31E-01	6.72E-01	-4.48E-05	2.96E-05	-4.48E-05	2.96E-05

SUMMARY OUTPUT Sr

Regression Statistics	
Multiple R	2.80E-01
R Square	7.85E-02
Adjusted R Square	2.43E-02
Standard Error	3.05E-01
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.35E-01	1.35E-01	1.45E+00	2.45E-01
Residual	1.70E+01	1.58E+00	9.29E-02		
Total	1.80E+01	1.71E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.62E+00	1.61E-01	1.01E+01	1.42E-08	1.28E+00	1.95E+00	1.28E+00	1.95E+00
X Variable 1	4.22E-05	3.51E-05	1.20E+00	2.45E-01	-3.18E-05	1.16E-04	-3.18E-05	1.16E-04

Relationship bewteen Soil Metal Concentrations and Distance in the 22 to 67 Degree Arc within the Plume
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SUMMARY OUTPUT V

Regression Statistics	
Multiple R	4.19E-01
R Square	1.75E-01
Adjusted R Square	1.27E-01
Standard Error	7.30E-02
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.93E-02	1.93E-02	3.61E+00	7.45E-02
Residual	1.70E+01	9.07E-02	5.33E-03		
Total	1.80E+01	1.10E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.64E+00	3.85E-02	4.25E+01	1.04E-18	1.56E+00	1.72E+00	1.56E+00	1.72E+00
X Variable 1	-1.60E-05	8.40E-06	-1.90E+00	7.45E-02	-3.37E-05	1.76E-06	-3.37E-05	1.76E-06

SUMMARY OUTPUT Zn

Regression Statistics	
Multiple R	2.76E-01
R Square	7.60E-02
Adjusted R Square	2.16E-02
Standard Error	8.09E-02
Observations	1.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	9.15E-03	9.15E-03	1.40E+00	2.53E-01
Residual	1.70E+01	1.11E-01	6.54E-03		
Total	1.80E+01	1.20E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.05E+00	4.26E-02	4.82E+01	1.28E-19	1.96E+00	2.14E+00	1.96E+00	2.14E+00
X Variable 1	1.10E-05	9.30E-06	1.18E+00	2.53E-01	-8.63E-06	3.06E-05	-8.63E-06	3.06E-05

SUMMARY OUTPUT As

Regression Statistics	
Multiple R	5.94E-01
R Square	3.52E-01
Adjusted R Square	3.12E-01
Standard Error	9.97E-02
Observations	1.80E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	8.65E-02	8.65E-02	8.70E+00	9.41E-03
Residual	1.60E+01	1.59E-01	9.94E-03		
Total	1.70E+01	2.45E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	8.69E-01	5.59E-02	1.55E+01	4.49E-11	7.51E-01	9.88E-01	7.51E-01	9.88E-01
X Variable 1	-3.52E-05	1.19E-05	-2.95E+00	9.41E-03	-6.05E-05	-9.91E-06	-6.05E-05	-9.91E-06

Relationship bewteen Soil Metal Concentrations and Distance in the 22 to 67 Degree Arc within the Plume
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SUMMARY OUTPUT Se

Regression Statistics	
Multiple R	3.66E-01
R Square	1.34E-01
Adjusted R Square	7.99E-02
Standard Error	2.03E-01
Observations	1.80E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.02E-01	1.02E-01	2.48E+00	1.35E-01
Residual	1.60E+01	6.60E-01	4.12E-02		
Total	1.70E+01	7.62E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.65E-01	1.14E-01	1.45E+00	1.67E-01	-7.68E-02	4.06E-01	-7.68E-02	4.06E-01
X Variable 1	-3.82E-05	2.43E-05	-1.57E+00	1.35E-01	-8.98E-05	1.33E-05	-8.98E-05	1.33E-05

APPENDIX 2
Regression Soil Chemical Concentrations versus Soil Industrial Source Indicator Chemical Concentrations
Inco Refinery as the Assumed Industrial Source

APPENDIX 2A
Data Set

site	year	use	dist	dir	Ba	Be	Ni	Co	Cu
MOLAR MASS					137.33	9.01218	58.7	58.9332	63.546
1	1998	res	372	318	120	0.7	4250	195	325
2	1998	boul	463	301	105	0.6	1400	33.5	165
3	1998	res	442	275	39	0.5	1650	31	150
4	1998	res	675	342	210	1	2050	39	205
5	1998	boul	852	332	120	0.9	585	19.5	115
6	1998	res	1083	329	82	0.6	560	16	81
7	1998	boul	882	6	67	0.5	210	9.4	45
8	1998	res	1130	5	108	0.6	595	18.5	79
9	1998	res	908	16	104	0.6	2250	56	240
10	1998	boul	1387	32	55	0.5	21	5.1	17
11	1998	school	2072	51	130	1	980	25.5	125
12	1998	row	3396	30	160	1.1	78	14	30
14	1998	res	1030	113	54	0.5	585	17.5	69
15	1998	row	2134	83	92	0.6	1400	42.5	165
16	1998	res	2930	87	140	1	310	11	51
17	1998	row	245	243	39	0.5	520	14	56
19	1998	row	6557	33	79	0.7	104	9.1	22
20	1998	lawn	4593	91	130	1	130	12	29
23	1998	row	5457	3	110	1	50	14.5	20
24	1998	boul	304	323	99	0.6	5050	105	350
25	1998	boul	1043	338	80	0.6	270	12.5	63
26	1998	boul	926	299	110	0.8	215	9.5	55
27	1998	boul	1279	306	39	0.5	15	4.3	19
28	1998	row	364	185	51	0.5	940	33.5	180
29	1998	boul	1278	337	91	0.6	470	21	160
30	1998	lawn	3602	289	86	0.7	65	8.2	26
31	1998	row	2450	8	76	0.6	66	6.9	27
32	1998	park	2654	357	105	1.1	155	8.6	34
33	1998	park	1991	341	140	1	160	13	32
34	1998	boul	1215	293	125	1	175	9.4	72
35	1998	park	3308	287	190	0.8	185	15.5	39
36	1998	park	1755	314	87	0.7	125	10.5	28
37	1998	park	1253	275	63	0.5	1100	22.5	96
38	1998	boul	2013	288	64	0.6	58	5.6	35
39	1998	res	9547	276	59	0.5	18	4.5	15
40	1998	lawn	9438	262	99	0.7	30	8.1	18
41	1998	row	6114	264	91	0.7	37	8	19
42	1998	res	4465	268	42	0.5	23	4.9	9
43	1998	row	2244	107	47	0.5	580	13	63
44	1998	res	6206	89	67	0.6	74	6.3	18
45	1998	row	9522	93	83	0.7	46	5.9	26
46	1998	row	10254	81	105	0.8	31	9.5	21
47	1998	res	7131	78	66	0.5	63	6	20
48	1998	lawn	6244	77	105	0.8	115	8.9	25
49	1998	res	4868	71	100	0.7	130	8.5	34
50	1998	res	3192	66	92	0.8	145	9.7	38
51	1998	res	1973	42	115	0.8	2750	51.5	275

site	year	use	dist	dir	Ba	Be	Ni	Co	Cu
MOLAR MASS					137.33	9.01218	58.7	58.9332	63.546
52	1998	lawn	3058	294	86	0.8	74	9	22
53	1998	lawn	4527	286	74	0.6	54	7.5	17
54	1998	row	6224	281	115	0.9	38	9.7	22
55	1998	res	7933	278	140	0.7	41	6.1	28
56	1998	res	9818	288	91	0.5	20	8.2	17
58	1998	res	5305	300	100	0.8	48	8.9	20
59	1998	res	4487	319	98	0.8	89	8.5	29
60	1998	res	3571	338	74	0.6	92	7.4	21
61	1998	res	3576	11	96	0.8	190	9.6	35
62	1998	res	5602	55	87	0.6	345	13	56
63	1998	cemet	5292	50	67	0.6	305	12.5	46
64	1998	lawn	6361	57	120	0.9	115	9.1	33
65	1998	res	7040	63	65	0.5	195	9.3	35
66	1998	res	8295	65	66	0.5	77	5.3	19
67	1998	res	9516	68	93	0.7	78	10	20
68	1998	res	11265	73	92	0.6	68	8.5	19
69	1998	res	11911	63	110	1	65	13.5	23
70	1998	res	10747	52	115	0.9	97	11	30
71	1998	res	7587	44	91	0.7	83	7	19
72	1998	res	5894	21	81	0.9	73	8.1	23
73	1998	lawn	4939	345	140	1.1	195	12.5	50
74	1998	res	6872	330	110	0.8	38	10.4	33
75	1998	res	7579	321	140	1.2	44	11	47
76	1998	res	8640	305	20	0.5	20	7.3	17
77	1998	res	10824	296	87	0.5	24	7.3	22
78	1998	row	11373	308	71	0.5	17	6.3	15
79	1998	row	10218	315	98	0.6	24	9.7	25
80	1998	res	8825	325	89	0.5	33	7.4	21
81	1998	res	7795	344	86	0.5	29	7.4	17
82	1998	res	7603	10	105	0.9	55	9.6	21
83	1998	res	8085	21	240	0.8	55	10.5	34
84	1998	lawn	8736	31	130	1	69	11	30
85	1998	res	9911	40	90	0.7	96	10.5	23
86	1998	res	11331	47	140	1	52	15	28
87	1998	res	13009	55	96	0.8	69	10.5	23
88	1998	row	13274	45	82	0.6	48	6.7	26
89	1998	res	11406	35	110	0.6	42	6.2	25
90	1998	res	9879	21	145	1.1	42	10	38
91	1998	res	9385	11	130	0.9	49	6.4	27
150	1998	res	1745	21	225	0.8	3900	74.5	355
151	1998	woodl	2351	19	120	0.9	1500	29	160
157	1998	res	1749	21	99	0.7	1100	27	140
158	1998	tilled	1775	23	140	1	1100	22.5	130
159	1998	lawn	7665	29	94	0.6	103	8.1	30
160	1998	untilled	7695	29	120	0.8	140	12.5	39
161	1998	tilled	7594	30	115	0.9	82	9.3	29
162	1998	row	4601	26	70	0.5	110	6.1	25

site	year	use	dist	dir	Ba	Be	Ni	Co	Cu
MOLAR MASS					137.33	9.01218	58.7	58.9332	63.546
163	1998	tilled	4604	26	89	0.6	105	6.4	24
164	1998	res	11360	36	130	0.7	51	6.6	27
165	1998	tilled	11356	36	105	0.8	42	9.7	17
170	1999	row	3621	260	24.5	0.5	185	6	21
171	1999	row	3260	267	85	0.7	115	8	36
172	1999	vaclot	3091	249	30	0.5	110	5	20
173	1999	vaclot	2527	263	35.5	0.5	43	5	11
174	1999	res	2311	271	92.5	0.8	91	8	26
175	1999	res	1879	278	93	0.7	103	9	26
176	1999	park	1374	274	87.5	0.5	20	5	42
177	1999	lawn	818	269	105	0.8	430	14	69
178	1999	woodlot	2946	280	115	1	145	12	31
179	1999	res	2637	283	81	0.8	83	7	19
180	1999	school	1727	291	88.5	0.7	70	10	21
181	1999	boul	1504	291	71	0.7	92	7	25
182	1999	lawn	1331	344	130	1.1	350	16	63
183	1999	boul	1295	23	99	0.6	1050	30	135
184	1999	row	1471	58	125	1	1250	33	170
185	1999	woodlot	3927	105	45.5	1	120	5	19
186	1999	woodlot	5080	131	155	1.1	320	11	63
187	1999	res	1826	351	110	0.9	370	17	55
188	1999	woodlot	1850	14	150	1.2	550	21	81
189	1999	res	2271	360	110	0.9	180	13	42
190	1999	boul	2722	28	130	1.1	490	18	70
191	1999	res	3229	41	100	0.8	285	14	48
192	1999	field	3801	50	110	0.8	430	14	57
193	1999	field	4506	56	94	0.6	265	10	44
194	1999	woodlot	5104	64	110	0.6	535	17	66
195	1999	woodlot	5879	67	130	0.9	195	16	32
196	1999	woodlot	11941	91	48.5	1.1	43	7	27
197	1999	boul	3496	348	140	1.1	290	11	49
198	1999	row	3341	357	66	0.5	145	8	58
199	1999	row	3659	20	98.5	0.8	180	10	39
200	1999	woodlot	4465	41	170	1.3	525	17	89
201	1999	lawn	5060	48	110	0.7	305	14	50
202	1999	lawn	5017	335	99	0.7	105	9	27
203	1999	lawn	4581	343	90	0.7	71	8	28
204	1999	res	6016	347	120	0.8	91	10	42
205	1999	row	4997	351	89	0.7	65	8	18
206	1999	park	5647	356	97.5	0.9	185	13	40
207	1999	boul	3928	359	93.5	0.9	255	12	64
208	1999	row	4268	17	155	1.2	130	18	30
209	1999	row	4772	26	120	1	165	15	33
210	1999	field	5246	34	59.5	0.7	340	11	48
211	1999	field	5992	38	76	0.5	160	8	42
212	1999	field	6305	46	150	1.1	215	16	41
213	1999	woodlot	7521	56	150	0.8	330	14	52

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
MOLAR MASS		26.98154	112.41	40.08	51.996	55.847	207.2	24.305	54.938
1	1998	11500	0.9	27500	26	27000	155	12500	485
2	1998	9750	1	64000	21	21500	130	34500	560
3	1998	2700	0.2	27500	15	29500	57	6600	585
4	1998	20000	2.5	20500	54	22500	108	7950	405
5	1998	17000	1.1	17000	24	21500	64	9150	280
6	1998	12500	4.4	14000	19	18500	73	7400	415
7	1998	12000	0.7	18000	20	15500	32	9500	310
8	1998	14000	0.9	31500	23	17000	62	5700	325
9	1998	13000	0.6	13000	20	17500	59	5400	415
10	1998	6500	0.2	29000	12	12500	9	5800	460
11	1998	22500	0.3	8500	31	30500	32	6750	580
12	1998	24000	0.3	34500	31	31000	19	13500	555
14	1998	8950	0.3	15500	17	15000	29	6250	245
15	1998	15000	0.9	9200	21	16500	48	3750	235
16	1998	23500	1	6150	28	15500	26	4950	190
17	1998	9350	0.4	6650	12	14500	27	3250	195
19	1998	17500	0.4	5000	22	20000	25	5150	445
20	1998	23500	0.6	4650	28	18500	27	5500	235
23	1998	24500	0.3	6900	32	28000	22	6350	715
24	1998	9900	0.2	29000	21	22500	98	12500	465
25	1998	12500	1.1	25500	21	17000	73	12000	365
26	1998	15500	0.9	23000	24	14000	79	11000	275
27	1998	5550	0.2	39500	12	12000	15	13500	455
28	1998	7500	0.6	19000	14	16500	57	7900	345
29	1998	10350	0.5	45000	34	17500	170	20000	530
30	1998	17000	0.7	9900	22	19000	53	6750	510
31	1998	13500	0.5	16500	21	16500	50	10400	360
32	1998	23000	0.8	7950	28	18000	37	5600	245
33	1998	25500	0.7	6300	30	29500	22	5300	460
34	1998	18500	1.1	22000	27	15000	78	10500	260
35	1998	16500	1.8	5750	39	21000	62	5450	650
36	1998	16500	0.6	7350	24	20500	32	5150	435
37	1998	4550	0.5	7300	14	15000	86	2800	270
38	1998	11000	0.6	16500	22	14000	29	6950	430
39	1998	11500	0.3	10350	15	14000	46	6200	330
40	1998	15500	0.5	2700	22	20000	22	12500	495
41	1998	15000	0.4	8500	20	18000	48	6350	670
42	1998	9550	0.3	7200	14	14500	21	3750	250
43	1998	7600	0.3	19500	16	17500	24	7550	260
44	1998	14500	0.5	4150	17	11500	27	2800	158
45	1998	16500	0.9	5950	21	19500	36	4050	485
46	1998	18000	0.8	23500	22	18500	34	7100	400
47	1998	11000	0.4	9000	15	13500	52	5150	265
48	1998	19000	0.3	5450	24	22500	36	5050	330
49	1998	18000	0.6	16000	23	20000	50	10500	320
50	1998	17000	0.6	6250	24	19500	27	5150	370
51	1998	18500	0.4	7650	26	21000	54	5450	365

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
MOLAR MASS		26.98154	112.41	40.08	51.996	55.847	207.2	24.305	54.938
52	1998	15000	0.5	4950	20	18000	58	4100	615
53	1998	16500	0.7	5050	23	20000	36	4800	205
54	1998	18500	0.5	9000	24	23000	30	6550	620
55	1998	20000	0.5	15500	24	15500	61	6450	230
56	1998	14500	0.2	22000	21	15000	16	8800	300
58	1998	17500	0.5	7500	23	21000	28	6600	440
59	1998	16500	0.9	12000	22	18500	80	6000	560
60	1998	16000	0.4	5800	20	17000	23	4150	235
61	1998	19250	0.4	15000	24	19500	30	9750	340
62	1998	14000	0.7	7450	21	19000	101	4800	440
63	1998	14500	0.5	5000	18	19000	38	5000	590
64	1998	22500	1	5400	27	21000	25	5150	405
65	1998	11500	0.4	13500	17	14500	62	5400	345
66	1998	13000	0.3	15000	16	13500	23	5050	190
67	1998	20000	0.5	6800	26	25000	102	5750	440
68	1998	16500	0.6	4450	21	18500	43	4050	495
69	1998	21500	0.3	12500	29	28000	27	8300	525
70	1998	24000	0.6	7600	30	26500	46	5950	330
71	1998	15000	0.4	6100	21	12000	21	3950	165
72	1998	22000	0.3	6750	37	24000	22	5200	270
73	1998	23500	1.2	12000	32	23000	45	7100	525
74	1998	18000	0.9	17500	24	18500	32	5450	430
75	1998	24500	1.3	6750	34	15000	28	4650	255
76	1998	13500	0.2	21000	23	14000	20	6450	280
77	1998	13000	0.2	18000	21	14500	91	6700	355
78	1998	15000	0.2	19000	20	16000	62	9750	270
79	1998	17500	0.2	42000	25	20000	25	11500	515
80	1998	14500	0.2	20000	21	16500	19	8900	375
81	1998	16500	0.4	12500	22	17500	26	5300	355
82	1998	18500	0.5	16500	27	21500	30	7000	395
83	1998	18000	1	26000	30	24000	210	9250	470
84	1998	24500	0.4	5650	41	28500	24	5600	350
85	1998	20500	0.4	4650	26	23500	29	5200	610
86	1998	25000	0.6	18500	33	30000	34	11000	740
87	1998	20000	0.4	7200	26	25500	32	6400	440
88	1998	16000	0.5	7750	21	16500	36	5000	295
89	1998	17000	0.4	10500	21	17500	58	4350	295
90	1998	23500	0.6	8900	31	26500	42	6150	385
91	1998	25500	0.8	6100	32	16000	56	4350	310
150	1998	14000	0.2	11500	26	22000	380	4750	910
151	1998	24500	0.5	4600	28	16000	62	3450	220
157	1998	16000	1	6000	23	20000	100	4400	400
158	1998	24500	0.2	32250	33	26000	34	5600	465
159	1998	14500	0.4	9850	22	19000	89	5350	320
160	1998	20000	0.8	14000	29	23500	115	9000	455
161	1998	26000	0.4	7300	33	19500	23	6150	235
162	1998	13000	0.3	8000	21	16000	32	5550	260

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
MOLAR MASS		26.98154	112.41	40.08	51.996	55.847	207.2	24.305	54.938
163	1998	15500	0.3	11500	20	17500	27	5550	300
164	1998	18000	0.9	6650	25	19500	69	4050	280
165	1998	23000	0.4	2850	28	28500	17	4950	355
170	1999	3550	0.4	5550	13	13000	28	1150	410
171	1999	14000	0.7	31000	21	15000	45	12000	350
172	1999	3450	0.4	15000	11	12000	27.5	5750	180
173	1999	7400	0.3	10500	12	10000	16	5300	160
174	1999	17000	0.5	10450	23	17000	31.5	5450	310
175	1999	16500	0.5	9150	24.5	18500	35	5200	385
176	1999	6850	0.5	48000	13.5	12500	31.5	9500	520
177	1999	16000	0.7	26500	24.5	18500	76.5	12500	370
178	1999	20500	0.8	12000	32	22500	29	4950	625
179	1999	16500	0.4	9550	21	17000	41	5500	255
180	1999	17000	0.5	6650	22.5	19000	35	4850	420
181	1999	15000	0.6	12500	20.5	16000	39	6900	280
182	1999	23000	0.6	12500	34	27500	43	7700	630
183	1999	13000	0.4	34000	23	17000	63.5	16000	460
184	1999	19500	0.6	27500	29.5	21000	37.5	15500	320
185	1999	12000	0.5	5850	17	9950	19	2300	145
186	1999	24500	1.3	6350	30.5	12000	37.5	3350	155
187	1999	21000	0.7	12000	31	23500	38.5	7000	415
188	1999	26000	0.6	15500	39	24500	47.5	10250	405
189	1999	18000	0.7	15000	29.5	20500	54	7900	350
190	1999	23000	0.7	10250	39	27000	44.5	7650	440
191	1999	16500	0.4	5200	24	22000	29.5	5100	625
192	1999	18500	0.3	2950	26.5	21500	30	4000	450
193	1999	17000	0.3	9400	24	18500	30.5	5500	335
194	1999	17000	0.4	6800	26	14000	39	4600	270
195	1999	19500	0.8	4100	30.5	26500	33.5	4950	725
196	1999	12500	0.5	3850	18.5	19000	26	3750	420
197	1999	26000	0.7	12350	36	17500	40.5	5900	220
198	1999	7400	0.4	95500	18	12500	97.5	50500	415
199	1999	18000	0.4	21000	24.5	19000	29	12500	295
200	1999	30000	1.3	9350	39.5	23000	57.5	6800	200
201	1999	16000	0.4	15500	23.5	20000	40.5	8100	520
202	1999	14500	0.6	46500	23.5	17000	44.5	24000	425
203	1999	18000	0.3	5800	27	20500	21	4850	285
204	1999	17000	0.5	13000	26.5	17500	115	4350	265
205	1999	19500	0.4	4950	25.5	21500	22	4650	275
206	1999	18500	0.9	9400	25.5	18500	45	4450	365
207	1999	14000	0.6	36500	24.5	18500	103.5	20000	450
208	1999	25000	0.4	6300	42	32000	25.5	8100	690
209	1999	20500	0.4	5700	32.5	27500	33.5	6400	595
210	1999	13000	0.6	7050	21	15000	32	3350	590
211	1999	11500	0.4	33500	20.5	15500	44.5	17500	370
212	1999	23000	0.5	7050	33.5	28500	34.5	7450	670
213	1999	19500	0.6	9150	29.5	18000	51	4600	325

site	year	Mo	Sr	V	Zn	As	Se
MOLAR MASS		95.94	87.62	50.9415	65.38	74.9216	78.96
1	1998	0.5	75	33	315	16.1	3.8
2	1998	1.1	175	29	250	12.2	2.2
3	1998	1.1	43	20	215	12.2	1.4
4	1998	0.7	59	43	230	14.4	2.7
5	1998	0.6	85	37	145	5	1.2
6	1998	0.5	33	30	99	5.1	0.8
7	1998	0.5	55	26	90	3.1	0.5
8	1998	0.6	230	32	130	5.5	1.4
9	1998	0.5	41	32	145	14.4	2.4
10	1998	0.5	61	22	35	2.2	0.1
11	1998	0.5	41	50	89	7.6	1.6
12	1998	0.5	105	45	84	3.9	0.1
14	1998	0.5	29	31	65	3.8	0.9
15	1998	0.5	36	31	150	8	3.4
16	1998	0.5	72	40	92	3	0.8
17	1998	0.5	16	26	64	4	0.5
19	1998	0.6	17	39	106	3	0.2
20	1998	0.5	49	42	87	2.8	0.5
23	1998	0.6	51	49	87	4.2	0.3
24	1998	0.6	68	29	255	10.1	2.8
25	1998	0.5	67	30	130	3.5	0.6
26	1998	0.5	81	32	115	3.1	1
27	1998	0.6	100	20	72	1.9	0.1
28	1998	0.6	39	20	160	7.4	2.3
29	1998	1.4	90	29	175	5.6	0.8
30	1998	0.5	36	37	95	4.2	0.3
31	1998	0.5	70	32	101	2.4	0.3
32	1998	0.5	30	42	100	3	0.8
33	1998	0.5	34	47	90	4	0.4
34	1998	0.5	87	37	135	3.7	1.2
35	1998	0.5	18	42	135	7.1	0.5
36	1998	0.5	27	38	125	4.2	0.3
37	1998	0.5	22	21	160	4.9	1
38	1998	0.5	53	25	115	2.4	0.3
39	1998	0.5	27	27	99	2	0.1
40	1998	0.5	72	34	78	3.6	0.2
41	1998	0.5	31	31	105	3.2	0.3
42	1998	0.5	32	31	45	1.8	0.2
43	1998	0.5	35	40	72	5.7	0.8
44	1998	0.5	46	26	65	1.8	0.3
45	1998	0.6	27	37	115	3.8	0.3
46	1998	0.5	175	37	98	2.5	0.2
47	1998	0.5	115	26	98	2.4	0.3
48	1998	0.6	45	42	82	3.4	0.3
49	1998	0.5	101	35	110	4	0.3
50	1998	0.5	25	36	110	3.3	0.4
51	1998	0.7	46	38	150	10.7	2.5

site	year	Mo	Sr	V	Zn	As	Se
MOLAR MASS		95.94	87.62	50.9415	65.38	74.9216	78.96
52	1998	0.5	18	33	92	4.8	0.3
53	1998	0.5	40	36	63	3.1	0.1
54	1998	0.5	31	41	92	4.1	0.3
55	1998	0.5	74	35	125	2.4	0.3
56	1998	0.5	66	32	66	2	0.2
58	1998	0.5	72	38	87	3.5	0.3
59	1998	0.7	36	37	155	3.9	0.4
60	1998	0.5	39	35	66	2.4	0.2
61	1998	0.5	44	40	82	4.1	0.4
62	1998	0.5	65	36	165	4.4	0.8
63	1998	0.7	23	33	130	5.1	0.6
64	1998	0.5	300	37	100	10	1.1
65	1998	0.5	38	30	84	4.2	0.4
66	1998	0.5	57	29	61	2.1	0.1
67	1998	0.5	35	44	104	4.2	0.3
68	1998	0.8	38	39	90	4	0.3
69	1998	0.5	75	46	96	4.2	0.1
70	1998	0.5	52	48	115	4	0.4
71	1998	0.5	35	29	53	1.3	0.1
72	1998	0.9	120	41	104	4.2	0.3
73	1998	0.5	105	47	140	2.9	0.2
74	1998	0.5	100	34	225	3.1	0.3
75	1998	0.5	49	47	150	4.3	0.6
76	1998	0.5	47	30	59	2.2	0.1
77	1998	0.5	42	29	98	3	0.3
78	1998	0.5	62	34	73	2.7	0.1
79	1998	0.5	88	37	94	3.5	0.1
80	1998	0.5	42	33	63	3.3	0.1
81	1998	0.5	36	36	63	3.3	0.1
82	1998	0.5	51	40	78	3.8	0.2
83	1998	0.7	81	37	215	4	0.2
84	1998	2.8	67	42	105	4	0.2
85	1998	0.5	32	42	92	4	0.2
86	1998	0.5	64	47	185	4.4	0.2
87	1998	0.6	47	45	115	3.9	0.3
88	1998	0.5	26	32	99	2.8	0.2
89	1998	0.5	49	32	115	.	.
90	1998	0.8	48	44	115	3.9	0.2
91	1998	0.5	34	40	105	3.1	0.2
150	1998	0.8	38	37	235	.	.
151	1998	0.6	44	41	120	.	.
157	1998	0.9	23	35	140	.	.
158	1998	0.8	23	50	100	.	.
159	1998	0.5	37	32	160	.	.
160	1998	0.7	76	39	275	.	.
161	1998	0.5	59	44	135	.	.
162	1998	0.5	31	30	91	.	.

site	year	Mo	Sr	V	Zn	As	Se
MOLAR MASS		95.94	87.62	50.9415	65.38	74.9216	78.96
163	1998	0.5	32	33	79	.	.
164	1998	0.5	40	33	295	.	.
165	1998	0.5	23	44	90	.	.
170	1999	0.5	14	28	62	2.5	0.3
171	1999	0.5	135	28.5	93.5	5.2	0.7
172	1999	0.5	34	25	66.5	1.3	0.2
173	1999	0.5	35	19.5	58.5	1.5	0.1
174	1999	0.5	36	32	77	3.1	0.4
175	1999	0.5	30	33.5	145	4.2	0.5
176	1999	0.5	105	17	160	1.9	0.1
177	1999	0.6	74	33	140	5.8	1
178	1999	0.5	25	40.5	97	5.8	0.8
179	1999	0.5	26	30.5	81	3	0.4
180	1999	0.5	22	35.5	82.5	3.8	0.2
181	1999	0.5	36	29.5	100	2.9	0.6
182	1999	0.9	67	45	130	6.9	0.8
183	1999	0.6	78	32.5	125	5.9	1.2
184	1999	1.4	170	39.5	135	9	2.4
185	1999	0.5	27	26	72	1.9	0.4
186	1999	0.8	110	38.5	95.5	3.2	1.6
187	1999	0.8	61	40.5	105	4.7	0.8
188	1999	1.3	92	45.5	130	4.9	1
189	1999	0.8	55	41	115	4.7	0.8
190	1999	1.2	39	45.5	125	5.1	0.9
191	1999	0.5	26	36.5	105	4.3	0.4
192	1999	0.5	29	34.5	100	4.6	1
193	1999	0.5	42	33	160	4.2	0.7
194	1999	0.5	215	30	100	5.3	1.4
195	1999	0.9	33	45.5	100	5.3	0.8
196	1999	0.5	32	37.5	97.5	3.5	0.3
197	1999	0.9	165	37.5	180	3.3	0.6
198	1999	1.2	165	23	110	4	0.4
199	1999	0.7	59	36.5	115	3.7	0.4
200	1999	0.7	115	48.5	160	5.3	1.6
201	1999	0.6	104	36.5	98.5	4.1	0.7
202	1999	0.5	195	32	95	3.1	0.3
203	1999	0.9	38	36.5	70.5	2.9	0.1
204	1999	0.7	71	32.5	235	4.2	0.8
205	1999	0.6	37	37.5	66	2.6	0.1
206	1999	0.5	78	36	130	4.2	0.7
207	1999	0.8	79	34	125	4	0.6
208	1999	1.2	42	53	87	4.3	0.1
209	1999	0.9	44	44	94	5.6	0.4
210	1999	0.5	30	30	135	4.6	1
211	1999	0.5	150	28	110	4.1	0.5
212	1999	0.7	140	48	125	5.3	0.6
213	1999	0.8	130	34	130	4.1	0.8

site	year	Mo	Sr	V	Zn	As	Se
MOLAR MASS		95.94	87.62	50.9415	65.38	74.9216	78.96
214	1999	0.7	135	30	79	4.9	1.6
215	1999	0.6	71	40	79.5	3.5	0.5
216	1999	1.1	86	28.5	150	4.5	1.3
217	1999	0.8	94	45.5	135	3.1	0.3
218	1999	0.5	64	35.5	87	3.3	0.3
219	1999	1.2	57	35.5	190	5.3	0.2
220	1999	1.1	34	55	185	6.1	0.7
221	1999	1.1	25	29.5	74	3.1	1.1
222	1999	1.1	45	41.5	120	3.9	0.8
223	1999	1.1	30	57.5	94	5.1	0.4
224	1999	7.2	32	45.5	130	4.7	0.4
225	1999	1.2	33	48.5	99.5	4.9	0.5
226	1999	1.1	32	60	165	6.4	0.4
227	1999	1.1	61	44	105	3.8	0.3
228	1999	0.8	41	45	96	4.2	0.3
229	1999	1.2	78	35.5	135	4.2	0.8
230	1999	0.9	140	46.5	170	9.4	2.5
231	1999	0.5	46	33	110	3.7	0.3
232	1999	0.5	101	29.5	99.5	3	0.3
233	1999	1	105	40	135	4.3	0.5

site	year	use	dist	dir	Ba	Be	Ni	Co	Cu
MOLAR MASS					137.33	9.01218	58.7	58.9332	63.546
214	1999	woodlot	10337	57	125	0.9	170	13	42
215	1999	woodlot	9033	52	115	1	81	14	29
216	1999	field	8338	48	95	0.7	225	11	49
217	1999	res	6181	12	140	1.1	95	15	32
218	1999	res	7097	357	89.5	0.8	72	8	27
219	1999	field	11806	10	130	0.8	60	12	32
220	1999	woodlot	12819	24	150	0.9	75	14	20
221	1999	woodlot	14596	36	105	0.9	102	6	18
222	1999	woodlot	15348	44	145	1.6	93	12	41
223	1999	woodlot	15743	52	105	1.1	71	18	25
224	1999	woodlot	18854	52	110	0.9	78	12	22
225	1999	woodlot	14433	63	100	1	85	14	24
226	1999	field	16218	67	115	1.2	60	18	25
227	1999	woodlot	13595	74	115	0.9	40	12	18
228	1999	lawn	5221	69	88.5	0.9	43	13	15
229	1999	res	2580	56	100.5	0.8	515	19	83
230	1999	woodlot	3896	72	155	1.2	735	24	105
231	1999	school	5591	75	85.5	0.6	71	8	29
232	1999	woodlot	3071	104	88.5	0.9	108	9	31
233	1999	row	4244	342	135	0.6	390	16	67

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
MOLAR MASS		26.98154	112.41	40.08	51.996	55.847	207.2	24.305	54.938
214	1999	15000	0.5	18500	25.5	19500	27.5	5400	365
215	1999	19000	0.6	19000	31	22000	21.5	8000	430
216	1999	13000	0.8	17000	25	14000	42.5	5250	290
217	1999	26500	0.7	12500	43	26000	26.5	7550	375
218	1999	19000	0.5	11950	28.5	17500	35.5	6450	275
219	1999	17000	0.6	21500	35.5	24500	85.5	10250	715
220	1999	22500	0.9	6500	36.5	30000	50.5	4400	1250
221	1999	21000	0.7	2750	24.5	9250	46	2900	126
222	1999	26000	1.3	5300	36	18000	54	4800	370
223	1999	22500	0.6	4750	40.5	35500	39.5	6000	750
224	1999	22000	0.7	5200	37	28500	41	5300	475
225	1999	21500	0.5	4950	36.5	28500	36.5	5650	650
226	1999	24500	0.7	7650	40.5	33500	45	7000	1900
227	1999	20000	0.5	6600	34.5	25000	25	7100	635
228	1999	19000	0.5	2900	29	26500	37.5	5300	675
229	1999	16500	0.4	25500	46	20500	59	13000	445
230	1999	27500	1	8800	36	25000	46.5	5800	405
231	1999	14500	0.6	15000	22.5	18500	46.5	9200	575
232	1999	12000	0.7	19000	22.5	15500	82	9100	270
233	1999	19500	0.4	34500	35.5	23500	60	16500	460

APPENDIX 2B
Results

Relationship between Soil Nickel and other soil metal concentrations
Method 2

SUMMARY OUTPUT Ba

Regression Statistics	
Multiple R	3.77E-01
R Square	1.42E-01
Adjusted R Square	1.10E-01
Standard Error	1.18E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	6.24E-02	6.24E-02	4.46E+00	4.41E-02
Residual	2.70E+01	3.78E-01	1.40E-02		
Total	2.80E+01	4.40E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.67E+00	1.81E-01	9.27E+00	7.07E-10	1.30E+00	2.04E+00	1.30E+00	2.04E+00
Ni	1.36E-01	6.44E-02	2.11E+00	4.41E-02	3.89E-03	2.68E-01	3.89E-03	2.68E-01

SUMMARY OUTPUT Be

Regression Statistics	
Multiple R	8.73E-02
R Square	7.61E-03
Adjusted R Square	-2.91E-02
Standard Error	1.16E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	2.77E-03	2.77E-03	2.07E-01	6.53E-01
Residual	2.70E+01	3.61E-01	1.34E-02		
Total	2.80E+01	3.64E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.82E-01	1.77E-01	-1.03E+00	3.12E-01	-5.44E-01	1.80E-01	-5.44E-01	1.80E-01
Ni	2.87E-02	6.30E-02	4.55E-01	6.53E-01	-1.01E-01	1.58E-01	-1.01E-01	1.58E-01

SUMMARY OUTPUT Co

Regression Statistics	
Multiple R	9.61E-01
R Square	9.24E-01
Adjusted R Square	9.22E-01
Standard Error	6.57E-02
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.42E+00	1.42E+00	3.30E+02	1.15E-16
Residual	2.70E+01	1.16E-01	4.31E-03		
Total	2.80E+01	1.54E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-5.09E-01	1.00E-01	-5.07E+00	2.50E-05	-7.14E-01	-3.03E-01	-7.14E-01	-3.03E-01
Ni	6.50E-01	3.58E-02	1.82E+01	1.15E-16	5.76E-01	7.23E-01	5.76E-01	7.23E-01

Relationship between Soil Nickel and other soil metal concentrations
Method 2

SUMMARY OUTPUT Cu

Regression Statistics	
Multiple R	9.90E-01
R Square	9.80E-01
Adjusted R Square	9.79E-01
Standard Error	3.88E-02
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.96E+00	1.96E+00	1.30E+03	2.30E-24
Residual	2.70E+01	4.07E-02	1.51E-03		
Total	2.80E+01	2.00E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.84E-01	5.93E-02	-3.10E+00	4.51E-03	-3.05E-01	-6.20E-02	-3.05E-01	-6.20E-02
Ni	7.61E-01	2.11E-02	3.60E+01	2.30E-24	7.18E-01	8.05E-01	7.18E-01	8.05E-01

SUMMARY OUTPUT As

Regression Statistics	
Multiple R	8.75E-01
R Square	7.66E-01
Adjusted R Square	7.56E-01
Standard Error	8.07E-02
Observations	2.50E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	4.92E-01	4.92E-01	7.55E+01	1.01E-08
Residual	2.30E+01	1.50E-01	6.52E-03		
Total	2.40E+01	6.42E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-5.16E-01	1.45E-01	-3.56E+00	1.66E-03	-8.16E-01	-2.17E-01	-8.16E-01	-2.17E-01
Ni	4.61E-01	5.31E-02	8.69E+00	1.01E-08	3.51E-01	5.71E-01	3.51E-01	5.71E-01

Relationship between Soil Nickel and other soil metal concentrations
Method 2

SUMMARY OUTPUT Al

Regression Statistics	
Multiple R	4.32E-02
R Square	1.86E-03
Adjusted R Square	-3.51E-02
Standard Error	1.16E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	6.76E-04	6.76E-04	5.04E-02	8.24E-01
Residual	2.70E+01	3.63E-01	1.34E-02		
Total	2.80E+01	3.63E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.21E+00	1.77E-01	2.38E+01	1.17E-19	3.85E+00	4.57E+00	3.85E+00	4.57E+00
Ni	1.42E-02	6.31E-02	2.24E-01	8.24E-01	-1.15E-01	1.44E-01	-1.15E-01	1.44E-01

SUMMARY OUTPUT Cd

Regression Statistics	
Multiple R	2.33E-01
R Square	5.43E-02
Adjusted R Square	1.93E-02
Standard Error	2.06E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	6.56E-02	6.56E-02	1.55E+00	2.24E-01
Residual	2.70E+01	1.14E+00	4.23E-02		
Total	2.80E+01	1.21E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.15E-01	3.14E-01	3.68E-01	7.16E-01	-5.29E-01	7.60E-01	-5.29E-01	7.60E-01
Ni	-1.39E-01	1.12E-01	-1.24E+00	2.24E-01	-3.69E-01	9.04E-02	-3.69E-01	9.04E-02

SUMMARY OUTPUT Ca

Regression Statistics	
Multiple R	1.45E-01
R Square	2.11E-02
Adjusted R Square	-1.52E-02
Standard Error	2.77E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	4.46E-02	4.46E-02	5.81E-01	4.53E-01
Residual	2.70E+01	2.08E+00	7.69E-02		
Total	2.80E+01	2.12E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	3.70E+00	4.23E-01	8.74E+00	2.34E-09	2.83E+00	4.57E+00	2.83E+00	4.57E+00
Ni	1.15E-01	1.51E-01	7.62E-01	4.53E-01	-1.95E-01	4.25E-01	-1.95E-01	4.25E-01

Relationship between Soil Nickel and other soil metal concentrations
Method 2

SUMMARY OUTPUT Cr

Regression Statistics	
Multiple R	2.30E-02
R Square	5.27E-04
Adjusted R Square	-3.65E-02
Standard Error	1.05E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.56E-04	1.56E-04	1.42E-02	9.06E-01
Residual	2.70E+01	2.97E-01	1.10E-02		
Total	2.80E+01	2.97E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.41E+00	1.60E-01	8.82E+00	1.97E-09	1.08E+00	1.74E+00	1.08E+00	1.74E+00
Ni	6.81E-03	5.71E-02	1.19E-01	9.06E-01	-1.10E-01	1.24E-01	-1.10E-01	1.24E-01

SUMMARY OUTPUT Se

Regression Statistics	
Multiple R	8.36E-01
R Square	6.99E-01
Adjusted R Square	6.86E-01
Standard Error	1.36E-01
Observations	2.50E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	9.93E-01	9.93E-01	5.35E+01	1.94E-07
Residual	2.30E+01	4.27E-01	1.86E-02		
Total	2.40E+01	1.42E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.73E+00	2.45E-01	-7.09E+00	3.22E-07	-2.24E+00	-1.23E+00	-2.24E+00	-1.23E+00
Ni	6.55E-01	8.96E-02	7.31E+00	1.94E-07	4.70E-01	8.41E-01	4.70E-01	8.41E-01

Relationship between Soil Nickel and other soil metal concentrations
Method 2

SUMMARY OUTPUT Fe

Regression Statistics	
Multiple R	1.46E-01
R Square	2.14E-02
Adjusted R Square	-1.48E-02
Standard Error	9.22E-02
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	5.03E-03	5.03E-03	5.92E-01	4.48E-01
Residual	2.70E+01	2.30E-01	8.50E-03		
Total	2.80E+01	2.35E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.19E+00	1.41E-01	2.98E+01	3.55E-22	3.90E+00	4.48E+00	3.90E+00	4.48E+00
Ni	3.86E-02	5.02E-02	7.69E-01	4.48E-01	-6.44E-02	1.42E-01	-6.44E-02	1.42E-01

SUMMARY OUTPUT Pb

Regression Statistics	
Multiple R	5.78E-01
R Square	3.34E-01
Adjusted R Square	3.10E-01
Standard Error	1.89E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	4.85E-01	4.85E-01	1.36E+01	1.02E-03
Residual	2.70E+01	9.65E-01	3.57E-02		
Total	2.80E+01	1.45E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	6.28E-01	2.89E-01	2.18E+00	3.85E-02	3.56E-02	1.22E+00	3.56E-02	1.22E+00
Ni	3.79E-01	1.03E-01	3.68E+00	1.02E-03	1.68E-01	5.90E-01	1.68E-01	5.90E-01

SUMMARY OUTPUT Mg

Regression Statistics	
Multiple R	3.81E-02
R Square	1.46E-03
Adjusted R Square	-3.55E-02
Standard Error	1.81E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.29E-03	1.29E-03	3.93E-02	8.44E-01
Residual	2.70E+01	8.86E-01	3.28E-02		
Total	2.80E+01	8.87E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	3.84E+00	2.77E-01	1.39E+01	8.38E-14	3.27E+00	4.40E+00	3.27E+00	4.40E+00
Ni	-1.96E-02	9.86E-02	-1.98E-01	8.44E-01	-2.22E-01	1.83E-01	-2.22E-01	1.83E-01

Relationship between Soil Nickel and other soil metal concentrations
Method 2

SUMMARY OUTPUT Mn

Regression Statistics	
Multiple R	5.70E-02
R Square	3.25E-03
Adjusted R Square	-3.37E-02
Standard Error	1.65E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	2.39E-03	2.39E-03	8.81E-02	7.69E-01
Residual	2.70E+01	7.34E-01	2.72E-02		
Total	2.80E+01	7.36E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.52E+00	2.52E-01	1.00E+01	1.37E-10	2.00E+00	3.04E+00	2.00E+00	3.04E+00
Ni	2.66E-02	8.98E-02	2.97E-01	7.69E-01	-1.58E-01	2.11E-01	-1.58E-01	2.11E-01

SUMMARY OUTPUT Zn

Regression Statistics	
Multiple R	3.84E-01
R Square	1.48E-01
Adjusted R Square	1.16E-01
Standard Error	9.08E-02
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	3.85E-02	3.85E-02	4.68E+00	3.95E-02
Residual	2.70E+01	2.22E-01	8.24E-03		
Total	2.80E+01	2.61E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.81E+00	1.39E-01	1.31E+01	3.39E-13	1.53E+00	2.10E+00	1.53E+00	2.10E+00
Ni	1.07E-01	4.94E-02	2.16E+00	3.95E-02	5.51E-03	2.08E-01	5.51E-03	2.08E-01

Relationship between Soil Nickel and other soil metal concentrations
Method 2

SUMMARY OUTPUT Mo

Regression Statistics	
Multiple R	1.19E-01
R Square	1.41E-02
Adjusted R Square	-2.24E-02
Standard Error	1.47E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	8.40E-03	8.40E-03	3.86E-01	5.40E-01
Residual	2.70E+01	5.87E-01	2.17E-02		
Total	2.80E+01	5.96E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-3.02E-01	2.25E-01	-1.34E+00	1.90E-01	-7.64E-01	1.60E-01	-7.64E-01	1.60E-01
Ni	4.99E-02	8.03E-02	6.21E-01	5.40E-01	-1.15E-01	2.15E-01	-1.15E-01	2.15E-01

SUMMARY OUTPUT Sr

Regression Statistics	
Multiple R	1.88E-01
R Square	3.54E-02
Adjusted R Square	-3.76E-04
Standard Error	3.01E-01
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	8.98E-02	8.98E-02	9.89E-01	3.29E-01
Residual	2.70E+01	2.45E+00	9.08E-02		
Total	2.80E+01	2.54E+00			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.24E+00	4.60E-01	4.87E+00	4.28E-05	1.30E+00	3.18E+00	1.30E+00	3.18E+00
Ni	-1.63E-01	1.64E-01	-9.95E-01	3.29E-01	-5.00E-01	1.73E-01	-5.00E-01	1.73E-01

SUMMARY OUTPUT V

Regression Statistics	
Multiple R	1.88E-01
R Square	3.55E-02
Adjusted R Square	-2.35E-04
Standard Error	7.77E-02
Observations	2.90E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	6.00E-03	6.00E-03	9.93E-01	3.28E-01
Residual	2.70E+01	1.63E-01	6.04E-03		
Total	2.80E+01	1.69E-01			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.45E+00	1.19E-01	1.22E+01	1.65E-12	1.21E+00	1.69E+00	1.21E+00	1.69E+00
Ni	4.22E-02	4.23E-02	9.97E-01	3.28E-01	-4.46E-02	1.29E-01	-4.46E-02	1.29E-01

Relationship between Soil Nickel and other soil metal concentrations
Method 2

Multiple R

	Ba	Be	Ni	Co	Cu	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn	Mo	Sr	V	Zn	As	Se
Ba	1																		
Be	0.71982	1																	
Ni	0.37658	0.08725	1																
Co	0.42674	0.10862	0.96144	1															
Cu	0.39285	0.1119	0.98975	0.96561	1														
Al	0.66351	0.90371	0.04316	0.02134	0.0452	1													
Cd	-0.12547	0.08715	-0.23299	-0.19714	-0.17909	0.09316	1												
Ca	0.06565	-0.07607	0.14511	0.1661	0.20853	-0.18518	-0.0551	1											
Cr	0.6556	0.83313	0.02296	0.04991	0.05597	0.7769	-0.00562	0.17082	1										
Fe	0.54128	0.69209	0.14644	0.21683	0.15952	0.60368	-0.26712	-0.00814	0.59631	1									
Pb	0.36097	-0.09635	0.5783	0.59736	0.5883	-0.2279	-0.07201	0.1158	-0.04145	0.01826	1								
Mg	0.10803	0.17444	-0.03815	0.04794	0.03866	0.05602	-0.04629	0.69018	0.38078	0.27758	-0.0728	1							
Mn	0.00977	-0.01641	0.05702	0.14185	0.02841	-0.24583	-0.57983	-0.00853	-0.07534	0.48878	0.24775	0.09059	1						
Mo	0.36219	0.50062	0.11874	0.17322	0.17752	0.31052	0.12051	0.40351	0.61168	0.34471	0.20275	0.48268	0.05455	1					
Sr	0.31845	0.16338	-0.18802	-0.10505	-0.15234	0.18297	0.33612	0.37014	0.31753	-0.11195	-0.0254	0.39659	-0.33752	0.22856	1				
V	0.69323	0.89516	0.18838	0.19904	0.19696	0.87677	-0.08808	-0.04809	0.72364	0.8385	-0.02919	0.1692	0.12547	0.33272	0.04118	1			
Zn	0.23417	0.01282	0.38435	0.43809	0.41281	-0.12867	0.13495	0.05479	0.01167	0.01851	0.7103	-0.11555	0.12863	0.30767	0.03229	-0.02841	1		
As	0.20001	0.11411	0.8755	0.90055	0.87176	0.08144	0.00811	0.10323	-0.01634	0.25275	0.30459	0.03006	0.07048	0.10363	0.01043	0.21081	0.41204	1	
Se	0.26244	0.13794	0.83615	0.78989	0.84243	0.1432	0.28297	0.19481	0.07461	-0.00869	0.32714	-0.04629	-0.38573	0.13697	0.20703	0.1131	0.42241	0.8186	1

APPENDIX 3
Regression of Soil Chemical Concentrations versus Soil Industrial Source Indicator Chemical Concentrations
The Former Steel Plant as the Assumed Industrial Source

APPENDIX 3A
Data Set

Dataset for the Analysis of the Former Steel Plant

site	year	use	dist-inco	dir	Ba	Be	Ni	Co	Cu
17	1998	row	245	243	39	0.5	520	14	56
24	1998	boul	304	323	99	0.6	5050	105	350
28	1998	row	364	185	51	0.5	940	33.5	180
1	1998	res	372	318	120	0.7	4250	195	325
3	1998	res	442	275	39	0.5	1650	31	150
2	1998	boul	463	301	105	0.6	1400	33.5	165
4	1998	res	675	342	210	1	2050	39	205
177	1999	lawn	818	269	105	0.8	430	14	69
5	1998	boul	852	332	120	0.9	585	19.5	115
26	1998	boul	926	299	110	0.8	215	9.5	55
TP-A	2001	testpit	na	na	100	0.7	241	11	51
TP-A	2001	testpit	na	na	101	0.7	235	11	52
TP-T	2001	testpit	na	na	164	0.6	183	8	40
TP-U	2001	testpit	na	na	139	1.1	164	8	44
TP-V	2001	testpit	na	na	95	0.5	253	10	44
TP14	2001	testpit	na	na	448	4.2	187.5	11	152
TP 13	2001	testpit	na	na	142	0.09	249	16	95
TP11	2001	testpit	na	na	131.5	1.1	1555	43.5	241
TP15	2001	testpit	na	na	107.5	0.6	747.5	20.5	15.5
TP10	2001	testpit	na	na	160.5	1	1240	44	159.5
TP8	2001	testpit	na	na	52.5	0.1	1490	37.5	143
TP17	2001	testpit	na	na	94	0.4	3760	78	426.5
TP9	2001	testpit	na	na	144.5	0.6	4770	95	488

Dataset for the Analysis of the Former Steel Plant

site	year	Al	Cd	Ca	Cr	Fe	Pb	Mg	Mn
17	1998	9350	0.4	6650	12	14500	27	3250	195
24	1998	9900	0.2	29000	21	22500	98	12500	465
28	1998	7500	0.6	19000	14	16500	57	7900	345
1	1998	11500	0.9	27500	26	27000	155	12500	485
3	1998	2700	0.2	27500	15	29500	57	6600	585
2	1998	9750	1	64000	21	21500	130	34500	560
4	1998	20000	2.5	20500	54	22500	108	7950	405
177	1999	16000	0.7	26500	24.5	18500	76.5	12500	370
5	1998	17000	1.1	17000	24	21500	64	9150	280
26	1998	15500	0.9	23000	24	14000	79	11000	275
TP-A	2001	12500	0.6	na	18	21300	104	na	303
TP-A	2001	12700	0.4	na	18	21700	105	na	305
TP-T	2001	11000	1.1	na	15	15100	183	na	318
TP-U	2001	12200	1.2	na	17	16300	110	na	195
TP-V	2001	10000	1.2	na	15	19000	55	na	390
TP14	2001	32950	2.2	na	97	180000	664	na	5510
TP 13	2001	9260	1	na	47	63150	102	na	2460
TP11	2001	8510	1.4	na	21	43650	143	na	961
TP15	2001	13800	1.2	na	21	22800	74	na	458
TP10	2001	16000	1.4	na	22	23050	141	na	467
TP8	2001	2280	1.1	na	11	23450	70	na	763
TP17	2001	3800	2.8	na	34	45280	307	na	785
TP9	2001	6200	3.7	na	30	45400	340	na	718

Dataset for the Analysis of the Former Steel Plant

site	year	Mo	Sr	V	Zn	As	Se	Sb
17	1998	0.5	16	26	64	4	0.5	na
24	1998	0.6	68	29	255	10.1	2.8	na
28	1998	0.6	39	20	160	7.4	2.3	na
1	1998	0.5	75	33	315	16.1	3.8	na
3	1998	1.1	43	20	215	12.2	1.4	na
2	1998	1.1	175	29	250	12.2	2.2	na
4	1998	0.7	59	43	230	14.4	2.7	na
177	1999	0.6	74	33	140	5.8	1	na
5	1998	0.6	85	37	145	5	1.2	na
26	1998	0.5	81	32	115	3.1	1	na
TP-A	2001	0	na	28	120	5.4	1	0.3
TP-A	2001	0	na	28	124	5.4	1	0.3
TP-T	2001	0	na	22	123	4.7	1.1	0.3
TP-U	2001	0	na	29	156	7.4	1	0.6
TP-V	2001	0	na	23	114	6.2	1	0.3
TP14	2001	14.5	na	31	385	18.4	4.6	2.5
TP 13	2001	1.5	na	41	350	40.3	1.9	1.2
TP11	2001	1.5	na	22	288	11.5	2.2	1.4
TP15	2001	1.5	na	28	151	4.9	0.6	0.9
TP10	2001	1.5	na	33	215	8.3	1.9	1.3
TP8	2001	1.5	na	17	215	12	2.4	1.4
TP17	2001	1.5	na	21	615	35.6	3.8	1.3
TP9	2001	1.5	na	26	610	51.9	6.4	1.6

APPENDIX 3B
Results

Comparison of Metals in the Surface Soils to Iron (Indicator Metal for the Former Steel Plant)

Fe:Pb

SUMMARY OUTPUT

Regression Statistics	
Multiple R	8.83E-01
R Square	7.80E-01
Adjusted R Square	7.69E-01
Standard Error	1.65E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	2.03E+10	2.03E+10	7.43E+01	2.45E-08
Residual	2.10E+01	5.73E+09	2.73E+08		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.07E+03	5.02E+03	2.13E-01	8.33E-01	-9.37E+03	1.15E+04	-9.37E+03	1.15E+04
Pb	2.23E+02	2.58E+01	8.62E+00	2.45E-08	1.69E+02	2.76E+02	1.69E+02	2.76E+02

Fe:Co

SUMMARY OUTPUT

Regression Statistics	
Multiple R	3.49E-02
R Square	1.22E-03
Adjusted R Square	-4.63E-02
Standard Error	3.52E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	3.17E+07	3.17E+07	2.56E-02	8.74E-01
Residual	2.10E+01	2.60E+10	1.24E+09		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3.36E+04	9.88E+03	3.40E+00	2.70E-03	1.30E+04	5.41E+04	1.30E+04	5.41E+04
Co	-2.75E+01	1.72E+02	-1.60E-01	8.74E-01	-3.84E+02	3.29E+02	-3.84E+02	3.29E+02

Comparison of Metals in the Surface Soils to Iron (Indicator Metal for the Former Steel Plant)

Fe:Al

SUMMARY OUTPUT

Regression Statistics	
Multiple R	5.71E-01
R Square	3.26E-01
Adjusted R Square	2.94E-01
Standard Error	2.89E+04
Observations	2.30E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	8.47E+09	8.47E+09	1.01E+01	4.46E-03
Residual	2.10E+01	1.75E+10	8.35E+08		
Total	2.20E+01	2.60E+10			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-3.17E+03	1.27E+04	-2.49E-01	8.06E-01	-2.96E+04	2.33E+04	-2.96E+04	2.33E+04
Al	3.04E+00	9.54E-01	3.18E+00	4.46E-03	1.05E+00	5.02E+00	1.05E+00	5.02E+00

Fe:V

SUMMARY OUTPUT

Regression Statistics	
Multiple R	1.22E-01
R Square	1.48E-02
Adjusted R Square	-3.21E-02
Standard Error	3.49E+04
Observations	2.30E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	3.84E+08	3.84E+08	3.15E-01	5.81E-01
Residual	2.10E+01	2.56E+10	1.22E+09		
Total	2.20E+01	2.60E+10			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.48E+04	3.24E+04	4.56E-01	6.53E-01	-5.26E+04	8.22E+04	-5.26E+04	8.22E+04
V	6.26E+02	1.12E+03	5.61E-01	5.81E-01	-1.70E+03	2.95E+03	-1.70E+03	2.95E+03

Comparison of Metals in the Surface Soils to Iron (Indicator Metal for the Former Steel Plant)

Fe:Se

SUMMARY OUTPUT

Regression Statistics	
Multiple R	5.29E-01
R Square	2.80E-01
Adjusted R Square	2.46E-01
Standard Error	2.99E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	7.29E+09	7.29E+09	8.18E+00	9.37E-03
Residual	2.10E+01	1.87E+10	8.91E+08		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	6.35E+03	1.11E+04	5.74E-01	5.72E-01	-1.67E+04	2.94E+04	-1.67E+04	2.94E+04
Se	1.26E+04	4.40E+03	2.86E+00	9.37E-03	3.44E+03	2.18E+04	3.44E+03	2.18E+04

Fe:Be

SUMMARY OUTPUT

Regression Statistics	
Multiple R	8.41E-01
R Square	7.07E-01
Adjusted R Square	6.93E-01
Standard Error	1.91E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	1.84E+10	1.84E+10	5.06E+01	5.15E-07
Residual	2.10E+01	7.63E+09	3.63E+08		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	2.79E+03	5.77E+03	4.84E-01	6.34E-01	-9.21E+03	1.48E+04	-9.21E+03	1.48E+04
Be	3.68E+04	5.17E+03	7.11E+00	5.15E-07	2.60E+04	4.76E+04	2.60E+04	4.76E+04

Comparison of Metals in the Surface Soils to Iron (Indicator Metal for the Former Steel Plant)

Fe:Ni

SUMMARY OUTPUT

Regression Statistics	
Multiple R	3.51E-02
R Square	1.23E-03
Adjusted R Square	-4.63E-02
Standard Error	3.52E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	3.20E+07	3.20E+07	2.59E-02	8.74E-01
Residual	2.10E+01	2.60E+10	1.24E+09		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3.36E+04	9.96E+03	3.37E+00	2.87E-03	1.29E+04	5.43E+04	1.29E+04	5.43E+04
Ni	-7.76E-01	4.82E+00	-1.61E-01	8.74E-01	-1.08E+01	9.26E+00	-1.08E+01	9.26E+00

Fe:Mn

SUMMARY OUTPUT

Regression Statistics	
Multiple R	9.80E-01
R Square	9.61E-01
Adjusted R Square	9.59E-01
Standard Error	6.96E+03
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	2.50E+10	2.50E+10	5.16E+02	2.88E-16
Residual	2.10E+01	1.02E+09	4.84E+07		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	9.76E+03	1.76E+03	5.53E+00	1.72E-05	6.09E+03	1.34E+04	6.09E+03	1.34E+04
Mn	2.98E+01	1.31E+00	2.27E+01	2.88E-16	2.70E+01	3.25E+01	2.70E+01	3.25E+01

Comparison of Metals in the Surface Soils to Iron (Indicator Metal for the Former Steel Plant)

Fe:Zn

SUMMARY OUTPUT

Regression Statistics	
Multiple R	4.79E-01
R Square	2.29E-01
Adjusted R Square	1.92E-01
Standard Error	3.09E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	5.96E+09	5.96E+09	6.24E+00	2.08E-02
Residual	2.10E+01	2.00E+10	9.54E+08		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	6.15E+03	1.24E+04	4.97E-01	6.24E-01	-1.96E+04	3.19E+04	-1.96E+04	3.19E+04
Zn	1.13E+02	4.53E+01	2.50E+00	2.08E-02	1.90E+01	2.08E+02	1.90E+01	2.08E+02

Fe:Cr

SUMMARY OUTPUT

Regression Statistics	
Multiple R	8.87E-01
R Square	7.87E-01
Adjusted R Square	7.77E-01
Standard Error	1.62E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	2.05E+10	2.05E+10	7.77E+01	1.69E-08
Residual	2.10E+01	5.53E+09	2.64E+08		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1.04E+04	5.93E+03	-1.75E+00	9.50E-02	-2.27E+04	1.96E+03	-2.27E+04	1.96E+03
Cr	1.64E+03	1.86E+02	8.81E+00	1.69E-08	1.25E+03	2.03E+03	1.25E+03	2.03E+03

Comparison of Metals in the Surface Soils to Iron (Indicator Metal for the Former Steel Plant)

Fe:As

SUMMARY OUTPUT

Regression Statistics	
Multiple R	3.84E-01
R Square	1.48E-01
Adjusted R Square	1.07E-01
Standard Error	3.25E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	3.84E+09	3.84E+09	3.64E+00	7.02E-02
Residual	2.10E+01	2.22E+10	1.06E+09		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.88E+04	9.90E+03	1.89E+00	7.20E-02	-1.83E+03	3.93E+04	-1.83E+03	3.93E+04
As	1.05E+03	5.49E+02	1.91E+00	7.02E-02	-9.43E+01	2.19E+03	-9.43E+01	2.19E+03

Fe:Cd

SUMMARY OUTPUT

Regression Statistics	
Multiple R	3.92E-01
R Square	1.54E-01
Adjusted R Square	1.14E-01
Standard Error	3.24E+04
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	4.00E+09	4.00E+09	3.82E+00	6.42E-02
Residual	2.10E+01	2.20E+10	1.05E+09		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.35E+04	1.19E+04	1.14E+00	2.68E-01	-1.12E+04	3.81E+04	-1.12E+04	3.81E+04
Cd	1.58E+04	8.06E+03	1.95E+00	6.42E-02	-1.01E+03	3.25E+04	-1.01E+03	3.25E+04

Comparison of Metals in the Surface Soils to Iron (Indicator Metal for the Former Steel Plant)

Fe:Ba

SUMMARY OUTPUT

Regression Statistics	
Multiple R	8.42E-01
R Square	7.10E-01
Adjusted R Square	6.96E-01
Standard Error	1.90E+04
Observations	2.30E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	1.84E+10	1.84E+10	5.13E+01	4.63E-07
Residual	2.10E+01	7.55E+09	3.60E+08		
Total	2.20E+01	2.60E+10			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.20E+04	7.36E+03	-1.62E+00	1.19E-01	-2.73E+04	3.35E+03	-2.73E+04	3.35E+03
Ba	3.56E+02	4.97E+01	7.16E+00	4.63E-07	2.52E+02	4.59E+02	2.52E+02	4.59E+02

Fe:Cu

SUMMARY OUTPUT

Regression Statistics	
Multiple R	1.71E-01
R Square	2.92E-02
Adjusted R Square	-1.71E-02
Standard Error	3.47E+04
Observations	2.30E+01

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00E+00	7.59E+08	7.59E+08	6.31E-01	4.36E-01
Residual	2.10E+01	2.52E+10	1.20E+09		
Total	2.20E+01	2.60E+10			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.54E+04	1.15E+04	2.21E+00	3.81E-02	1.53E+03	4.93E+04	1.53E+03	4.93E+04
Cu	4.51E+01	5.67E+01	7.94E-01	4.36E-01	-7.29E+01	1.63E+02	-7.29E+01	1.63E+02

Comparison of Metals in the Surface Soils to Iron (Indicator Metal for the Former Steel Plant)

Fe:Mo

SUMMARY OUTPUT

Regression Statistics	
Multiple R	9.62E-01
R Square	9.26E-01
Adjusted R Square	9.22E-01
Standard Error	9.57E+03
Observations	2.30E+01

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00E+00	2.41E+10	2.41E+10	2.63E+02	2.40E-13
Residual	2.10E+01	1.93E+09	9.17E+07		
Total	2.20E+01	2.60E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.68E+04	2.22E+03	7.59E+00	1.88E-07	1.22E+04	2.15E+04	1.22E+04	2.15E+04
Mo	1.13E+04	7.00E+02	1.62E+01	2.40E-13	9.89E+03	1.28E+04	9.89E+03	1.28E+04

Comparison of Metals in the Surface Soils to Iron for the Former Steel Plant

Multi R

	Ba	Be	Ni	Co	Cu	Al	Cd	Cr	Fe	Pb	Mn	Mo	V	Zn	As	Se
Ba	1															
Be	0.901268	1														
Ni	-0.11358	-0.18732	1													
Co	-0.08193	-0.13958	0.877048	1												
Cu	0.047642	-0.02882	0.92504	0.777339	1											
Al	0.83236	0.829013	-0.34594	-0.23754	-0.27451	1										
Cd	0.470106	0.268435	0.374099	0.20215	0.576491	0.147215	1									
Cr	0.900602	0.792147	0.000156	-0.00767	0.178576	0.725575	0.499486	1								
Fe	0.84232	0.840601	-0.03508	-0.03492	0.170819	0.570691	0.392189	0.887227	1							
Pb	0.832124	0.788952	0.184421	0.135523	0.396335	0.497408	0.635136	0.796495	0.882919	1						
Mn	0.818561	0.790919	-0.12668	-0.10195	0.06378	0.563533	0.292091	0.875882	0.980262	0.803065	1					
Mo	0.848084	0.905256	-0.09575	-0.09099	0.082074	0.650832	0.329449	0.848407	0.962275	0.856306	0.941153	1				
V	0.391985	0.194442	-0.08156	0.020179	-0.10186	0.601024	0.097438	0.475043	0.121517	0.012273	0.16791	0.075519	1			
Zn	0.294661	0.142186	0.670722	0.520469	0.845701	-0.14161	0.764627	0.454203	0.47873	0.650771	0.394214	0.341665	-0.03532	1		
As	0.188677	-0.04071	0.531867	0.383078	0.692598	-0.22762	0.700457	0.391295	0.384354	0.481649	0.348377	0.199092	0.088189	0.905763	1	
Se	0.430282	0.317755	0.71185	0.618747	0.860242	0.039774	0.734252	0.514464	0.529484	0.716413	0.439843	0.456026	-0.01154	0.878622	0.770498	1