ESTABLISHING THE DISTRIBUTION OF MERCURY, ARSENIC, AND OTHER ELEMENTS WITHIN SOILS AT THE MONTAGUE GOLD DISTRICT, NOVA SCOTIA

Heather Jaggard

Submitted in Partial Fulfilment of the Requirements
for the Degree of Bachelor of Science, Honours
Department of Earth Sciences
Dalhousie University, Halifax, Nova Scotia
April 27, 2007

Dalhousie University

Department of Earth Sciences
Halifax, Nova Scotia
Canada B3H 3J5
(902) 494-2358
FAX (902) 494-6889

DATE: April 23, 07

AUTHOR: Heather Jaggard

TITLE: Establishing the distribution of arsenic, mercury, and other elements within soils at the Montague Gold District, Nova Scotia

Degree: BsC-honours Convocation: May '08 Year: 2008

Permission is herewith granted to Dalhousie University to circulate and to have copied for non-commercial purposes, at its discretion, the above title upon the request of individuals or institutions.

Signature of Author

THE AUTHOR RESERVES OTHER PUBLICATION RIGHTS, AND NEITHER THE THESIS NOR EXTENSIVE EXTRACTS FROM IT MAY BE PRINTED OR OTHERWISE REPRODUCED WITHOUT THE AUTHOR'S WRITTEN PERMISSION.

THE AUTHOR ATTESTS THAT PERMISSION HAS BEEN OBTAINED FOR THE USE OF ANY COPYRIGHTED MATERIAL APPEARING IN THIS THESIS (OTHER THAN BRIEF EXCERPTS REQUIRING ONLY PROPER ACKNOWLEDGEMENT IN SCHOLARLY WRITING) AND THAT ALL SUCH USE IS CLEARLY ACKNOWLEDGED.

ABSTRACT

Analyses of soil profiles at the Montague Gold District, Nova Scotia indicate the presence of elevated levels of mercury and arsenic, as well as other potentially toxic elements within the soils. Elevated arsenic concentrations is a concern in the surrounding environment due to the naturally high levels within the local bedrock as well as the presence of arsenic-rich mine wastes. Mercury was added to the environment as a result of gold extraction methods used during mining activities, and is also a concern. Selection of the profiles for geochemical analyses focused on four locations: (1) up-ice from the gold deposits within the District; (2) down-ice from the deposits within the District; (3) a former stamp mill site within the District; and (4) a background site outside the District, with no known associated mineralization. At each of the four sample sites approximately 10 samples were taken from the surface horizons to a depth of 1 metre. All samples were sieved to two size fractions: <63 μm and 2 mm>x>63 μm for geochemical analysis. In general, the finer fraction shows higher metal (and arsenic) concentrations relative to the coarser fraction. At the mill site, soil arsenic levels are as high as 1900 ppm at a depth of 65 cm, and mercury levels reach 50,000 ppb at the same depth. Down-ice away from the mill site, concentrations remain elevated for arsenic (400 ppm at depths of 55 cm). Up-ice arsenic levels are lower (maximum 50 ppm at a depth of 10 cm), and background levels outside the District range to a high of 15 ppm at a depth of 100 cm. Mercury drops to a maximum of 300 ppb (at a depth of 5 cm) away from the mill site in any direction. The highest concentrations of metals are found within the organic-rich horizons A_0 and A_{00}. Mercury is positively correlated with organic carbon, and also with molybdenum, lead, silver, sulphur, tin, cadmium, vanadium, and sodium. Arsenic shows no correlation with carbon, and has inconsistent correlations with other metals. The higher levels of metals and arsenic at the down-ice location confirms that glacial scouring redistributed higher concentrations of selected elements (in particular arsenic, iron, gold, sulfur, and others) from the mineralized zone in the direction of the advancing ice.

Key words: mercury, arsenic, Montague, gold, Nova Scotia, soil horizon, geochemistry, environment, contamination

TABLE OF CONTENTS

APPENDICES

TABLE OF FIGURES

TABLE OF TABLES

ACKNOWLEDGEMENTS

I would like to thank first and foremost Dr. Anne Marie O'Beirne-Ryan for her continuous support throughout this entire process. Her guidance, encouragement, and patience from day one provided me with the confidence to complete this project.

I would also like to thank Terry Goodwin for all of his support and assistance in the field as well as his contagious enthusiasm for the project. Special thanks to Mike Parsons for his assistance, valuable knowledge in geochemistry, and financial support throughout this project. Thank you also to Bill LeBlanc for his patience and assistance during the hours spent at BIO. Thank you to the Math Department at Dalhousie University, in particular Elizabete Almeida, for her time and patience.

Thank you to my classmates and friends in the Earth Science Department at Dalhousie University who kept me laughing and drove me to accomplish tasks I never thought I could ever achieve.

Finally I would like to thank my parents who have been constantly supportive throughout this entire process. Their endless belief in me has instilled the confidence that I can accomplish anything I set my mind to.

CHAPTER 1: INTRODUCTION

1.1 Statement of Purpose

Gold mining activities within the province of Nova Scotia have left the land encompassing abandoned mining districts contaminated by various potentially toxic elements. The elements associated with contamination of abandoned gold mines in Nova Scotia are primarily mercury (Hg) and arsenic (As). This study examines the concentrations of these elements, as well as other potentially harmful elements, within soils of the Montague Gold District, and assesses the potential for elevated levels of these elements within different soil horizons.

This determination of metal distribution throughout the Montague District is a component of a larger study run by Natural Resources Canada, the Nova Scotia Department of Natural Resources, and other partners. The main goal of this multi-partner study is to characterize the dispersion, transformation, and fate of metals within the environment surrounding abandoned gold mines in Nova Scotia.

1.2 History of Gold Mining in Nova Scotia

Gold mining in Nova Scotia began in the early 1860s shortly after the first identification of gold within the province. The first recorded discovery of gold in the province was made by Capt. C. L'Estrange within the Mooseland area in 1858. It received no public attention until 1860, when John G. Pulsiver discovered the presence of gold in quartz veins in Tangier (Bates, 1987). Figure 1.1 is a posed studio photo of John Pulsiver in 1860.

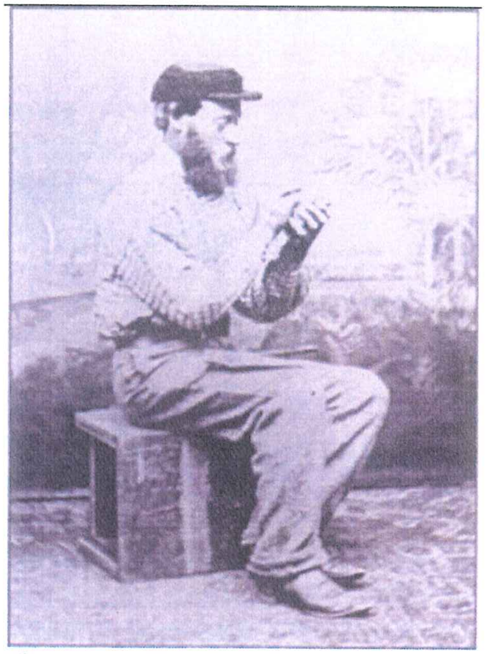


Figure 1.1 The first discovery of gold in quartz at Tangier, Halifax County, Nova Scotia 1860. Courtesy of the Public Archives of Nova Scotia (*in* Bates, 1987).

Further discoveries soon gathered public attention and a gold rush followed after the government's acknowledgement of the deposits (Gregory, 1975). There were 64 mining districts throughout the province between 1862- 1940. The amount of gold mined in Nova Scotia during this time totalled 37 tonnes (Bates, 1987 cited in Smith *et al.,* 2005).

Stamp milling and Hg amalgamation were the primary methods used for gold extraction throughout the mining districts. Stamp milling was the main process used to break the ore extracted from the ground into sand to silt-sized material. This allowed for further processing and extraction of the gold. The Hg amalgamation process extracted free gold by spreading the crushed fine-grained ore over mercury (Hg) coated copper plates. Free gold within the pulp would combine with the Hg to form an amalgam which would be removed from the plates and heated to recover the gold (Smith *et al.,* 2005). The amount of Hg used in the extraction process varies in historical literature. In general, approximately one ounce of Hg was used for every ounce of gold recovered (Phillips, 1867; Richards and Locke, 1940 cited in Smith *et al.*, 2005). Some documents record mines using up to three ounces of Hg to recover one ounce of gold within the crushed pulp (Moggridge Kussisto 1978 cited in Smith *et al.*, 2005). A significant amount of Hg used in this extraction process was lost to the surrounding environment. Approximately 10-25% of the Hg used was lost due to flouring (subdivision of the amalgam into fine particles), evaporative loss during retorting, and careless human handling during processing (Henderson, 1935; EPS, 1978 cited in Smith *et al.*, 2005). Approximately 3700-9300 kg of Hg is thought to have been lost to the surrounding environment during the 1862-1940 mining production within the province of Nova Scotia (Smith *et al.*, 2005).

Most of the gold in Nova Scotia is “free-milling”, or can be easily liberated by crushing. A certain percentage of this gold is bound to sulphide minerals and cannot be liberated by Hg amalgamation. During the 1890s chlorination and cyanide processes came into common use to refine these refractory ores (Eaton, 1978). Like Hg, cyanide and other reagents used during these extraction processes were lost to the surrounding environment.

Jonasson and Boyle (1972) measured natural levels of Hg within Meguma Supergroup rocks (Schenk, 1997). Some of the main sulphide minerals within the Meguma Supergroup include pyrite, arsenopyrite, galena, chalcopyrite, sphalerite, and pyrrhotite (Malcolm, 1929). All of these sulphide minerals contain varying amounts of Hg with concentrations often in excess of 30 mg/kg (30 ppm). Table

1.1 gives the levels measured by Jonasson and Boyle (1972). This suggests that elevated concentrations of Hg found within gold districts, while dominantly related to the mining amalgamation practices, are also potentially elevated as a result of the natural levels within the local bedrock.

Mineral	Hg concentration (mg/kg)
pyrite	0.1-100
arsenopyrite	0.1-3
galena	0.04-70
chalcopyrite	0.1-40
sphalerite	0.1-200
pyrrhotite	0.1-5

Table 1.1 Natural levels of Hg found within sulphide minerals of the Meguma Supergroup (Jonasson and Boyle, 1972).

Arsenic is another toxic element which was added to the surrounding environment during mining production. Arsenic is found naturally occurring within the bedrock largely in the form of arsenopyrite (FeAsS) (Dale and Freedman, 1982). Crushing of the ore during mining practices liberated high levels of As into the surrounding environment via tailings and waste rock piles (Brooks *et al.,* 1982).

1.3 General Geology of the Region

Originating in the Cambrian Period, the metasedimentary rocks of the Nova Scotia Meguma Supergroup are host to most gold bearing deposits within the province (Eaton, 1978; Brooks *et al.,* 1982). The Meguma Supergroup is divided into two main units, the lower Goldenville Group and the overlying conformable Halifax Group. The Goldenville Group is the host rock for gold within the study area and consists of metamorphosed sandstones (metagreywackes), siltstones and minor shales (Smith *et al.*, 2005; Dale and Freedman, 1982; Thompson, 1978). The overlying Halifax Group consists mostly of slates, however, this Group is not found within the Montague District. Figure 1.2 is a geological map of Nova Scotia with the study area indicated (Fisher and Keppie, 2006).

Most gold bearing deposits found within the Goldenville Group are in quartz veins or disseminated forms. Anticlinal folding of the Goldenville is present sub-parallel to the Atlantic coastline and has resulted in quartz vein aggregates in the domes of the anticlines within the slates (Eaton, 1978).

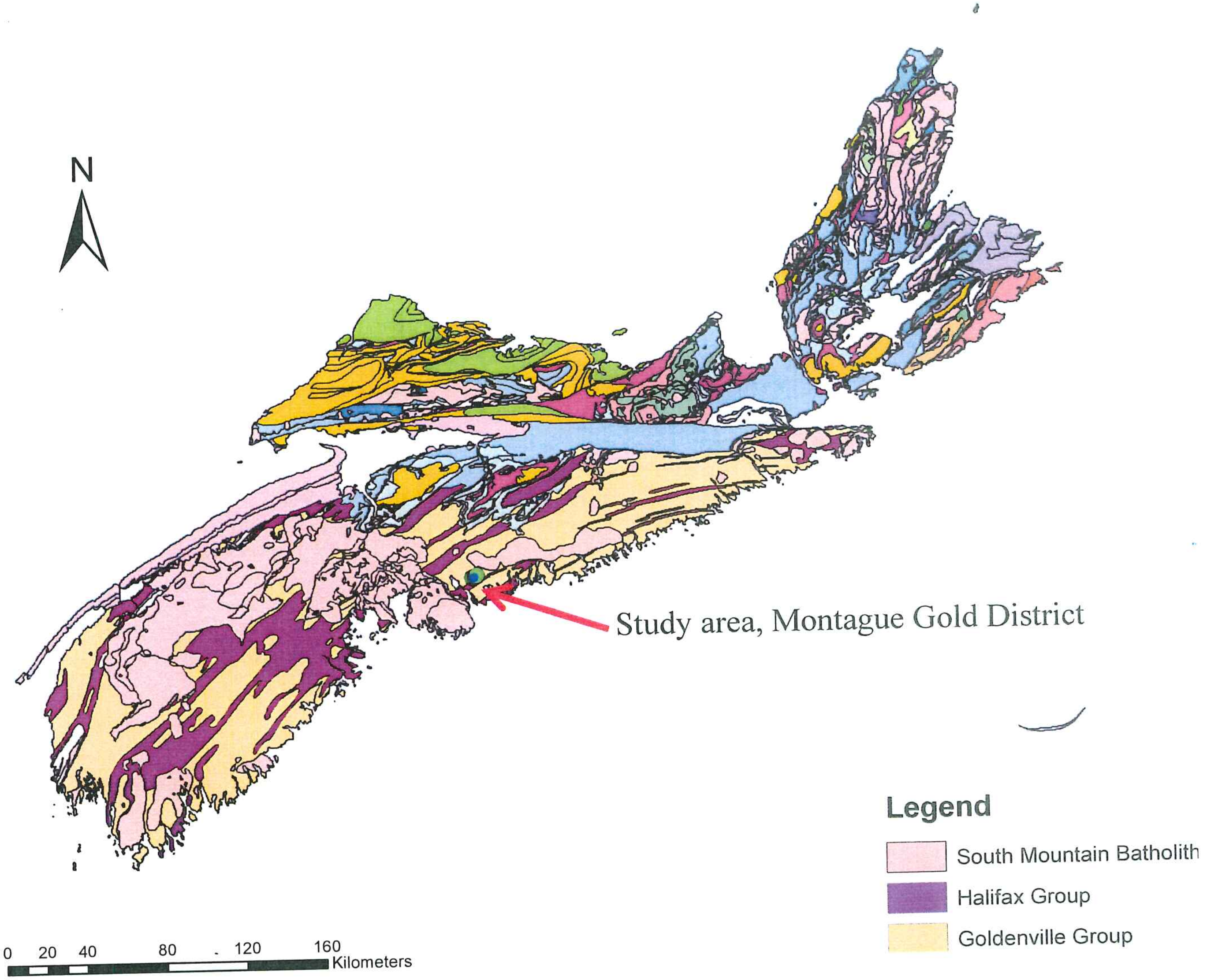


Figure 1.2 Geological map of Nova Scotia with study area indicated. The geological units of significance for the study area are indicated in the legend (Fisher and Keppie, 2006).

1.4 Overview of Mercury and Arsenic Geochemistry

Arsenic and mercury exist naturally within the environment in the atmosphere, water, soils, rocks, plants and animals. Within the Goldenville Group the natural occurrence of As, in the form of arsenopyrite, is widespread. Mercury also occurs naturally in lower concentrations within the local bedrock and surficial till, compared to concentrations of As. Mining practices accelerated the release of naturally occurring As and Hg to the local environment at Montague Gold District, but additional Hg was added during mining processes in gold extraction. Both of these elements can occur in a variety of different forms, determined by a number of factors such as pH and redox conditions. The mobility and toxicity of As and Hg in the environment is determined by these factors.

1.4.1 Mercury

Mercury exists in several physical states and chemical forms under standard environmental conditions. These characteristics contribute to the complexity of Hg interactions within the environment, as outlined below.

Mercury is a heavy metal which is commonly found in three forms in the environment; (1) uncharged elemental mercury (Hg^0), (2) inorganic or divalent mercury (Hg^{2+}), and (3) organic or methyl mercury (CH_3Hg^+) (Ebinghaus *et al.*, 1999; Smith, 1996). Elemental Hg is most commonly found in the atmosphere. It volatizes at ~ 40°C from its liquid state and can travel very long distances in the atmosphere. Inorganic mercury (Hg^{2+}) is commonly found in soils and surface waters. The methylation of inorganic Hg by bacteria in a reducing environment produces the most toxic form of Hg; the organic Hg complex methylmercury (CH_3Hg^+) (Krabbenhoft and Rickert, 1997). The main concern associated with methylmercury is that it can bioaccumulate rapidly through an aquatic food chain (Siegel, 2002). Figure 1.3 shows common transformations of Hg in the environment.

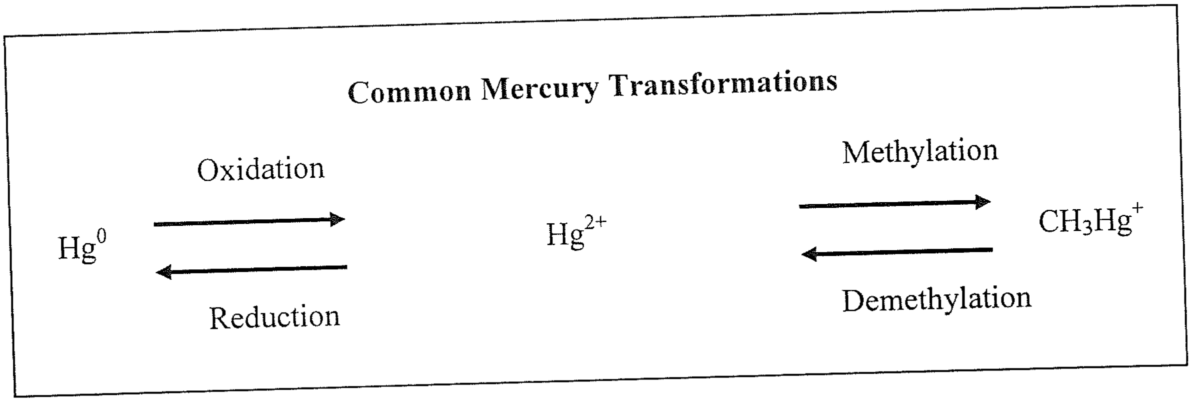


Figure 1.3 Common Hg transformations in the environment

Methylation in water and sediments is affected by the amount of dissolved oxygen present, the amount of sulphur present, the pH of the water and sediment, and the presence of clay and organic material. Oxygen depleted areas, such as swamps, are the most common types of areas for methylation to occur (Smith, 1996).

Hg is a non-essential heavy metal and can cause health problems if it accumulates in certain organs in the human body. Methylmercury (CH_3Hg^+) accumulates in the brain whereas Hg^{2+} tends to have more of an affinity for the kidneys (Siegel, 2002, pg 11). Figure 1.4 is a detailed overview of Hg cycling in a remote watershed (Page, 2001).

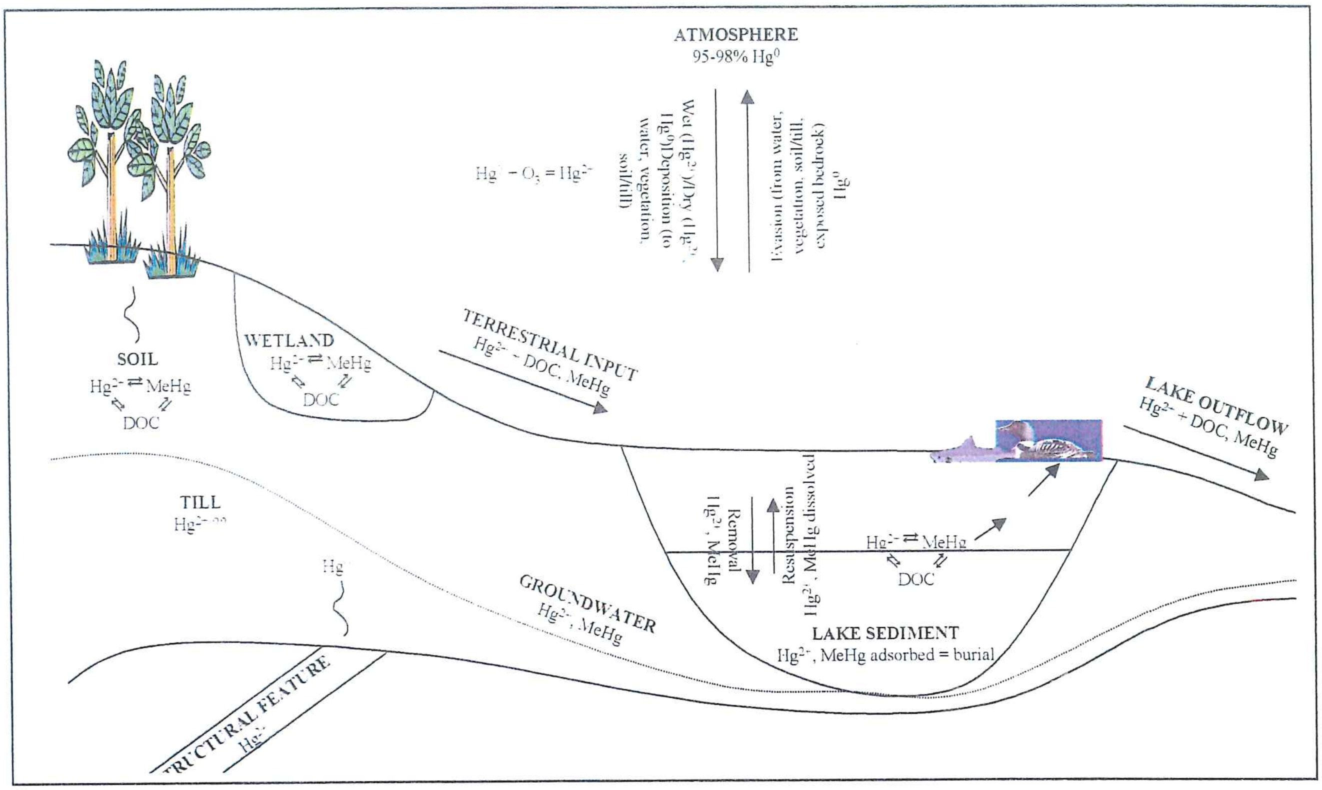


Figure 1.4 Overview of Hg cycling in a remote watershed (DOC – dissolved organic carbon). (Taken from Page, 2001)

1.4.2 Arsenic

Arsenic is found naturally in the environment commonly originating from bedrock and soil in various minerals such as arsenopyrite (FeAsS), niccolite (NiAs), cobaltite (CoAsS), and tennantite ($(Cu, Fe)_{12}As_4S_{13}$) (Boyle and Johasson, 1973 cited in Azcue *et al.,* 1994). Arsenic is a metalloid and has a number of oxidation states which include -3, -1, 0, 3, and 5, but has only one stable isotope, ^{75}As (Plant *et al.,* 2005).

Arsenic is highly toxic and can lead to a variety of health problems in humans. It is carcinogenic, mutagenic, and teratogenic (National Research Council, 1999 cited in Lollar, 2005). Because As is readily soluble under a variety of conditions, it can easily contaminate well water and is easily ingested by humans from airborne particles (Dale and Freedman, 1982). Arsenic can only be obtained by humans through inhalation or ingestion and not by direct contact with the skin.

Arsenic concentrations in the geogenic environment are highest in organic-rich and sulphide-rich shales, sedimentary ironstones, phosphatic rocks, and some coals (Smedley and Kinninburgh, 2002).

Arsenic enters the atmosphere as a result of wind erosion, volcanic emissions, volatilization from soils, marine aerosols, and pollution (Plant *et al.,* 2005). Arsenic-rich minerals can oxidize naturally as a result of mining activity. Oxidation of FeAsS can be described by the reaction:

$$4FeAsS + 13O_2 + 6H_2O = 4Fe^{2+} + 4AsO_4^{3-} + 4SO_4^{2-} + 12H^+$$

This oxidation reaction involves the release of acid, arsenic, and sulphate as acid mine drainage (Plant *et al.*, 2005).

1.5 Format of Thesis

The main focus of this thesis is (a) to determine the concentrations of Hg and As in the various soil horizons of the former Montague Gold District; (b) if possible, to establish with which soil components the Hg and As are associated; (c) to examine the potential for Hg and As contamination of the land at Montague

Gold district as a result of historical mining practices; (d) to determine which metals and/or elements Hg and As tend to be associated within the various horizons sampled throughout the former Gold District; and (e) to establish whether glacial transport was a factor in distributing metals throughout the district.

Chapter 2 of this thesis addresses the history of the Montague Gold district as well as the local geology and environmental impacts of mining. Chapter 3 discusses the techniques and methods used in the sampling and analytical processes. Chapter 4 discusses the results obtained from the carbon and geochemical analysis. Chapter 5 is a discussion on the interpretation of the results and environmental implications for the area, and recommendations for future study, and chapter 6 is a brief summary of the main conclusions of the study.

CHAPTER 2: MONTAGUE GOLD DISTRICT

2.1 History of the Montague Gold District

The Montague Gold District was proclaimed in 1863 after exploration efforts discovered an elevated even distribution of gold throughout the quartz veins within the area (Harrington and McKenzie, 1927). Mining of the District continued until 1940 with a total estimated amount of 65,196.9 oz gold extracted during this time (Bates 1987). Figure 2.1 is a photo taken of the active mining district in 1925 (Gregory, 1975).

Figure 2.1 Montague Gold Mine, building and waste rock dumps (Photo circa 1925).

Throughout the years of operation, ownership was transferred and various companies joined the mining effort for varying amounts of time. At times, shafts were abandoned, mining efforts ceased and little or no record of extraction was reported. At other times, large returns and rich ore were reported by a number of companies throughout the history of the District (Harrington and McKenzie, 1927).

The Montague District today shows various signs of once being an active mining community. Waste rock piles are metres in height along the road sides and in clear view, while vegetation has not yet covered the tailings leaving them also in plain sight. Figure 2.2 shows the tailings visible today, over 65 years after mining operations have ceased. The stamp mill structures are no longer standing, but cement foundations can be picked out within the new-growth forest of the area. An example of a foundation which can be seen today is shown in Figure 2.3. A significant amount of money has been spent by the Nova Scotia Department of Natural Resources to fence off old mine shafts within the District (Parsons, 2006). These fenced-off shafts can be observed within areas of Crown land across the District (Fig. 2.4).

Figure 2.2 Tailings in Montague District (Photo taken by H. Jaggard, Fall 2006).

Figure 2.3 The remnants of a former stamp mill which is now surrounded by new-growth forest (Photo taken by H. Jaggard, Fall 2006).

Figure 2.4 Fenced off abandoned mine shafts located on Crown land within the former Montague Gold District (Photo taken by H. Jaggard, Fall 2006).

2.2 Geology of the Montague Gold District

The bedrock geology of the Montague Gold District consists of the Goldenville Group greywackes/meta-sandstones and slates (Eaton, 1978; Schenk, 1997). Figure 2.5 is a location map of the Montague District within the Goldenville Group of the Meguma Supergroup (Schenk, 1997).

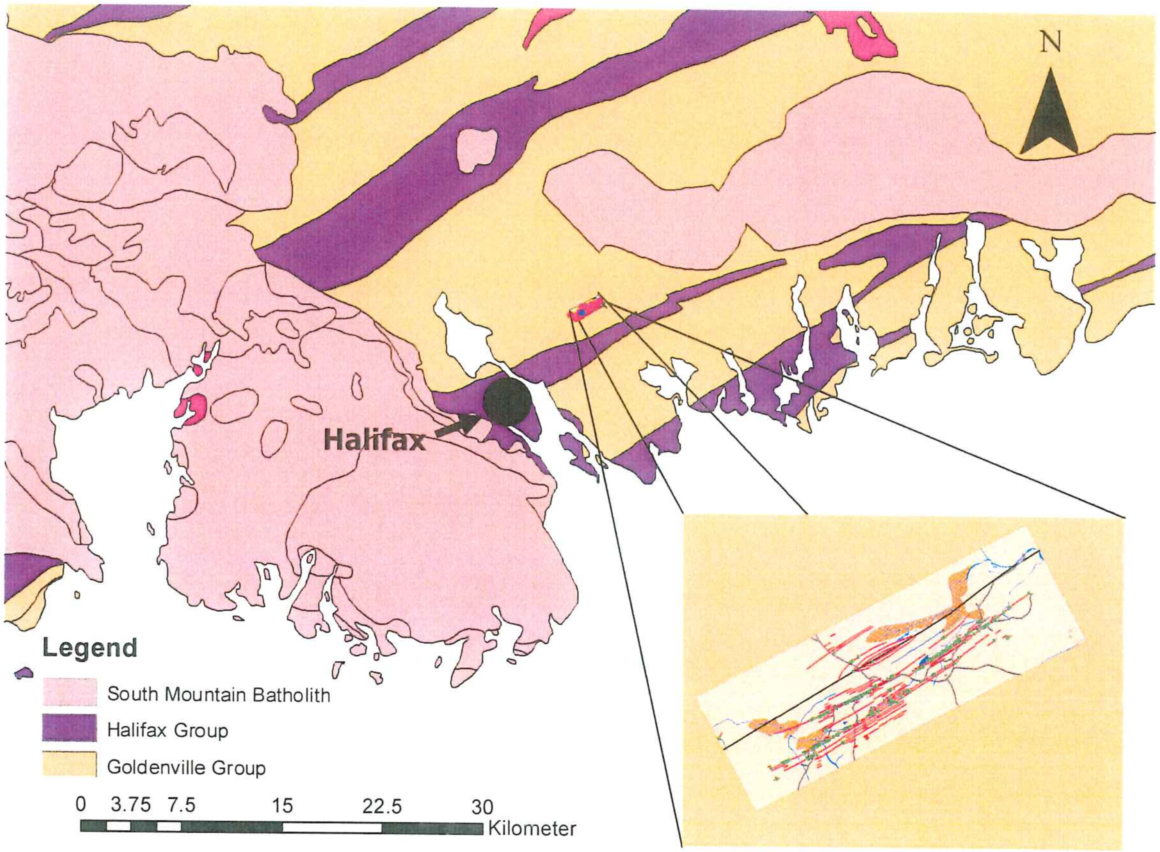


Figure 2.5 Location map of the Montague Gold District in relation to Halifax.

Montague District, along with most gold districts within the province, show evidence of shear cleavage development within the host rocks. Well-developed mineral lineations are evident within these cleavage planes (Smith *et al.*, 2005). This cleavage post-dates regional metamorphism and plutonism (Smith *et al.*, 1985; Smith and Kontak, 1988).

Gold deposits found throughout the Meguma Supergroup are associated with major fold structures (Malcolm, 1929 cited in Smith *et al.*, 2005). Quartz veins are documented to have been formed prior to folding and continuing until after 370-360 Ma granitic intrusion (Clarke *et al.*, 1988; Clarke and Halliday, 1980; Reynolds *et al.*, 1981, 1987). The anticlinal fold at Montague District is the main structural feature of the District and is host to the quartz veins and gold deposits.

Faribault's 1902 geological maps have been incorporated into a GIS database through DNR, Halifax. Figure 2.6 is a GIS version of Faribault's 1902 geological map of the Montague Gold District (Fisher and Keppie, 2006 after Faribault, 1902). The location of the main anticlinal hinge, quartz veins, former shafts, tailings and rivers within the district are some of the features shown in Figure 2.6.

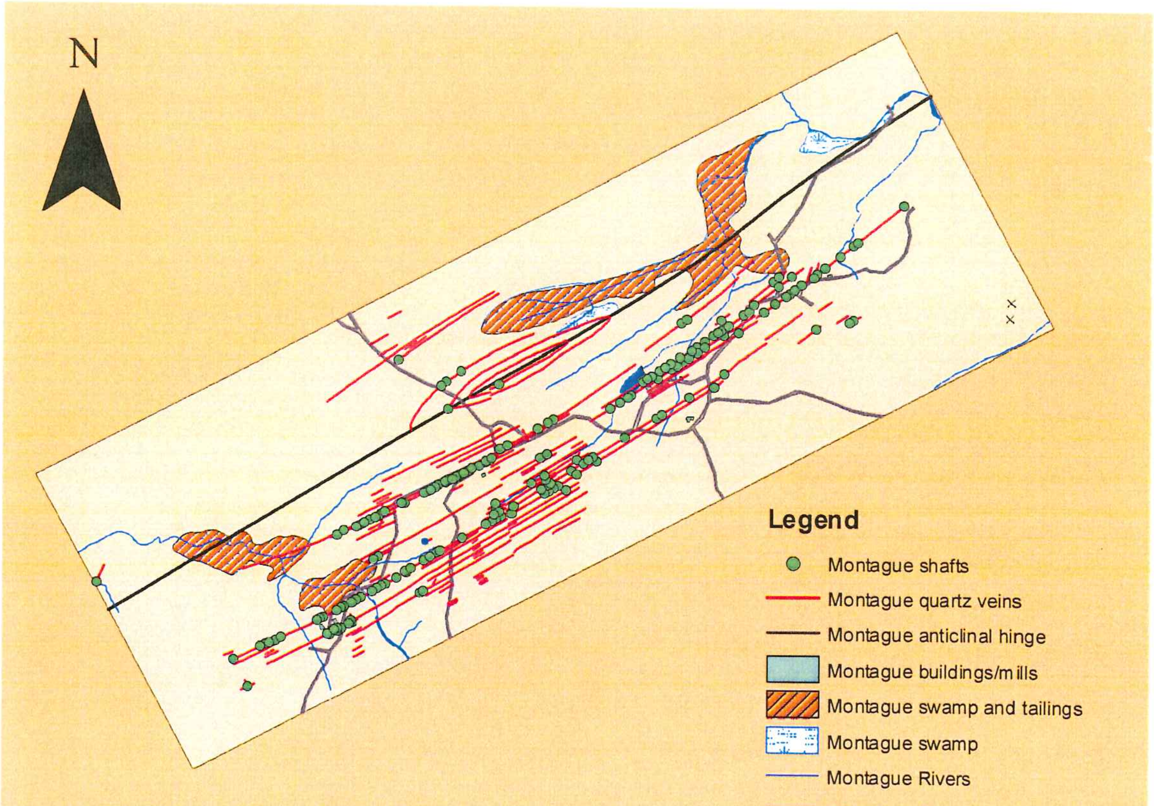


Figure 2.6 Finer details of the Montague Gold District after Faribault's 1902 Geological Survey of Canada map (Fisher and Keppie, 2006).

Arsenopyrite, as well as gold, is found within the quartz veins located at Montague District. The largest concentrations of gold tend to be concentrated near the crest of the anticline along the bedding planes and in fissures (Grantham and Jones, 1976). Within the quartz veins other minerals present include carbonate, pyrite, and pyrrhotite (Anonymous, 1978 cited in Dale and Freedman, 1982). The quartz veins follow bedding planes between the quartzite and slate along the main anticlinal fold which trends north 78° east (Fig. 2.6). The plunge of the fold to the east ranges from 5-8 degrees and to the west ranges from 5-21 degrees. The axial plane of the fold dips north about 80 degrees (Malcolm, 1929).

There are few faults observed within the former district. A single fault plunges south from the centre of the anticlinal dome and results in a displacement of approximately 12 metres. During mining practice, a few other faults were observed to strike almost parallel to the strata, dipping south at a low angle (Malcolm, 1929).

2.2.1 Local Till and Soil Classification (CSSC)

The classification of the soils in and around the Montague Gold District is described in the Canadian System of Soil Classification (CSSC). The soil order is classified as podzolic, developing beneath coniferous forests, and results from the leaching of overlying horizons in moist, cool to cold climates. The distribution of podzolic soils within Canada is shown in Figure 2.7 (Schaus cited in Christopherson and Byrne, 2006). A large majority of eastern and western

Canadian soils are podzolic in order. Figure 2.8 is a diagram describing the podzolization process (Christopherson and Byrne, 2006).

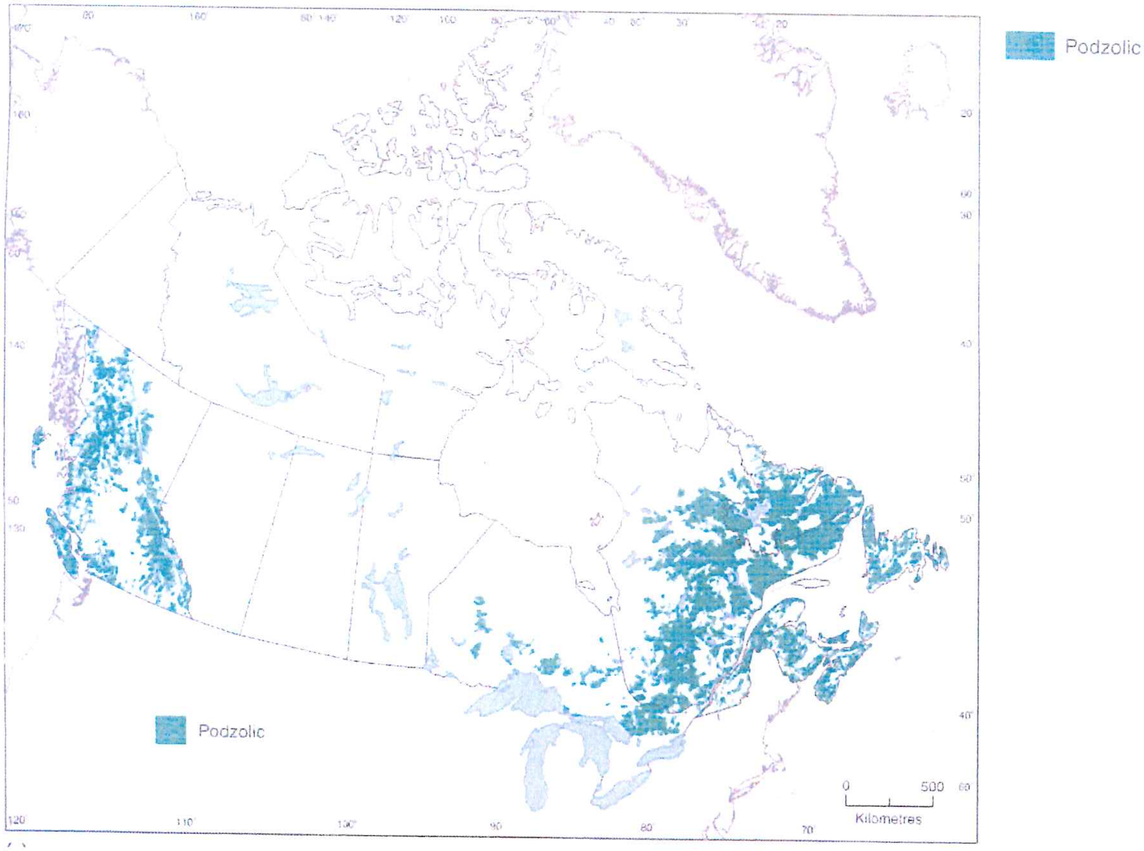


Figure 2.7 The distribution of podzolic order soils in Canada (after Pam Schaus, data from Agriculture and Agri-Food Canada, Soil Landscapes of Canada cited in Christopherson and Byrne, 2006).

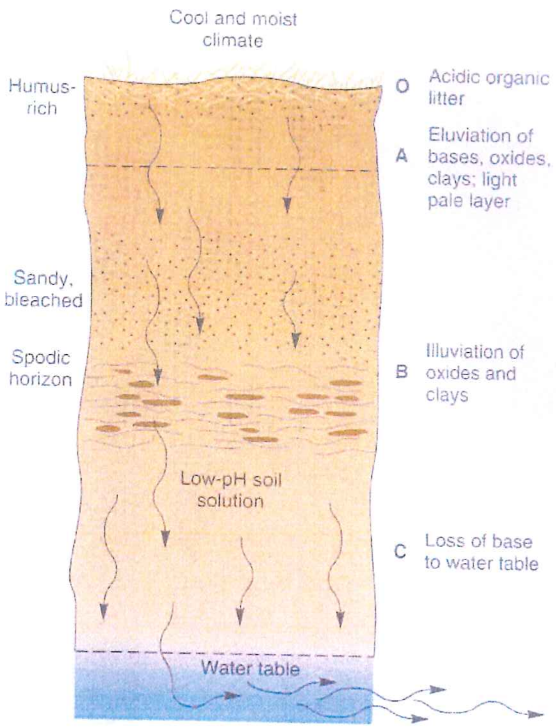


Figure 2.8 The podzolization soil-forming process typical in Nova Scotia and in other cool, moist climates across the country (Christopherson and Byrne, 2006).

The till which surrounds Montague District is of the Wisconsinan Stage of the Quaternary Period and is a result of the last glaciation (Stea *et al.,* 1992). The material characterizing the local till was released from the base of an ice sheet centered over Nova Scotia during the melting period at the end of the glaciation. Ground moraines and streamlined drifts are some structural features observable throughout the local area. The till is characterized as having a stony, sandy matrix with material derived from the local bedrock sources. The topography of the area is characterized as being flat to rolling with many surface boulders. On average, the till has a thickness range of 2-20m throughout the area (Stea *et al.,* 1992).

2.3 Tailings and Mine Waste Locations, Montague Gold District

The mining practices which were undertaken between 1863 and 1940 left a large portion of the Montague District contaminated with tailings and waste rock (Parsons, personal communication, 2006). Tailings are defined as silt to sand-sized material which is a waste product of the milling process. It is waste material which remains after all the metals considered economic have been removed from the ore (Kinross, 2005). After the mined ore was subjected to the stamp mill and Hg amalgamation, the remaining waste was deposited downslope as a slurry into the low-lying bog and stream (Dale and Freedman, 1982). Figure 2.2 is a picture of the arsenic-rich tailings which are seen today near the western portion of the district. Swampy areas and marshlands surround a portion of the tailings area which is visible in the background of Figure 2.2.

Waste rock is defined as being boulder-to-cobble sized material which is locally removed from a mine and which has no commercial or economic value (INCO, 2002). Within the Montague district, there are waste rock piles scattered on road sides and throughout the overgrown bush. Figure 2.9 shows a waste rock pile near a former stamp mill site. The area is now surrounded by new growth forest.

Figure 2.9 A waste rock pile near a former stamp mill site (Photo taken by H. Jaggard, Fall 2006).

A report published in 1927 briefly describes the treatment of the tailings within the Montague District. The historical treatment of tailings included sizing the material and recovering as much gold concentrate as possible. It is reported that approximately one ton of arsenopyrite concentrate was recovered for every ten tons of tailings. This concentrate was reported to average 30% As and from $45.00 to $65.00 per ton in gold (Harrington and McKenzie, 1927). In historical reports, the 'treatment' of tailings only refers to the amount of gold which was still extractable after initial processing.

2.4 Mining Impacts on the Montague Gold District

Historical mining in the Montague District and other historical gold districts within the province have resulted in the generation of tailings containing

Hg, As and other potentially toxic elements (Smith *et al.*, 2005). Other impacts on the Montague District include the remaining waste rock piles, abandoned shafts and mill structures. Some Districts throughout the province (eg. Dufferin, Upper Seal Harbour and Lower Seal Harbour Gold Districts) have been found to have tailings transported significant distances (>2 km) offsite by local streams and rivers (Smith *et al.*, 2005). In the case of Montague, natural conditions within the District have allowed for contaminants to be transported outside the boundaries of the District as well. Mitchell Brook flows from Loon Lake through the District near the SW end. This brook flows directly through tailings and continues NW into Lake Charles. Figure 2.10 is an airphoto of Montague District and surrounding area (NSDNR, 2003 after Hopper *et al.*, 2002). The airphoto shows the location of Loon Lake, Mitchell Brook and Lake Charles relative to the tailings within the District.

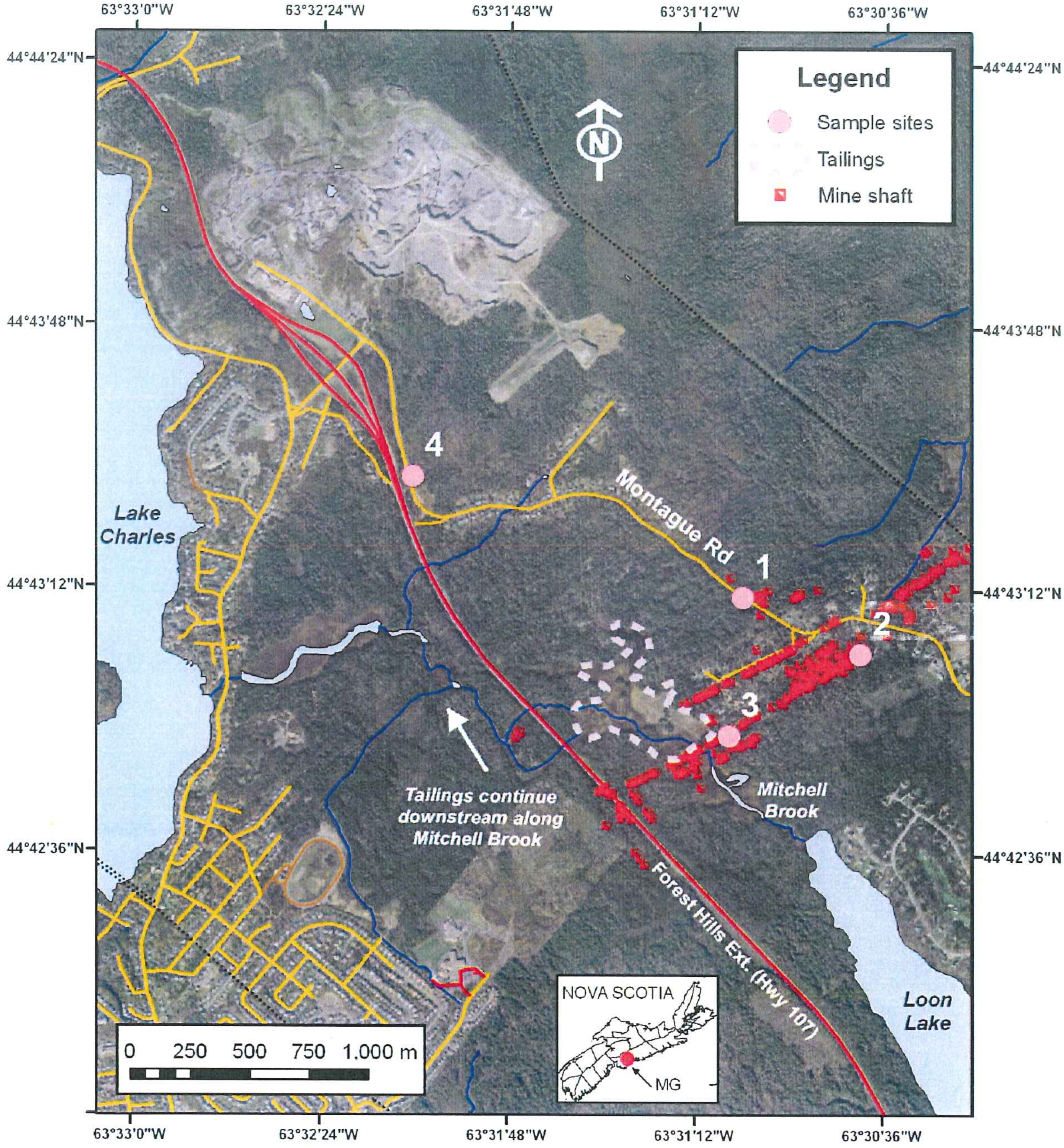


Figure 2.10 This airphoto of Montague District and surrounding area shows the relative location of Loon Lake, Mitchell Brook and Lake Charles to the tailings of the District (Digital orthophoto © 2003, NSDNR after Hopper *et al,* 2002).

A case study of the metal concentrations found throughout Mitchell Brook can be reviewed in section 2.7.1.

2.5 Environmental Implications

During the early days of mining, little was known of the environmental impacts on the surrounding environment. In the 1960s and 1970s, awareness of the environmental effects of mining increased and drastic changes in the processes used during extraction and mine waste handling were made. Unfortunately, the impacts made on local environments, including Montague District, were irreversible by the time this knowledge was introduced to the industry.

Although there have been no recent reports of any Nova Scotians becoming ill from Hg or As exposure, tailings and contaminated sites should still be avoided (Government of Nova Scotia, 2006). In 2005, advisories were given by the Government of Nova Scotia suggesting possible ways to avoid exposure to harmful metals found within gold districts. Figure 2.11 is an advisory posted within the Montague District in March 2006 informing of the presence of As within the local soils. These signs were posted mainly because of concerns regarding very high levels of As within the local tailings. Figure 2.12 shows all terrain vehicle (ATV) tracks across the tailings. There are seasonal human activities and recreation which rework the tailings and expose fresh surfaces to the environment.

Figure 2.11 An advisory posted within the Montague District informing of As content in local soils (Photo taken by H. Jaggard, Fall 2006).

Figure 2.12 ATV (All terrain vehicle) tracks and jumps on the tailings within Montague District (Photo taken by H. Jaggard, Fall 2006).

2.6 Effects on Land Development

Expanding residential developments and recreational activities in and around the Montague District are increasing the likelihood of human contact with the tailings and surrounding soils.

In order to better understand the distribution of As, Hg, and other potentially toxic elements in the environment we need to know where concentrations are highest and what background levels are within the surrounding soils. As outlined in Chapter 1, this study is funded primarily by the Environment and Health Program of Natural Resources Canada. Results from these various projects will be used to assess the risks related to human health and ecology surrounding former Gold Districts (Smith *et al.,* 2005).

2.7 Previous Studies of Gold Mine Sites in Nova Scotia

As discussed in Section 2.3, naturally occurring potentially toxic elements (As, Pb, Sb, Tl) and anthropogenically added Hg may be present in relatively high concentrations in mine waste (Smith *et al.,* 2005). Historical mining practices throughout the province of Nova Scotia produced more than three million tons of tailings which were deposited directly into local rivers, swamps, lakes, and the ocean (Smith *et al.,* 2005).

The first study done on human health effects from mine wastes was in 1976 when a resident of Waverley, Nova Scotia was diagnosed with chronic arsenic poisoning (Hindmarsh *et al.,* 1977). This resident of Waverley lived near a past-producing gold District (Waverley) and their tap water was found to contain 5 mg/L As, which is 500 times the current drinking water limit of 0.01 mg/L (0.01 ppm) (Health Canada, 2006). Subsequently, a study directed towards measuring levels of As in drinking water found that 13% of 642 wells tested in gold Districts throughout Nova Scotia were in excess of the drinking water guideline for As in 1977 which at that time was 0.05 mg/L (Grantham and Jones, 1977).

Since 1977, reports have been published on elevated As and Hg levels in and/or around various Gold Districts throughout the province. These Districts include: Waverley Gold District (Mudroch and Sandilands, 1978; Mudroch and Clair, 1985; 1986), Montague Gold District (Brooks *et al.,* 1981; 1982; Dale and Freedman, 1982; Mudroch and Clair, 1985; 1986), Oldham Gold District (Lane *et al.,* 1988; 1989), Caribou Gold District (Beauchamp *et al.* 1998; Tetford, 1999; Wong *et al.,* 2002), Goldenville Gold District (Beauchamp *et al.,* 1998; Wong *et al.,* 1999), as well as ongoing studies of metal(loid) distribution, transport, and speciation at 11 gold mining Districts in Nova Scotia (Parsons *et al.,* 2004).

The ongoing studies by Parsons *et al.* (2004) at 11 gold Districts across the province have resulted in the chemical analysis of 520 tailings and sediment samples. These 11 gold Districts are Whiteburn, North Brookfield, Leipsigate, Mt. Uniacke, Lake Catcha, Mooseland, Dufferin, Lower Seal Harbour, Upper Seal Harbour, Forest Hill and South Rawdon (Smith *et al.,* 2005). Table 2.1 displays selected results gathered from five of these Districts within the ongoing study by Smith *et al.* (2005). There are also a number of selected results listed in Table 2.1 from previous studies and assessment reports done at various Districts.

Gold District	**Sample Media**	**Average As (ppm)**	**Average Hg (ppb)**	**Reference**
Tangier	bedrock-meta-greywacke	471	17	Smith *et al.*, 2005
	slate	608	18	
Salmon River/ Dufferin	soil, <180 microns	150	330	Jagodits and Walker, 1974
	tailings	3900	3300	Smith *et al.*, 2005
Goldenville	meta-greywacke	113	N/A	Smith *et al.*, 2005
	slate- meta-siltstone	3259	N/A	Smith *et al.*, 2005
Upper Seal Harbour	meta-greywacke	192	N/A	Smith *et al.*, 2005
	meta-siltstone	2503	N/A	Smith *et al.*, 2005
	rock, <75 microns	375.8	2.5	Dawe, 1988
Lower Seal Harbour	tailings	654	N/A	Smith *et al.*, 2005

Table 2.1 Hg and As concentrations from various media within selected gold Districts throughout the province of Nova Scotia.

Concentrations of Hg throughout these Districts range from <5 ppb to 3300 ppb and As values range from 113 ppm to 3900 ppm throughout the various media sampled (Smith *et al.*, 2005). The highest concentrations of Hg were found near mill structures which reflect the significant addition of Hg used during amalgamation practices to the environment. North Brookfield, Leipsigate and Lower Seal Harbour Districts show relatively low levels of Hg in tailings and sediment as a result of cyanidation dominating gold extraction during mining practices.

At some locations, the dissolved levels of As within local surface waters are very high ranging from 0.2-660 ug/L with a median of 100 ug/L compared to the background levels of 12 ppm (CCME, 2006). Dissolved levels of Hg range from 1 to 60 ng/L and show positive correlations with dissolved organic carbon at most sites (Smith *et al.*, 2005). It has been found during the ongoing study within the

11 gold Districts, that dissolved Hg concentrations in surface waters are relatively low (i.e. <20 ng/L) even in close proximity to tailings with levels of Hg reaching >100 ug/kg. These results suggest that most of the Hg is in insoluble forms and tends not to be dispersed downstream in solution (Smith *et al.,* 2005).

Research done by Little (2006) on the tailings at Wine Harbour, Nova Scotia indicated high concentrations of both As (200 to 200,000 ppm) and Hg (4,900 to 320,000 ppb).

Samples of till derived from the Meguma Supergroup were obtained in Kejimkujik National Park, Nova Scotia by Culgin (2002). Although this study was not undertaken within a gold District, the data provides information on natural levels of Hg within tills derived from the Meguma Supergroup. Hg levels from the sampled till range from 6.6 to 71.2 ppb (Culgin, 2002).

2.7.1 Previous Environmental Studies at Montague Gold District

The tailings at Montague were sampled in the early 1980s to depths ranging from 0-30 cm. Arsenic concentrations ranged from 1190 - 72100 ppm (Dale and Freedman, 1982). During the same study by Dale and Freedman (1982), a number of plants were sampled and analysed for As tolerance. Thriving plants were found naturally on the tailings with remarkably high As concentrations ranging from 11 – 834 ppm (Dale and Freedman, 1982).

In another study done by Brooks *et al.* (1982), levels of As were measured within the tailings, waters, stream sediments, plants and aquatic organisms at Montague District. Samples from Mitchell Brook were taken as the stream passed through the gold tailings and As in these waters was 190 ppb compared to the past drinking water safety limit of 50 ppb. In stream sediments, As levels were elevated within the mining area and remained elevated throughout most of the stream bed sediments to Lake Charles. Refer to Figure 2.10 for the relative location of Mitchell Brook to the tailings and Lake Charles. The As content within aquatic organisms correlated positively with the levels found in the stream water of Mitchell Brook (Dale and Freedman, 1982).

CHAPTER 3: METHODOLOGY

3.1 Introduction

As most of the area surrounding the Montague Gold District is covered in till and soil, assessment of soil profiles within the area is critical to determining the nature and distribution of metal(loid)s to which humans may be exposed.

Samples were selected at four sites in and surrounding the District. The selection of sample sites was significant and were chosen to see: (1) whether glacial scouring during the last glaciation had an effect on dispersing metals and metal(loids) throughout the District; (2) what elevated levels characterize the abandoned stamp mill site; and (3) what background levels of elements are characteristic just outside the abandoned Gold District. The direction of former glacial flow across the District is indicated in Figure 3.1.

The sample sites are referred to as (1) an up-ice location in relation to the main anticlinal hinge of the District, (2) a down-ice location in relation to the main anticlinal hinge of the District, (3) a stamp mill site location where samples were taken directly adjacent to a former mill structure, and (4) a background site, taken just outside Montague District (Figure 3.1). At each location, samples were taken from surface to depths of approximately 1 meter.

A complete overview of the soil sampling technique used throughout the study follows, as well as descriptions of the various laboratory analyses undertaken. The analyses performed on the samples were done to determine the vertical distribution of elements throughout the various sites sampled in and around the District.

Soil samples for this study were collected on three days in the Fall of 2006: September 28, October 25, and November 15.

3.2 Sample Locations

There were four separate locations sampled throughout this study; (1) up-ice, (2) down-ice, (3) the mill site, and (4) a background site (Figure 3.1). All samples overlie the same geologic unit, the Goldenville Group.

The terms 'up-ice' and 'down-ice' refer to the relative locations of the samples taken in reference to the anticlinal hinge trending SW-NE across the District. Due to the naturally higher concentration of arsenopyrite associated with gold occurrences in the Goldenville Group, glacial advance would have deposited higher concentrations of arsenopyrite and associated metals further 'down-ice' in relation to the main gold deposits centered on the anticlinal hinge. Therefore, the sample locations and protocol were designed assuming that there would be higher concentrations of As to the south or 'down-ice' from the gold and arsenopyrite-bearing quartz veins.

Details on each sample site (Sections 3.2.1-3.2.4) are presented in the following order: background (site 4), up-ice (site 1), down-ice (site 2), and mill site (site 3) (Figure 3.1). Sample site details including GPS locations, sample horizons, and sample depths are listed in Appendix A.

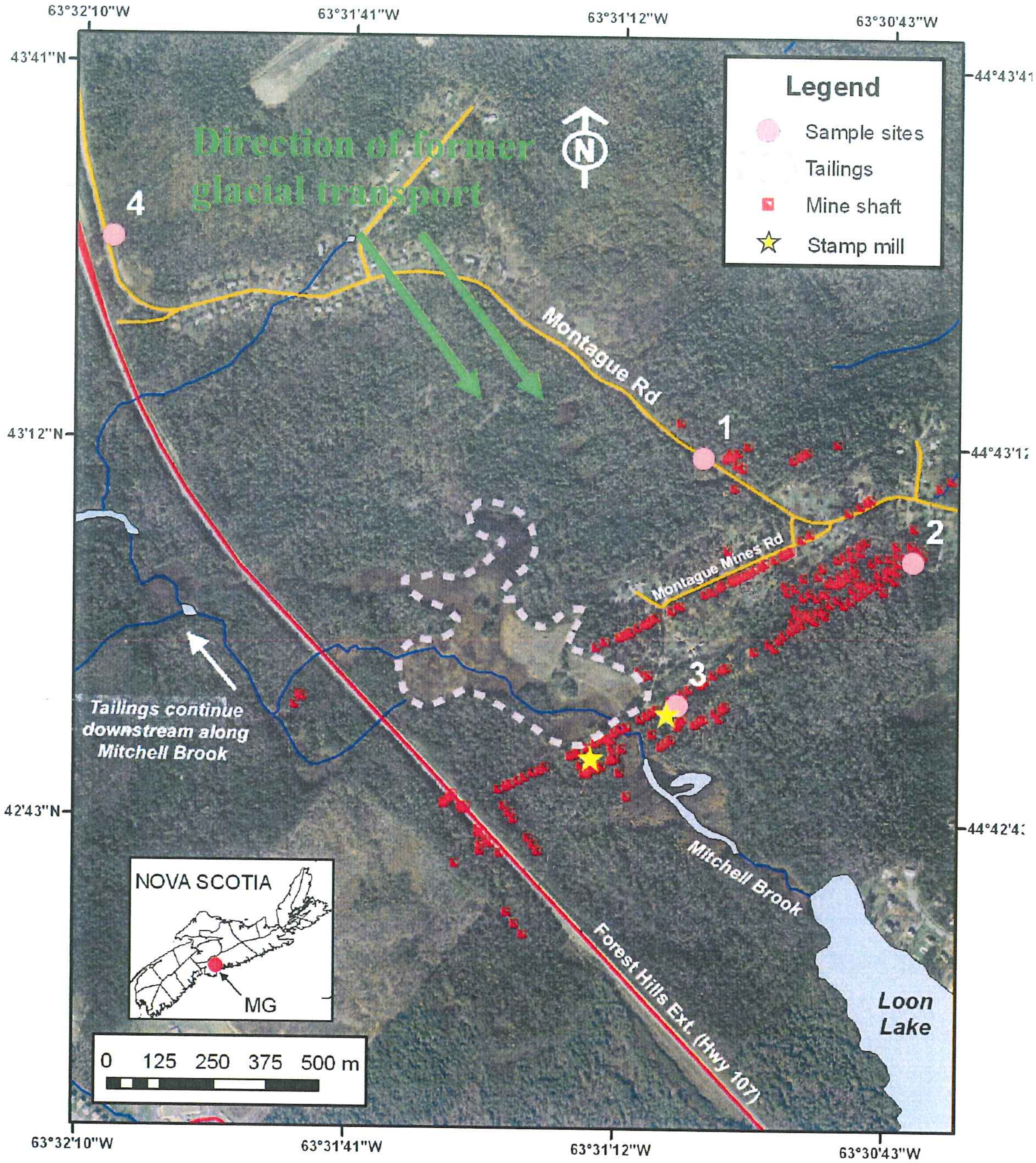


Figure 3.1 Airphoto showing the locations of the four sample sites in and surrounding Montague Gold District as well as the direction of former glacial transport across the District (Digital orthophoto © 2003, NSDNR after Hopper *et al,* 2002).

3.2.1 Background Sample Site (site 4)

The background sample site was taken outside the District along Montague Rd (Figure 3.1). The sample site was part of a stream bank along the north side of Montague Rd. Figure 3.2 shows the proximity of the sample site to the stream as well as to Montague Rd. There were 12 samples taken at various depths throughout the profile (Appendix A). A stratigraphic profile of the sample site can be referred to in Figure 3.9.

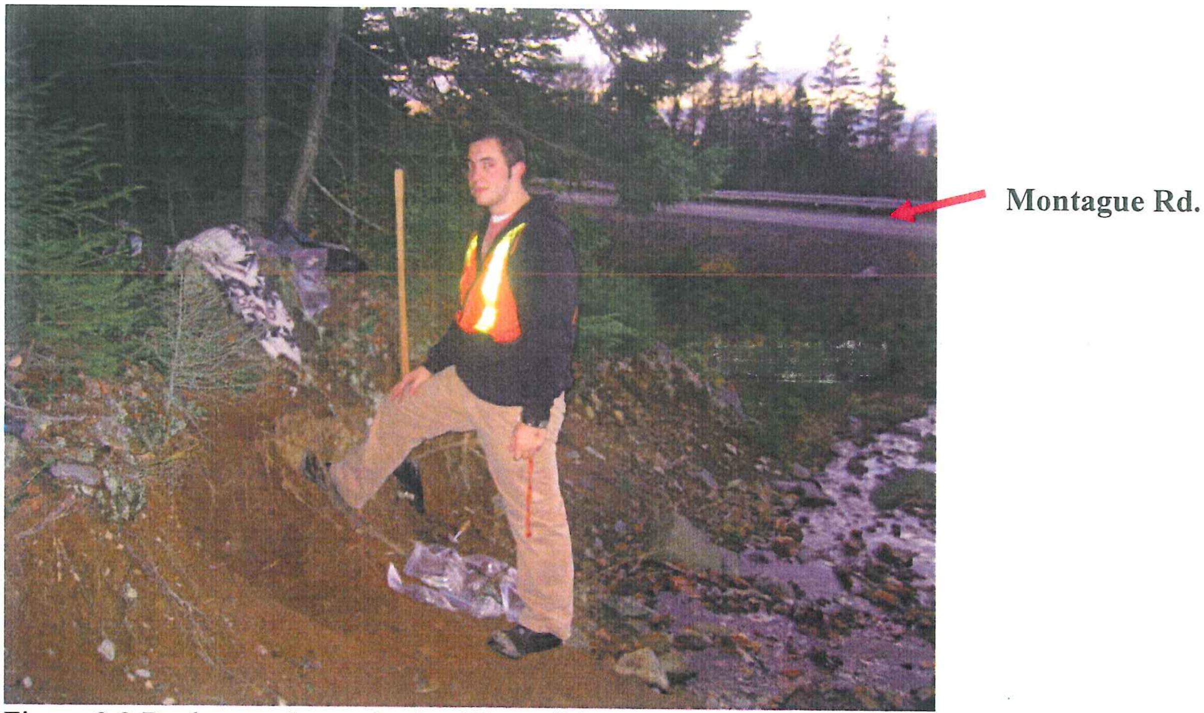


Figure 3.2 Background sample site. The soil horizon sampled was dug out from a stream cut (Photo taken by H. Jaggard, 2006).

3.2.2 Up-ice Sample Site (site 1)

The samples taken ‘up-ice’ in relation to the main anticlinal hinge were taken to the south of Montague Rd. (Figure 3.1). Eleven samples were taken at various depths at this location (Appendix A). Figure 3.3 shows the well-developed soil profile at this sample site. A stratigraphic profile of the sample site can be referred to in Figure 3.9.

Figure 3.3 Up-ice sample site (site 1). This soil profile was dug out from the south side of a road cut off Montague Rd. Well-developed horizons were seen at this site. (Photo taken by T. Goodwin, Fall 2006).

3.2.3 Down-ice Sample Site (site 2)

The down-ice site location (Figure 3.1) is expected to have higher levels of As throughout the horizon as a result of elevated levels of arsenopyrite transported across the district during the last glacial advance. There were 10 samples taken at various depths at this location (Appendix A). A stratigraphic profile of the sample site can be referred to in Figure 3.9. Figure 3.4 shows samples being collected at this sample site.

Figure 3.4 Down-ice sample site (site 2). (Photo taken by Anne Marie Ryan, 2006).

3.2.4 Mill Sample Site (site 3)

The mill site samples were taken directly adjacent to a former mill structure (Figure 3.1). Figure 3.5 shows the close proximity of the sample site to the former stamp mill building. A significant amount of anthropogenic material was observed throughout the sampled soil profile. Broken glass, as well as chips of red brick, was found throughout the profile (Figured 3.6). There was no apparent horizon development throughout the entire profile sampled. There were eight samples taken at various depths at this location (Appendix A). A stratigraphic profile of the sample site can be referred to in Figure 3.9.

Figure 3.5 The Mill sample site. A hole was dug directly adjacent to a mill foundation. (Photo taken by H. Jaggard, 2006).

Figure 3.6 Anthropogenic materials found throughout the profile dug at the Mill sample site. (Photo taken by T. Goodwin, 2006).

3.3 Soil Sampling

The soil classification scheme used in this thesis was slightly modified for this study, as well as for the specific soils found within the Montague area. The classification used was a simplified version of a complex naming system. Individual horizons were not subdivided in the present study, but the classification system used is sufficient for the needs in exploration and environmental geochemistry. The description of each layer is provided in Table 3.1 (Canadian Department of Agriculture, 1970 cited in Levinson, 1974).

The various horizons observed throughout the soil profiles were named A_{00}, A_0, A_2, B, and C respectively. These individual horizons can be seen in Figure 3.7 and individual stratigraphic profiles of each sample site can be referred to in Figure 3.9. Notice the organics topping the profile in Figure 3.7, continuing down into the lighter coloured till horizon at the bottom of the sample hole. Figure 3.8 is the sequence of horizons from A_{00} to horizon C. Colour changes between different horizons are clearly represented in Figure 3.8.

Soil Classification	
Soil Horizon	*Description*
A_{00}	Loose leaves and organic debris, largely undecomposed
A_0	Organic debris fully decomposed
A_2	A light coloured horizon of maximum eluviation of clay, iron oxide and/or organic matter. Prominent in podzolic soils
B	Maximum accumulation of silicate clay minerals, and an increase in iron oxides and organic matter (compared to A_2)
C	Loose and partly decayed rock of parent material, low organic matter

Table 3.1. Levinson's 1974 standard classification of soil horizons.

Figure 3.7 Down-ice sample site (site 2) with visible horizons (Photo taken by A.M Ryan, Fall 2006)

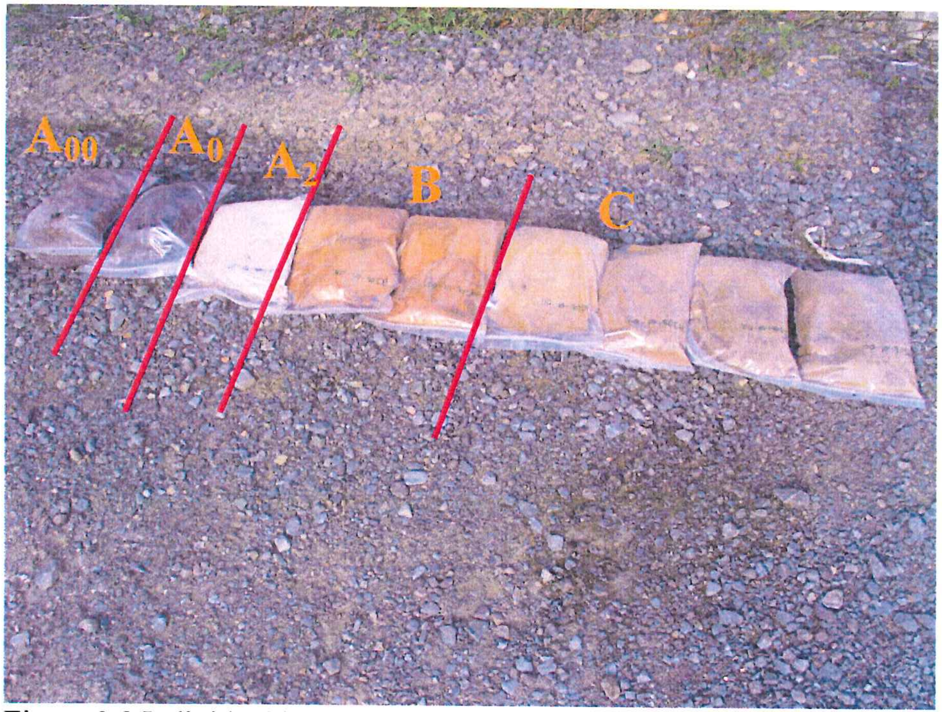


Figure 3.8 Individual horizons indicated in separate sample bags (Photo taken by T. Goodwin, Fall 2006).

3.4 Sampling Techniques and Protocol

Field sampling was undertaken in a standardized, controlled manner. Every site was sampled in the same way and care was taken to avoid any sort of cross contamination between the different horizons.

Bulk sampling of the top 5 cm or top 30 cm of a soil profile is common practice in environmental sampling procedures (Goodwin, personal communication, 2006). The sampling techniques used throughout this study included sampling by specific horizons as well as bulk samples for comparison. All soil samples were sieved to two size fractions; <2 mm and <63 μm. In general, the <2 mm size fraction is the most common size fraction used in environmental analysis of soils.

Sample sites were chosen where a profile could be seen, and sampled to a depth of approximately 1 meter at 10 cm intervals on average. Some potential sites were abandoned where large clasts within the till (horizon C) impaired sampling to the required depth. Sampling of the individual horizons began at the greatest depth continuing to the surface to avoid contamination of bottom layers by disturbance of top layers. Horizon C was, on average, the thickest of the horizons followed by horizon B, horizon A_{00}, horizon A_2, and the thinnest layer being horizon A_0, the decomposed organics (Figure 3.10). Although these thicknesses are generally what were found in the field, some sites did not follow this order. Site 1 had an A_2 horizon thicker than the top organics (A_0 and A_{00}), but at sites 2 and 4 the A_2 horizon was very thin in comparison to horizons A_{00} and A_0 (Figure 3.10). Some sites had more developed horizons than others. Site 3, the mill site, had no developed horizons present. Figure 3.9 indicates the stratigraphic differences observed at each sample site with horizons indicated.

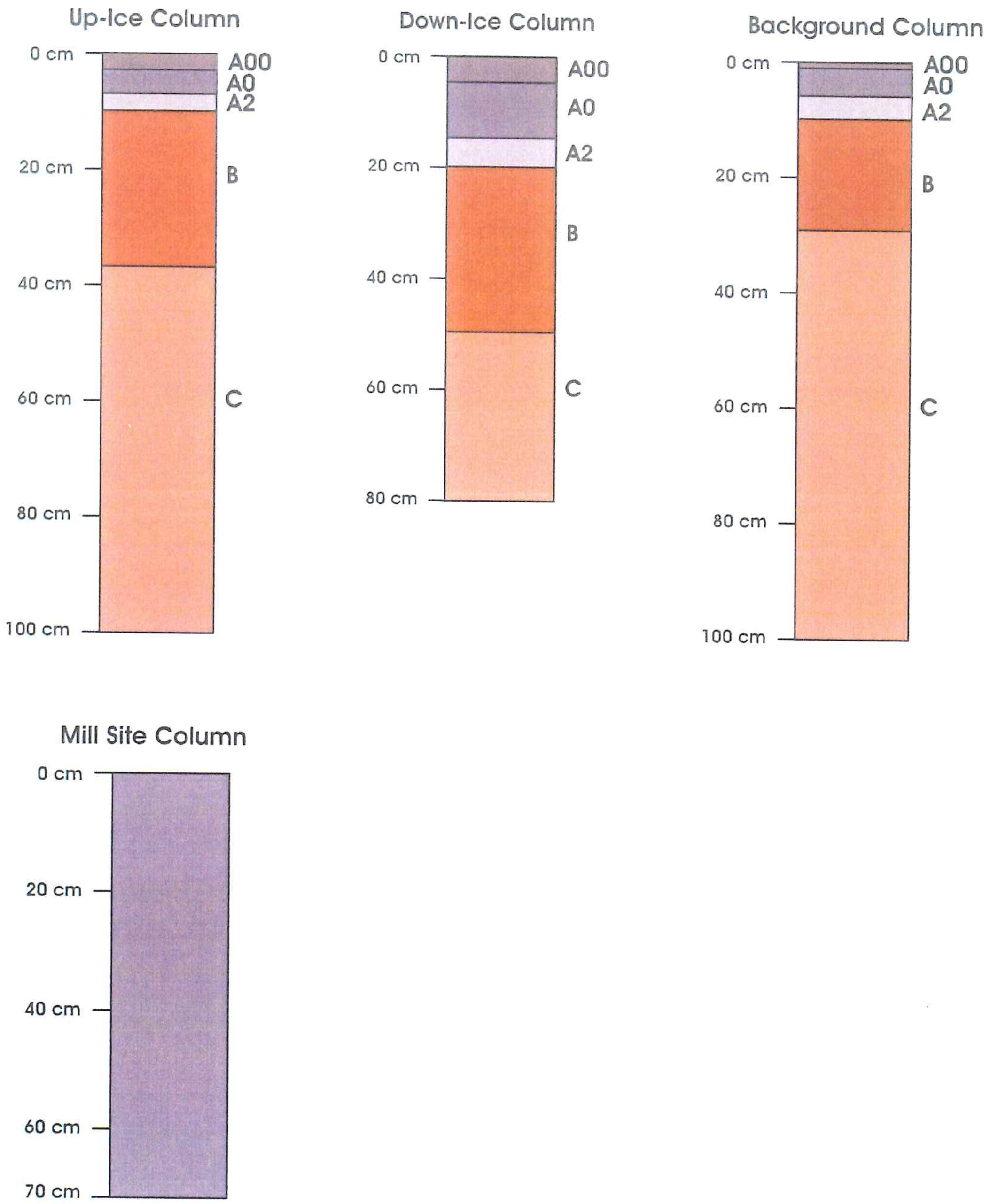


Figure 3.9 Stratigraphic columns/profiles characterizing the individuality of each sample site with separate horizons indicated.

Sampling every 10 cm throughout the till (horizon C) was standard at every site. Above about 40 cm depth, with the development of the B horizon, samples were taken in every horizon/sub-horizon rather than by set depths. This was done in order to maximize the information for each separate horizon. Figure 3.10 shows 10 cm increments throughout the profile; however horizons A_2, A_0, and A_{00} were sampled individually, thus avoiding mixing of two or more horizons.

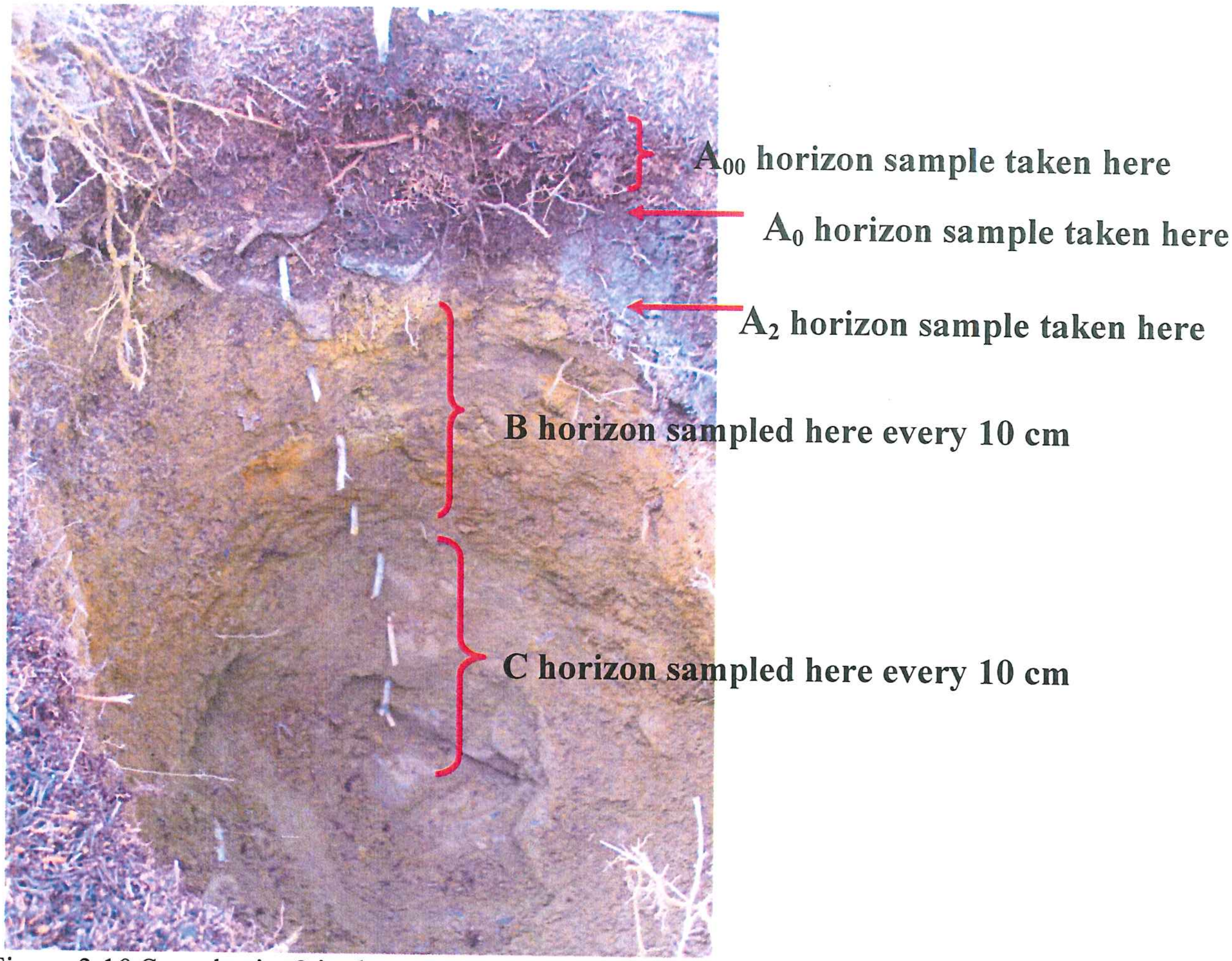


Figure 3.10 Sample site 2 is shown as an example of how sampling was done throughout the horizon (Photo taken by Anne Marie Ryan, 2006).

Bulk samples of the top 30 cm and top 5 cm were also taken at each sample site. These samples cross numerous horizons within a single sample. Figure 3.11 shows the bulk samples taken at the up-ice sampling location compared to Figure 3.8, which shows the individual horizons sampled. The mixed horizons are apparent within the bulk samples in Figure 3.11.

Figure 3.11 Bulk samples from the up-ice sampling location. The left sample bag contains the top 5 cm of the horizon and the right sample bag contain the top 30 cm. Notice the mixture of various soil horizons observable by the mottled colour (Photo taken by T. Goodwin, 2006).

Soil samples from the up-ice, down-ice and background sites were air dried at room temperature at the Dalhousie University Earth Sciences Department. Soils from the mill site, which were assumed to contain a significant amount of metal, were dried at a rock separation room at the Department of Natural Resources (DNR) in Halifax where human exposure was limited.

3.5 Analytical Techniques

Throughout this study, there were a number of analyses done on the samples taken in the field. Carbon determination was performed on all samples at the Bedford Institute of Oceanography (BIO), and major, minor, and trace element analysis were done on all samples at ACME Analytical Laboratories in North Vancouver, B.C. Statistical correlations on geochemical results were done at Dalhousie University with assistance from the Math Department.

3.5.1 Carbon

Carbon analysis on the soil samples taken from the district were made at Bedford Institute of Oceanography (BIO). Every sediment sample was analysed for organic carbon and total carbon content (inorganic carbon calculated by the difference). Each sample was sieved into two size fractions, <2 mm and <63 microns. Sieving was done at Dalhousie University using stainless steel sieves. Sediments were handled carefully to avoid cross contamination. The samples taken from the down-ice and mill site locations were predicted to have higher concentrations of contaminants, so sieving was done in a fume hood with the author wearing latex gloves and face mask to avoid any inhalation or skin contact.

A sample of 250 mg of each size fraction was used for organic and total carbon analysis. For total carbon analysis, water was added into the crucible of the 250 mg sample and allowed to dry for a minimum of two days. For the organic carbon analysis, the crucible was filled with 10% HCl to dissolve any carbonates present in the sample. This technique also takes a minimum of two days to complete before the carbon determination can begin.

Once the samples were ready to be tested for carbon content, copper and iron accelerators were added to the crucibles to distribute heat more evenly. The machine used for carbon analysis was a Carbon Determinator made by LECO (LECO instruction manual, 1988). The soil is heated to vaporization and the amount of CO_2 given off during this process is measured to determine the percentage of carbon in the 250 mg soil sample analysed.

The total inorganic carbon is calculated by subtracting the organic carbon percentage from the total carbon percentage obtained.

3.5.2 Major, Minor, and Trace Elements

Elemental analysis was performed on all 41 soil samples taken in the field. After being air dried, the samples were sent to Acme Analytical Laboratories located in North Vancouver, B.C. where they were analysed with package 1F-MS. This analysis involves the digestion of the samples using *modified aqua regia* at a temperature of 95°C for one hour, followed by an assay of 53 elements using an inductively coupled plasma-mass spectrometer (ICP-MS). The modified aqua regia used was a mixture of hydrochloric acid (HCl), nitric acid (HNO_3) and demineralised water (2:2:2). This strong acid mixture is capable of decomposing metal salts, carbonates, sulphides, most sulphates and some oxides and silicates (Acme Laboratory glossary). ICP-MS is a method which is capable of determining the concentrations of 70+ elements at ultra low detection limits (ppb) (Acme Laboratory glossary).

3.5.3 Statistical Correlations of Geochemical Results

The results obtained for all 53 elements from ICP-MS analysis were further analysed for statistical correlations. The program R 2.3.0 was used to correlate all the results (R 2.3.0, 2006). Numerical correlations were performed on all 53 elements and pairwise scatterplots were made for selected elements.

3.6 Quality Assurance and Quality Control (QA/QC)

Quality assurance/quality control (QA/QC) measures were incorporated into the sampling process, preparation, and analytical procedures to ensure the highest confidence in the quality of the data for the soils sampled.

Care was taken during extraction of the soils from each separate horizon to refrain from contamination of the upper and lower horizons. Detailed documentation of location, depth and sample description was completed for each sample site. Sample preparation for laboratory analysis and transport included sieving soils to pre-determined size fractions. Discussion of the various sediment sizes prepared for analysis are discussed in sections 3.6.1 and 3.6.2. A laboratory prepared preparation split of soils was added to document the quality of analysis during further processing.

3.6.1 Carbon Analysis

All soil samples were sieved to two size fractions for carbon analysis: <63 microns and <2 mm sizes.

Calibrations with the carbon determinator were taken every 5-6 samples to ensure integrity of the data throughout the analysis. Standards were put through the machine which had a set carbon reading at 0.050 +/- 0.002%. If this standard was off by more than 0.002%, the machine was re-calibrated before analysis continued. There are errors in measurements as some of the inorganic carbon results are negative, implying that there is more organic carbon than total carbon, which is not possible. These slight errors are taken into account and are interpreted as calibration errors which resulted in miscalculations with the carbon determinator machine. Duplicates were added throughout the carbon analysis and errors were calculated (Appendix B).

3.6.2 Elemental Analysis

The two size fractions of soil analysed at ACME Laboratories were <63 μm and 2 mm>x>63 μm. The 'coarser' fraction (2 mm>x>63 μm) analysed by ACME is not the same size fraction which was analysed for carbon (<2 mm).

Blind duplicates of various samples as well as reference standards were included with the samples submitted for geochemical analysis as part of the QA/QC program. Percentages of error between duplicate samples are listed in Appendix C. ACME Analytical Laboratories inserted their own quality control samples including preparation splits and reference standards as part of their own QA/QC program during sample analysis.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter presents soil geochemical results obtained from each sample taken in the field for both size fractions, <63µm and 2mm>x>63µm. These results are presented in the order: background (site 4), up-ice (site 1), down-ice (site 2), and mill site (site 3) samples (Figure 2.1). A presentation of graphical and numerical correlations between the 53 elements analysed is included with these results.

4.2 Soil Geochemistry

Geochemical results were obtained from ACME Analytical Laboratories in Vancouver, BC. Each sample from every sample site has its own distinct chemical signature.

The results which are predicted from the geochemical analysis are as follows:

1. The mill site would show the highest metal concentrations overall
2. The background site samples would show the lowest metal concentrations overall
3. The up-ice samples would have slightly lower metal concentrations than the down-ice samples due to glacial advance and deposition
4. A well-developed B horizon would show the highest metal concentrations throughout the profile

5. A well-developed A_2 horizon would show the lowest metal concentrations throughout the profile
6. The smaller size fraction, <63 μm would have higher metal concentrations due to greater cation exchange capacity of the clays relative to the larger size fraction

In the following presentation of geochemical results, graphs are plotted for 19 elements out of the 53 analysed. These elements are: Fe, Cu, Pb, Au, As, Hg, S, Cr, Ni, Al, Th, Mo, Ag, Co, Se, Zn, Mn, Mg, and La. The graphs are plotted as elemental concentration vs. depth. Raw geochemical data are presented in Appendix C.

It must be noted that the mill site (site 3) did not contain a well-developed soil profile. Comparisons made between soil profiles and individual horizons are between sample sites 1, 2, and 4, unless otherwise stated (Figure 3.9).

4.2.1 Background Sample Site (site 4)

Samples taken at this location show greater variability in element concentrations within upper horizons, whereas element concentrations throughout horizon C show decreased variability. Figures 4.1 - 4.6 are graphical representations of geochemical results obtained for the <63 μm size and 2 mm>x>63 μm size fractions, respectively.

There was not a very well developed A_2 horizon at this location and this is reflected in the geochemistry of this sample. This horizon, at ~10 cm depth, shows little difference in concentrations of elements from the samples taken above or below (Figures 4.1-4.6).

Peak concentrations of most elements at this sample site are found within the A_{00} or B horizons (Figures 4.1-4.6).

There is an abnormal peak in Au concentration within the B horizon which is significantly larger (914 ppb) than the mean concentration throughout the remainder of the profile (~0.8 ppb).

There are differences in element concentrations between the <63 µm size and 2 mm>x>63 µm size fractions. The majority of elements have higher concentrations in the smaller, <63 µm size fraction, including Hg and As. Trends within some of the non-metals show higher levels in the larger size fraction, such as Se, but overall levels of these elements are low (Appendix C).

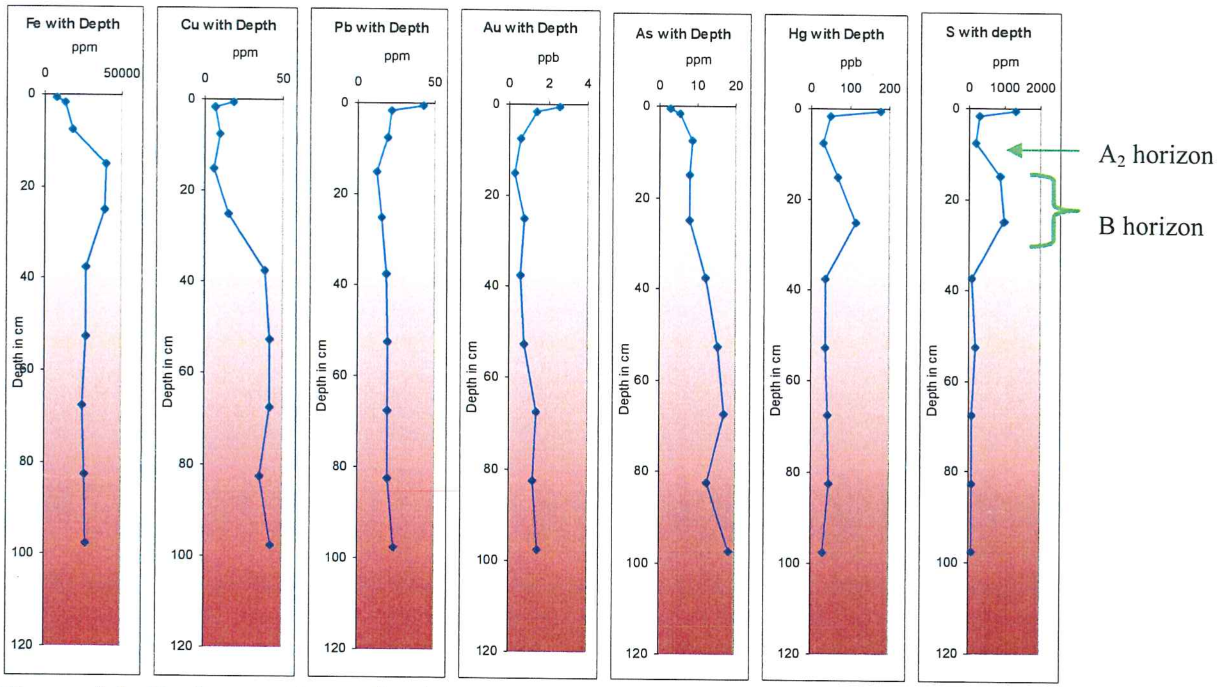


Figure 4.1: Background sample site, <63 µm size: Changes in Fe, Cu, Pb, Au, As, Hg, and S concentrations with depth throughout the soil profile.

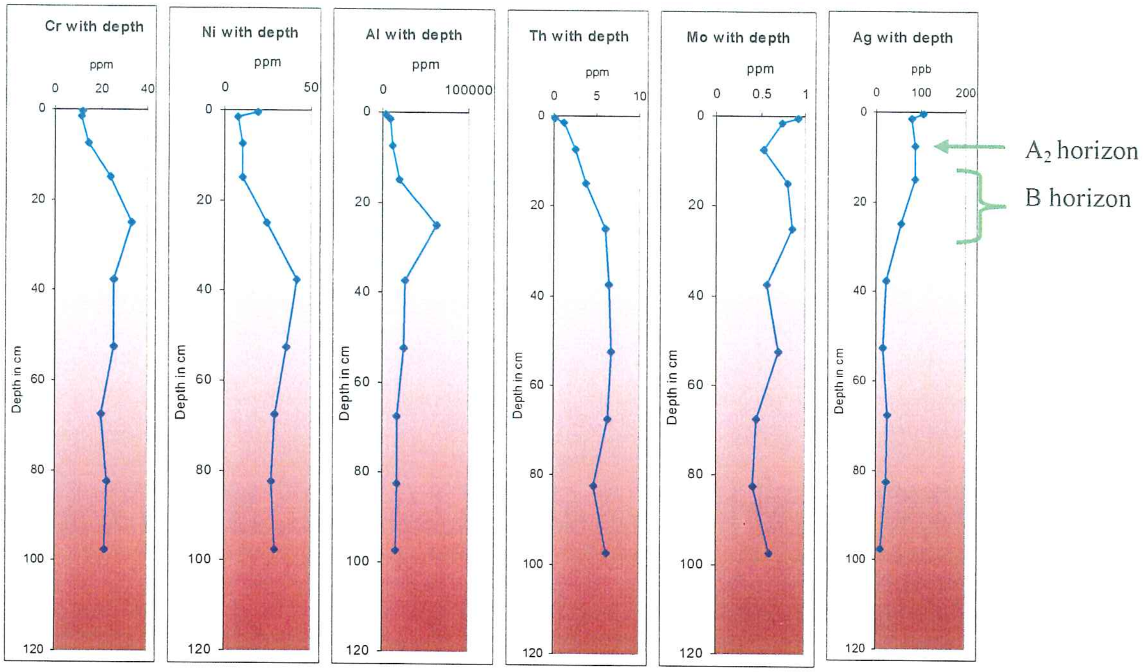


Figure 4.2: Background sample site, <63 µm size: Changes in Cr, Ni, Al, Th, Mo, and Ag concentrations with depth throughout the soil profile.

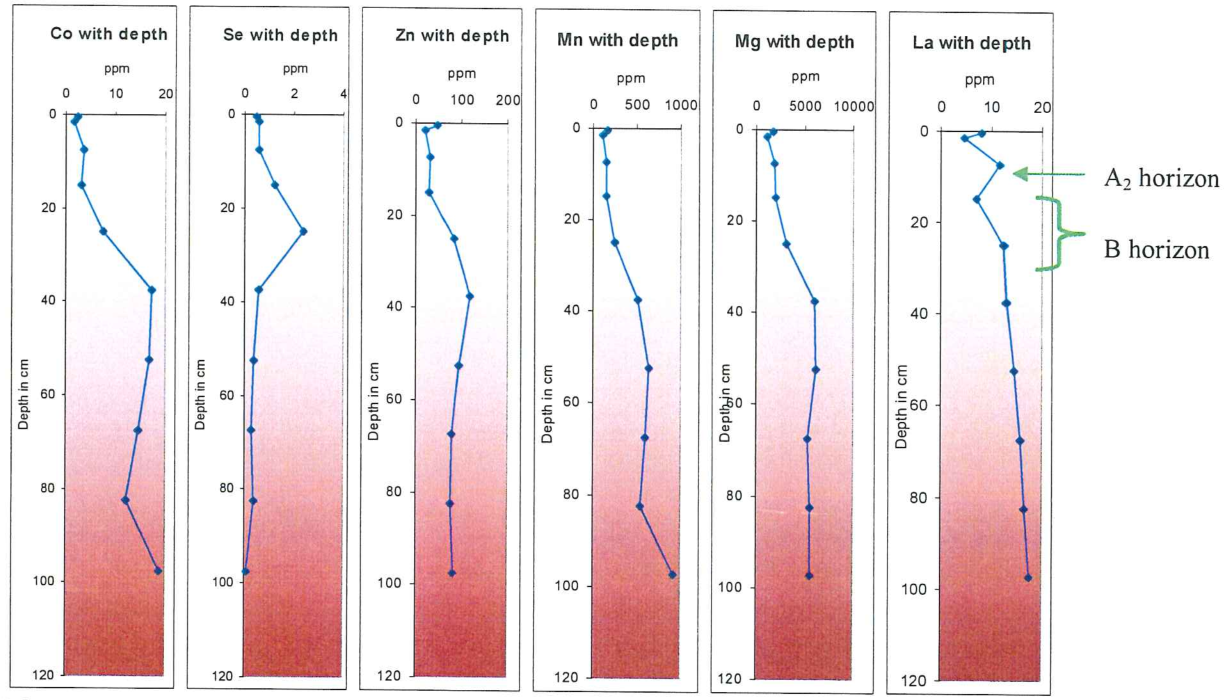
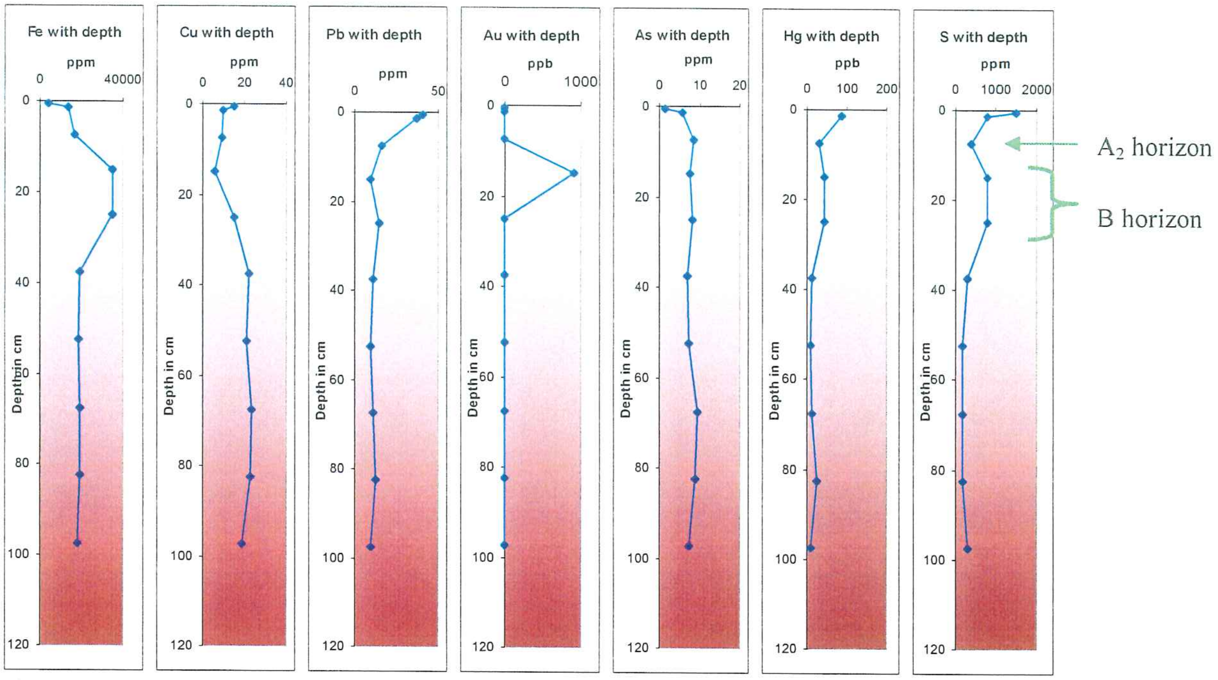


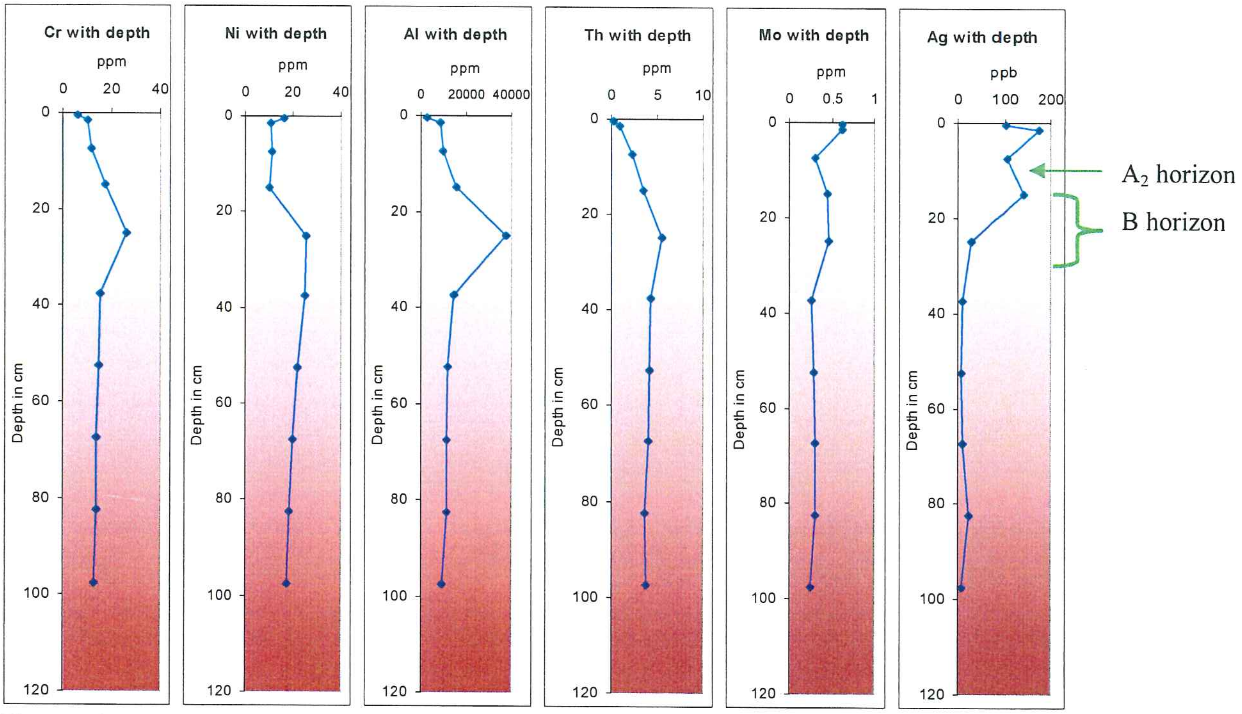
Figure 4.3: Background sample site, <63 µm size: Changes in Co, Se, Zn, Mn, Mg, and La concentrations with depth throughout the soil profile.



A_2 horizon

B horizon

Figure 4.4: Background sample site, 2 mm>x>63 μm size: Changes in Fe, Cu, Pb, Au, As, Hg, and S concentrations with depth throughout the soil profile.



A_2 horizon

B horizon

Figure 4.5: Background sample site, 2 mm>x>63 μm size: Changes in Cr, Ni, Al, Th, Mo, and Ag concentrations with depth throughout the soil profile.

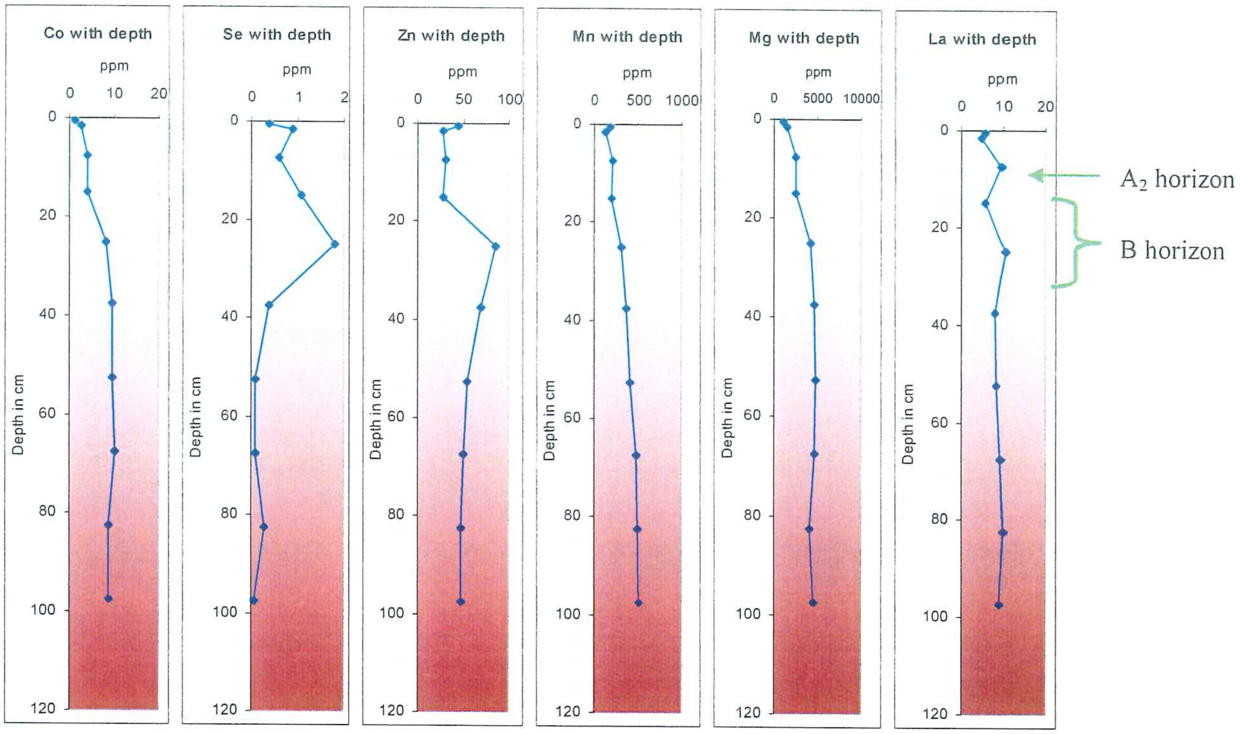


Figure 4.6: Background sample site, 2 mm>x>63 μm size: Changes in Co, Se, Zn, Mn, Mg, and La concentrations with depth throughout the soil profile.

4.2.2 Up-ice Sample Site (site 1)

The samples taken at this location show elemental variability within the upper horizons, A_{00}, A_0, A_2, and B. Lower variability in element concentrations are within horizon C. Figures 4.7 - 4.12 are graphical representations of the geochemical results for the <63 μm and 2 mm>x>63 μm size fractions.

The presence of a well-developed A_2 horizon at this site is reflected in the geochemistry with a general decrease in concentrations of elements at ~10 cm depth. Metals which do not show this trend are Fe, Cu, Pb, Th, La, and S (Figures 4.7 - 4.12).

Some of the highest metal concentrations at this location are either within the A_{00} or B horizons.

There are differences in element concentrations between the <63 μm size and 2 mm>x>63 μm size fractions. The majority of elements have higher concentration in the smaller, <63 μm size fraction, including Hg and As (Appendix C).

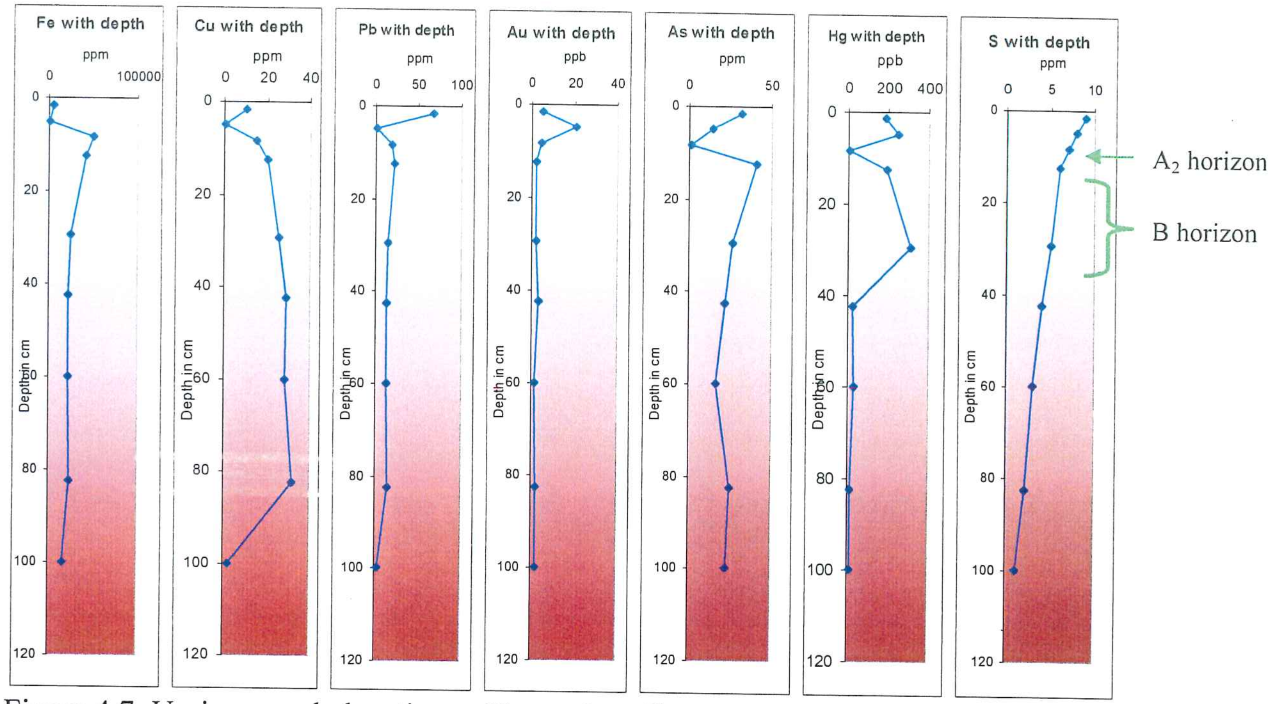


Figure 4.7: Up-ice sample location, <63 μm size: Changes in Fe, Cu, Pb, Au, As, Hg, and S concentrations with depth throughout the soil profile.

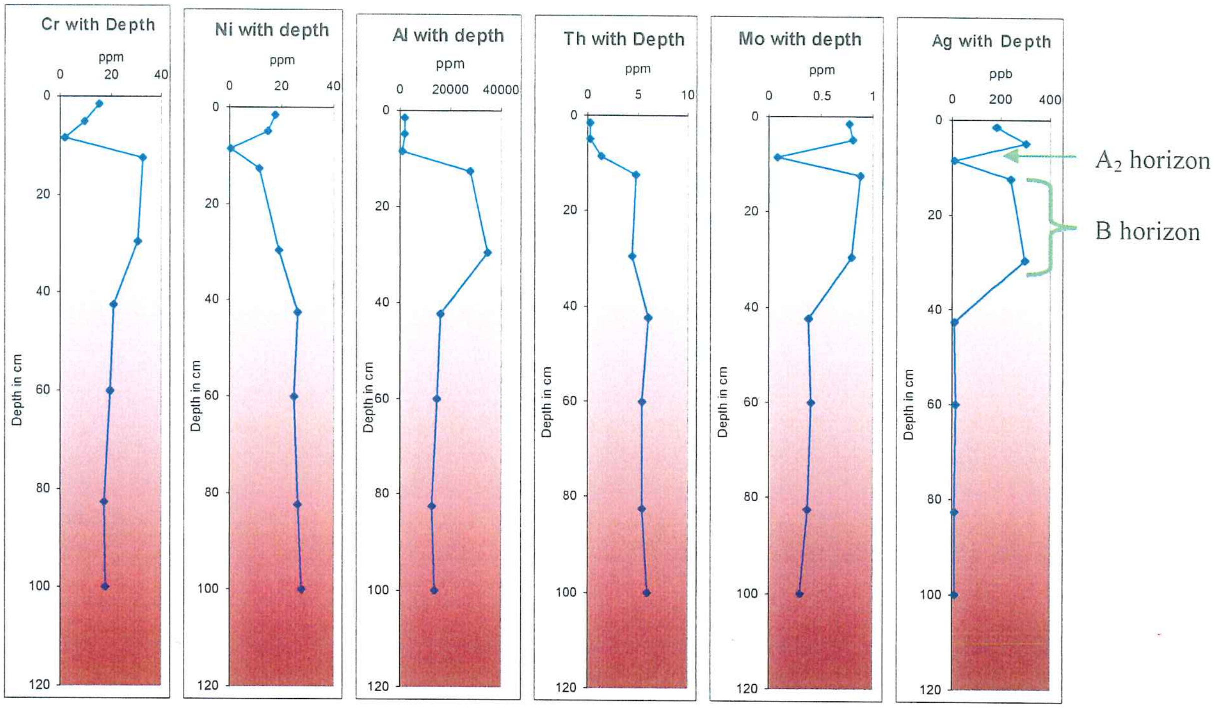


Figure 4.8: Up-ice sample location, <63 µm size: Changes in Cr, Ni, Al, Th, Mo, and Ag concentrations with depth throughout the soil profile.

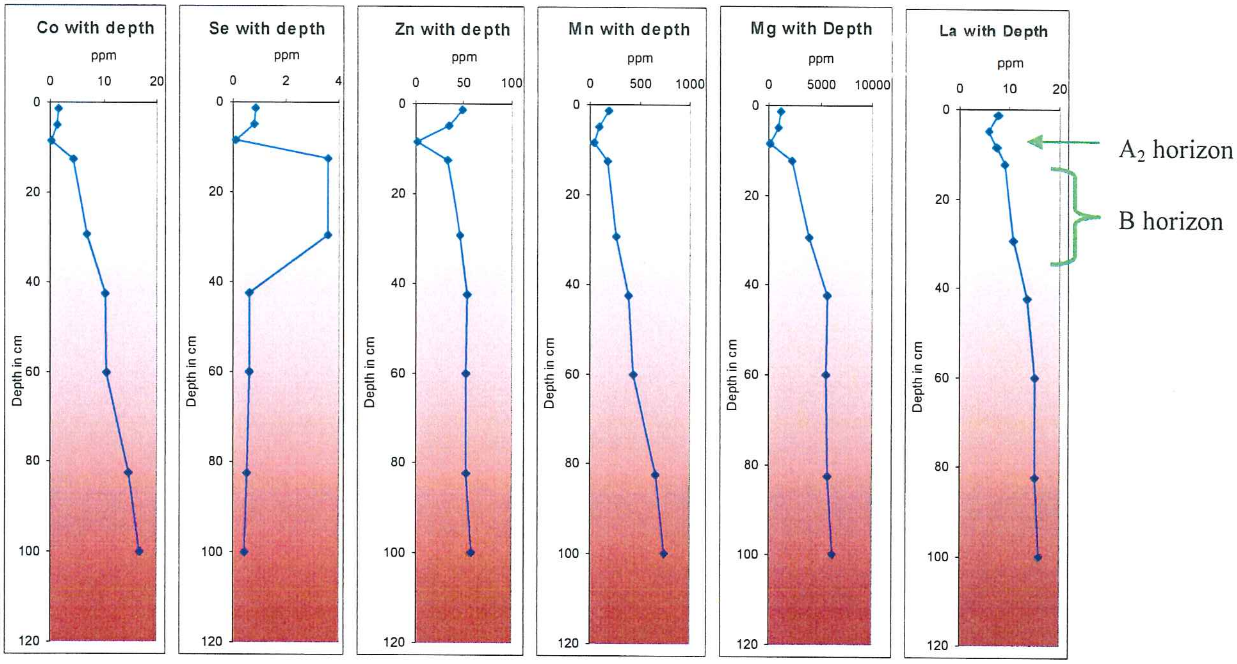


Figure 4.9: Up-ice sample location, <63 µm size: Changes in Co, Se, Zn, Mn, Mg, and La concentrations with depth throughout the soil profile.

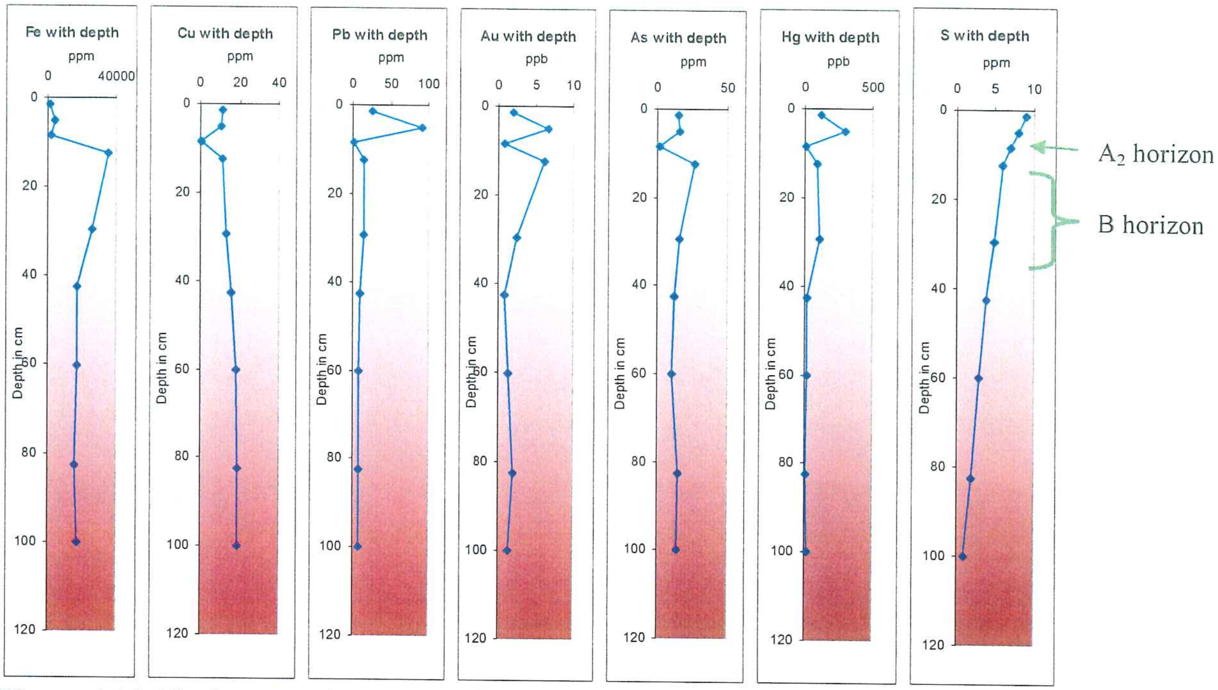


Figure 4.10: Up-ice sample location, 2 mm>x>63 μm size: Changes in Fe, Cu, Pb, Au, As, Hg, and S concentrations with depth throughout the soil profile.

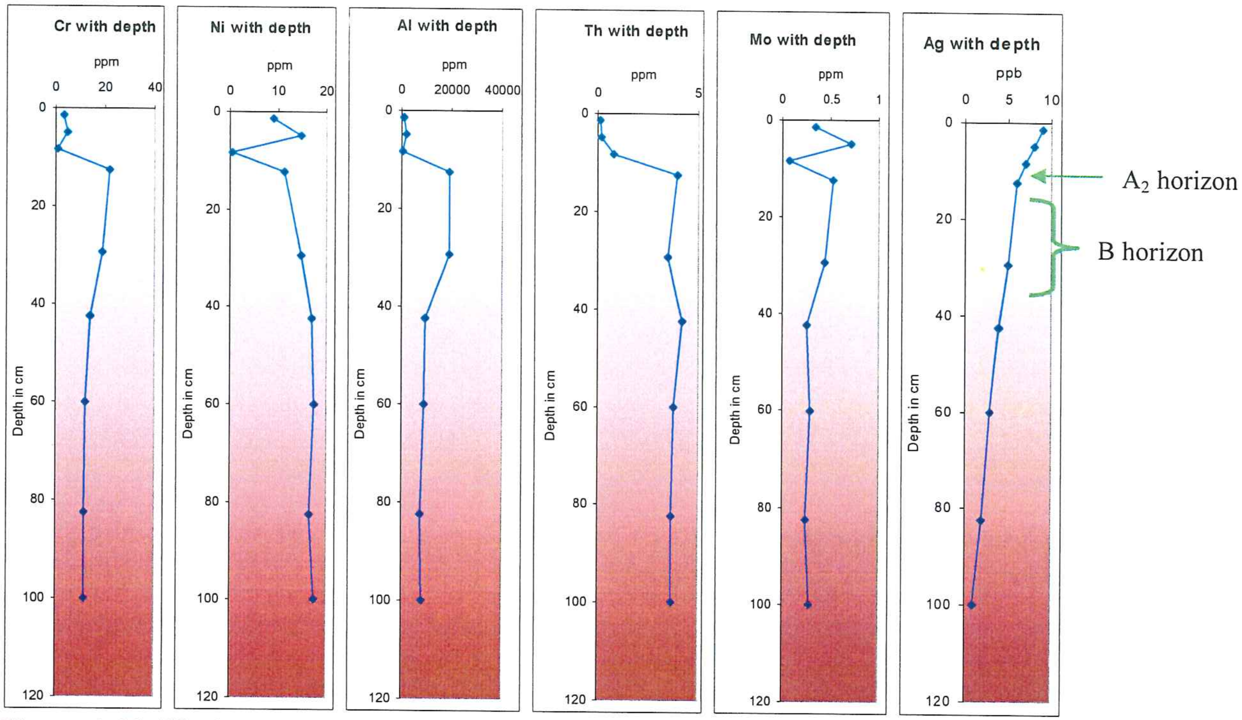


Figure 4.11: Up-ice sample location, 2 mm>x>63 μm size: Changes in Cr, Ni, Al, Th, Mo, and Ag concentrations with depth throughout the soil profile.

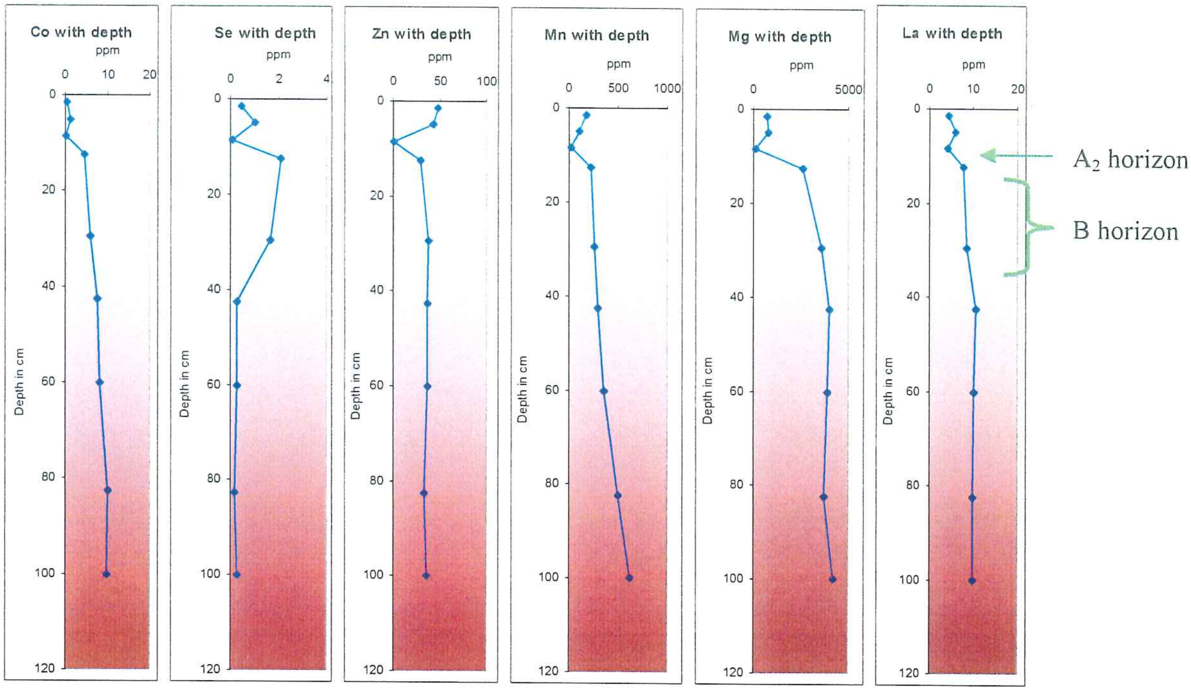


Figure 4.12: Up-ice sample location, 2 mm>x>63 µm size: Changes in Co, Se, Zn, Mn, Mg, and La concentrations with depth throughout the soil profile.

4.2.3 Down-ice Sample Site (site 2)

Samples taken at this location show variability in metal concentrations throughout much of the profile. The variability of metal concentrations within the A and B horizons is less than that found at the up-ice (site 1) and background (site 4) sites. Figures 4.13 – 4.18 are graphical representations of the geochemical results for the <63 µm and 2 mm>x>63 µm size fractions.

There was not a well-developed A_2 horizon at this location compared to the A_2 horizon sampled up-ice (site 1). This horizon is at ~20 cm depth at this site (Figures 4.13 – 4.18).

Peak elemental concentrations do not show a consistent trend between horizons at this site. Some elements show high levels in the A_{00} horizon, whereas others are peaking in horizons A_0, A_2, B, and even C. Similarly, consistent elemental differences are not as clearly defined between the two size fractions at this site. However, Hg and As tend to be higher in concentration within the smaller size fraction in most cases (Appendix C).

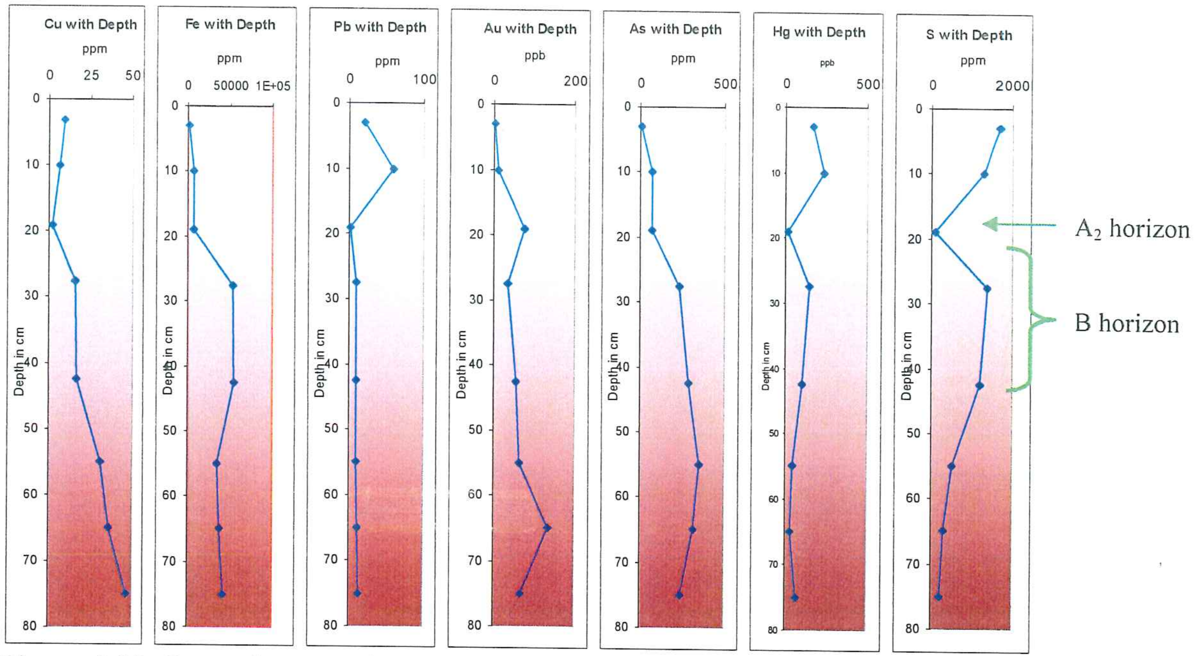


Figure 4.13: Down-ice sample location, <63 μm size: Changes in Fe, Cu, Pb, Au, As, Hg, and S concentrations with depth throughout the soil profile.

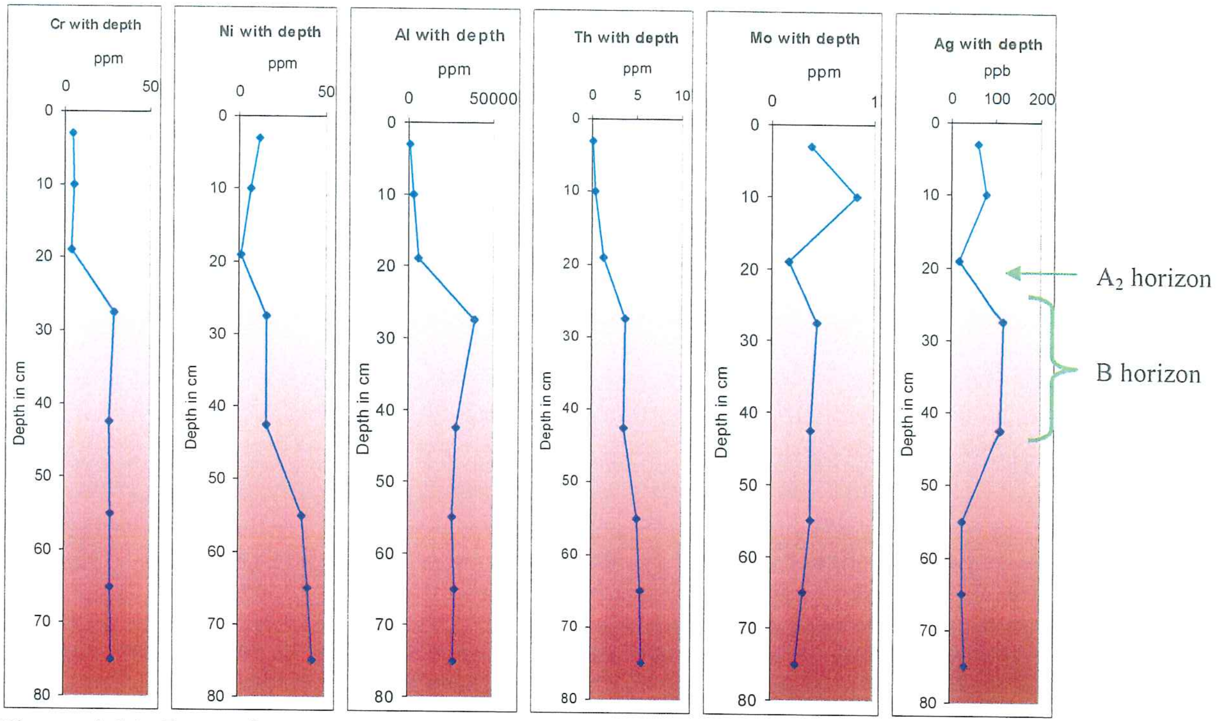


Figure 4.14: Down-ice sample location, <63 μm size: Changes in Cr, Ni, Al, Th, Mo, and Ag concentrations with depth throughout the soil profile.

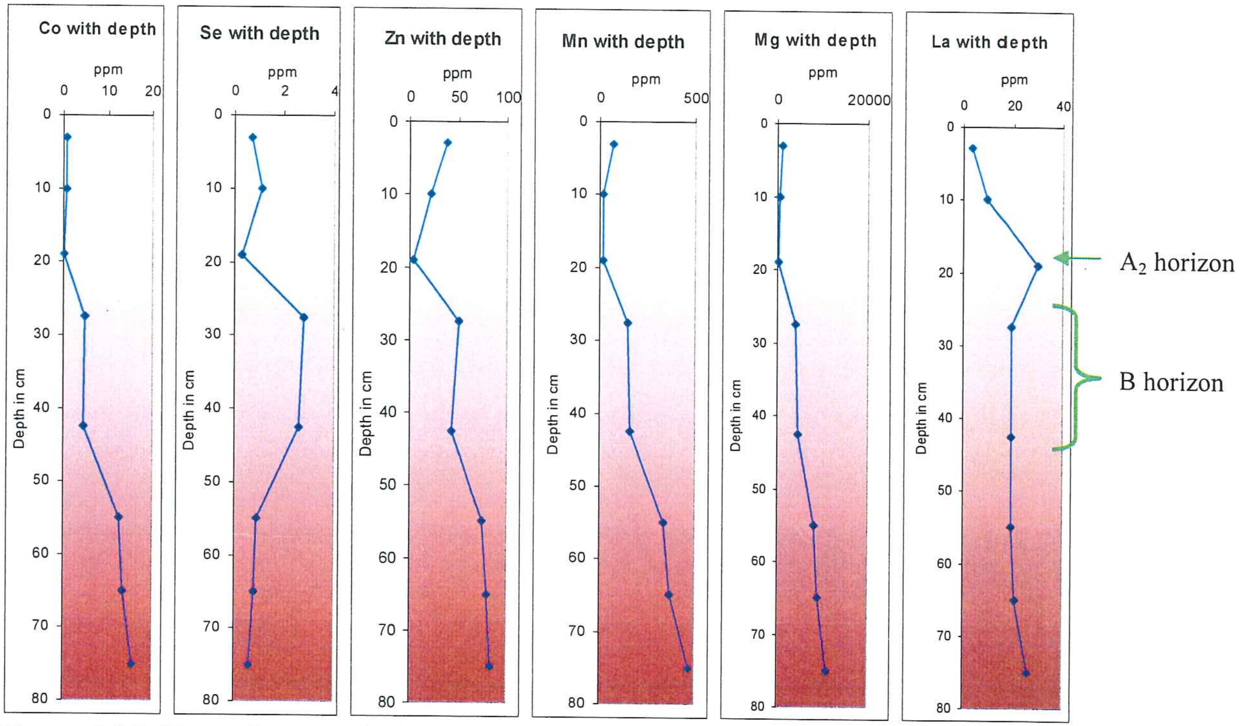


Figure 4.15: Down-ice sample location, <63 μm size: Changes in Co, Se, Zn, Mn, Mg, and La concentrations with depth throughout the soil profile.

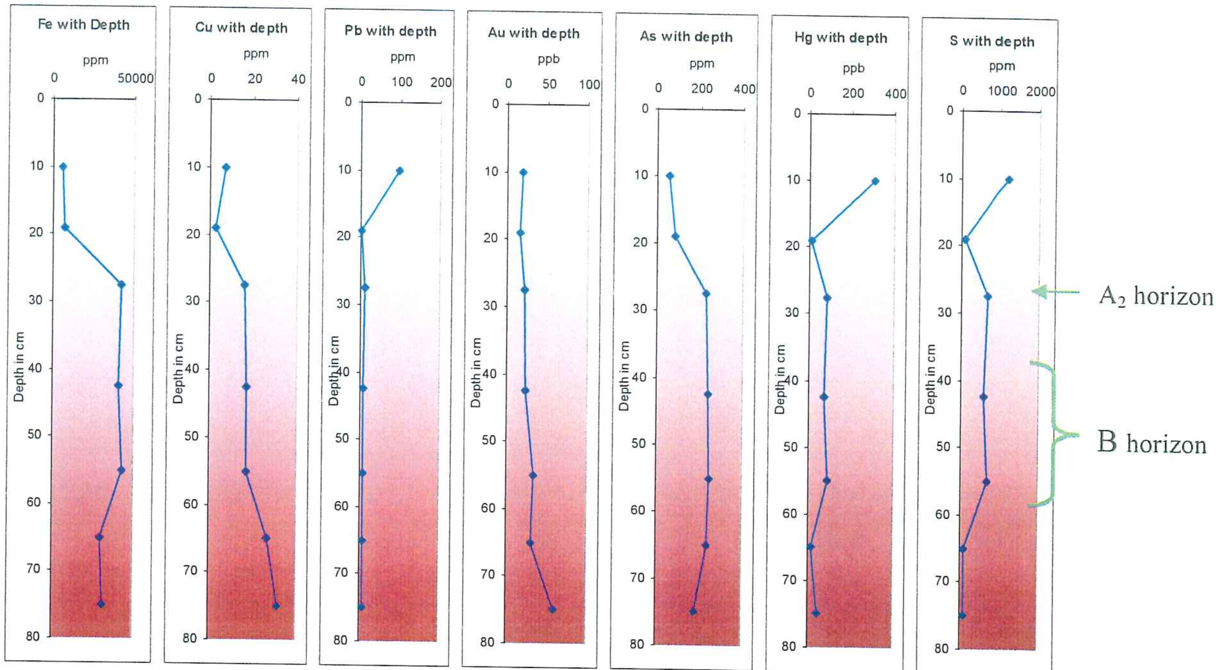


Figure 4.16: Down-ice sample location, 2 mm>x>63 μm size: Changes in Fe, Cu, Pb, Au, As, Hg, and S concentrations with depth throughout the soil profile.

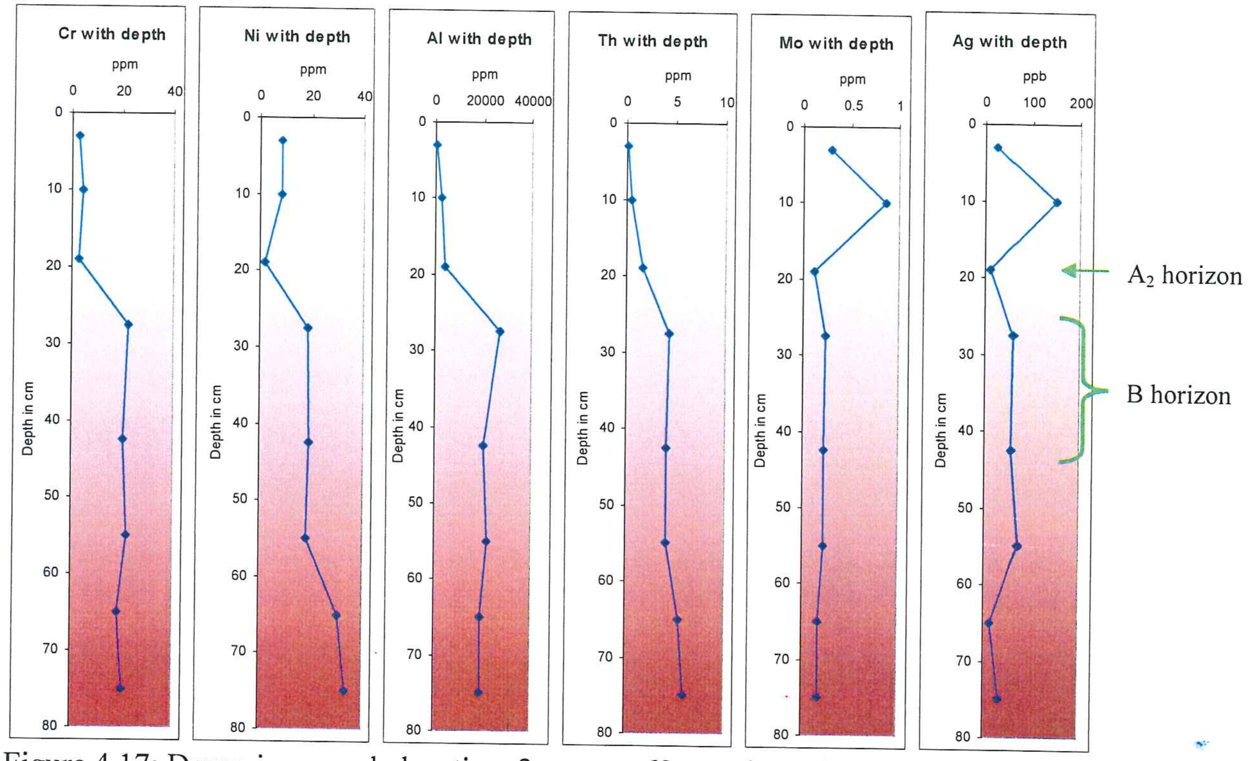


Figure 4.17: Down-ice sample location, 2 mm>x>63 μm size: Changes in Cr, Ni, Al, Th, Mo, and Ag concentrations with depth throughout the soil profile.

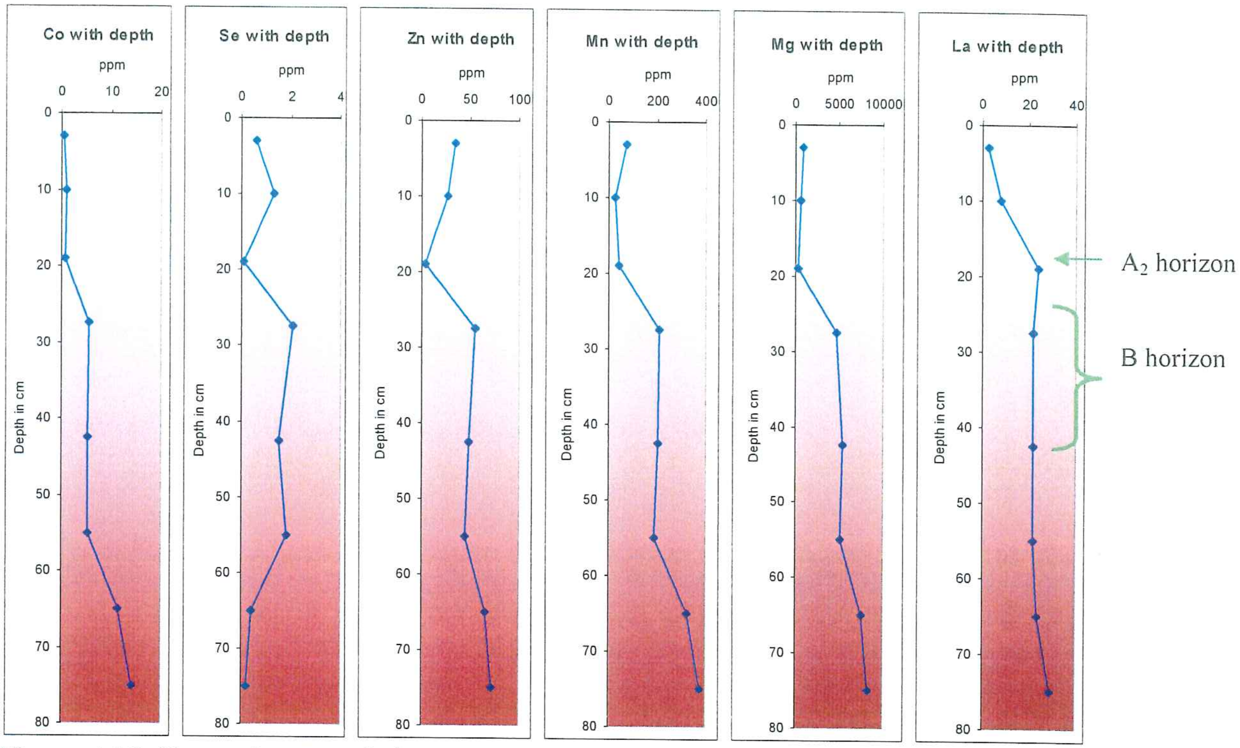


Figure 4.18: Down-ice sample location, 2 mm>x>63 µm size: Changes in Co, Se, Zn, Mn, Mg, and La concentrations with depth throughout the soil profile.

4.2.4 Mill Sample Site (site 3)

The mill site did not have a well-developed soil profile. Anthropogenic effects, such as the presence of glass and brick (Figure 3.6), were observed throughout the 70 cm profile sampled. However, most metals do show a general increase with depth.

Element concentrations at this site are orders of magnitude higher than at the background (site 4), up-ice (site 1), and down-ice (site 2) sites. Hg concentrations up-ice (mean value 115 ppb) are significantly lower that the mill site (mean value 15,700 ppb). Similarly, As concentrations up-ice (mean value 22.4 ppm) are also significantly lower than the mill site (mean value 813 ppm) (Appendix C).

Element concentrations are significantly different between the <63 μm size and 2 mm>x>63 μm size fractions. In general, the smaller size fraction, <63 μm size, shows higher concentrations.

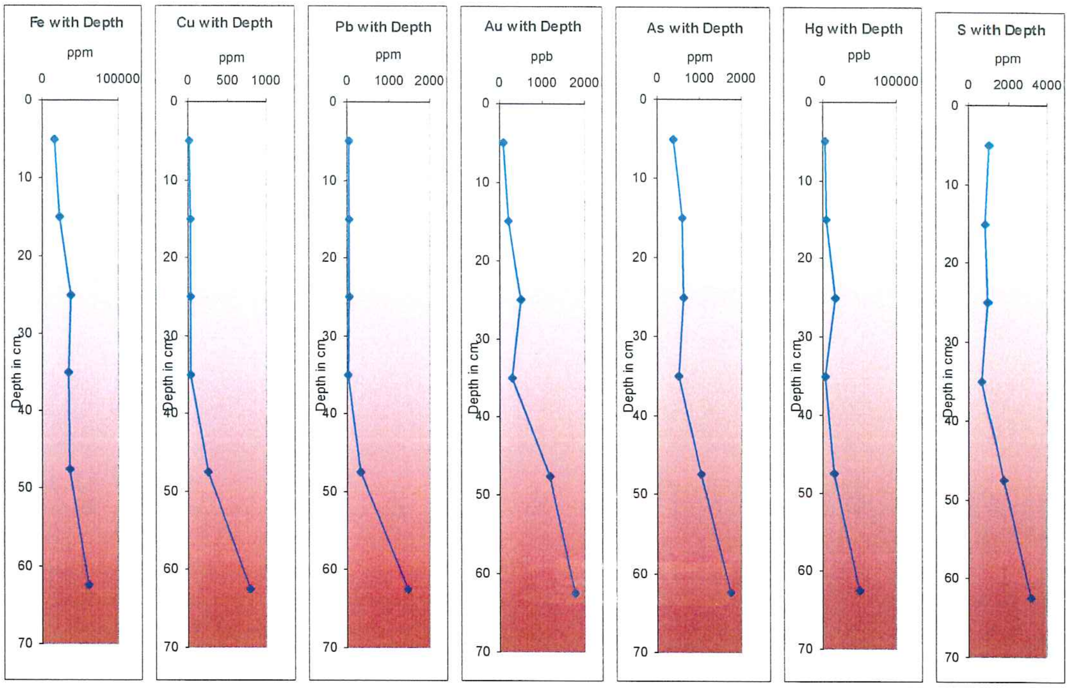


Figure 4.19: Mill site sample location, <63 μm size: Changes in Fe, Cu, Pb, Au, As, Hg, and S concentrations with depth throughout the soil profile.

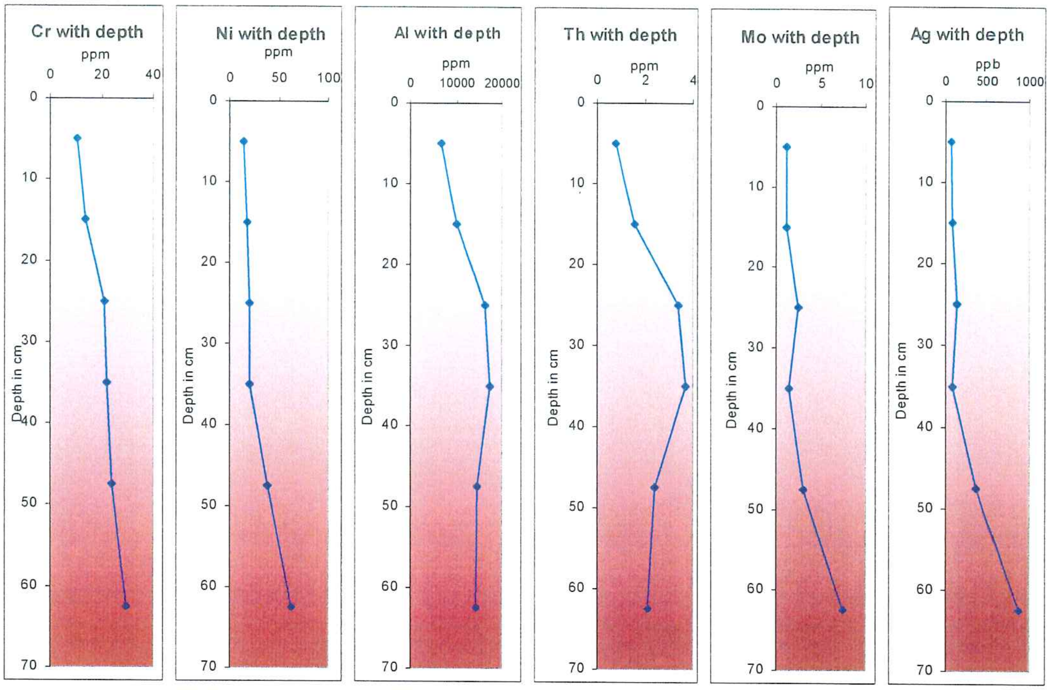


Figure 4.20: Mill site sample location, <63 µm size: Changes in Cr, Ni, Al, Th, Mo, and Ag concentrations with depth throughout the soil profile.

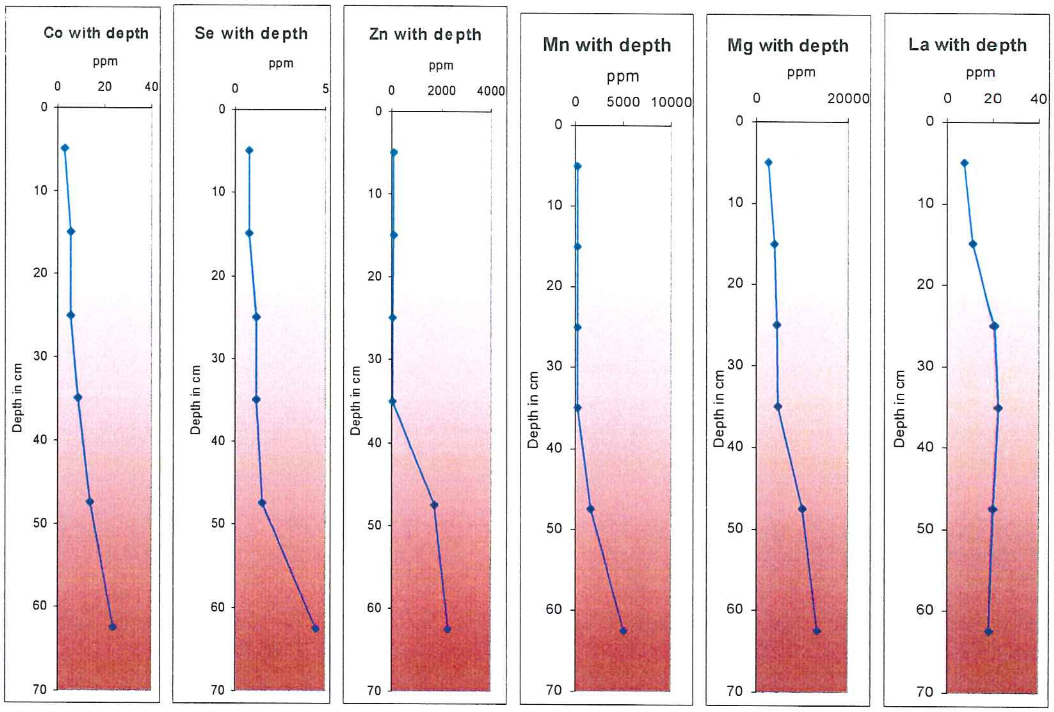


Figure 4.21: Mill site sample location, <63 µm size: Changes in Co, Se, Zn, Mn, Mg, and La concentrations with depth throughout the soil profile.

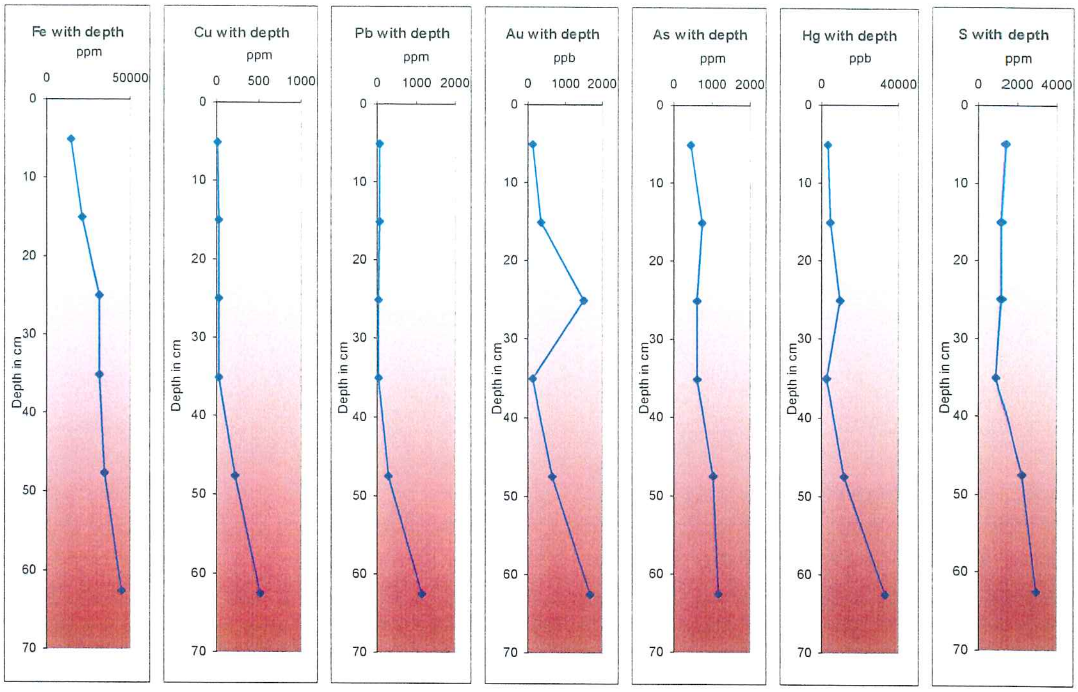


Figure 4.22: Mill site sample location, 2 mm>x>63 µm size: Changes in Fe, Cu, Pb, Au, As, Hg, and S concentrations with depth throughout the soil profile.

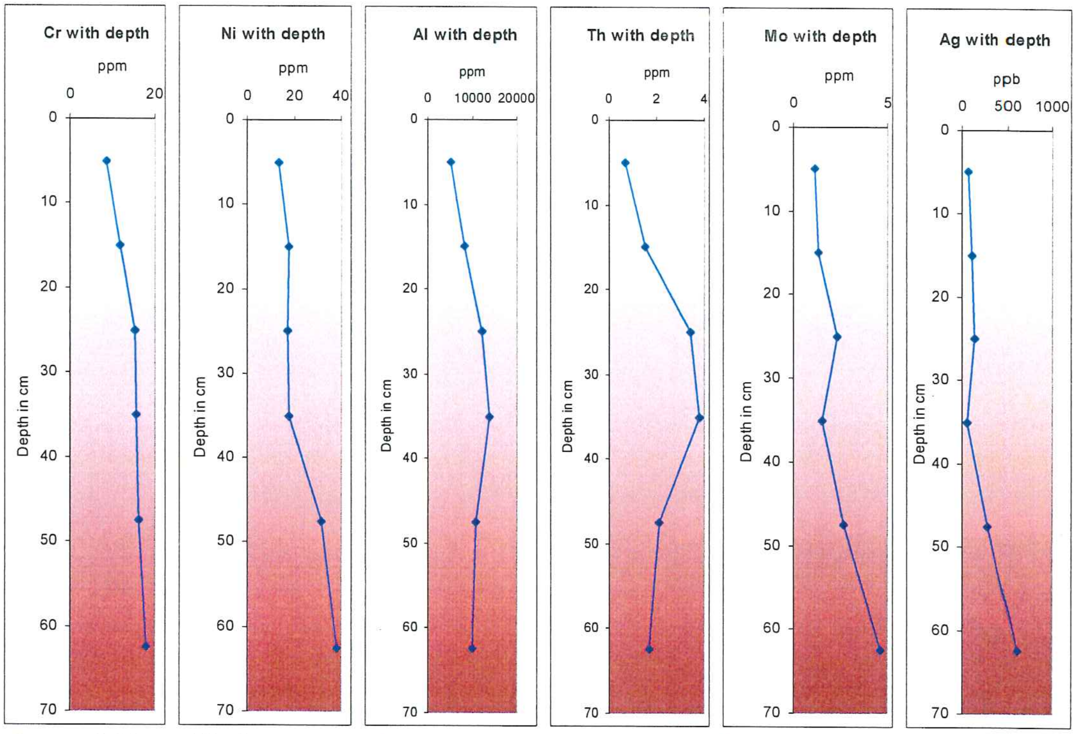


Figure 4.23: Mill site sample location, 2 mm>x>63 µm size: Changes in Cr, Ni, Al, Th, Mo, and Ag concentrations with depth throughout the soil profile.

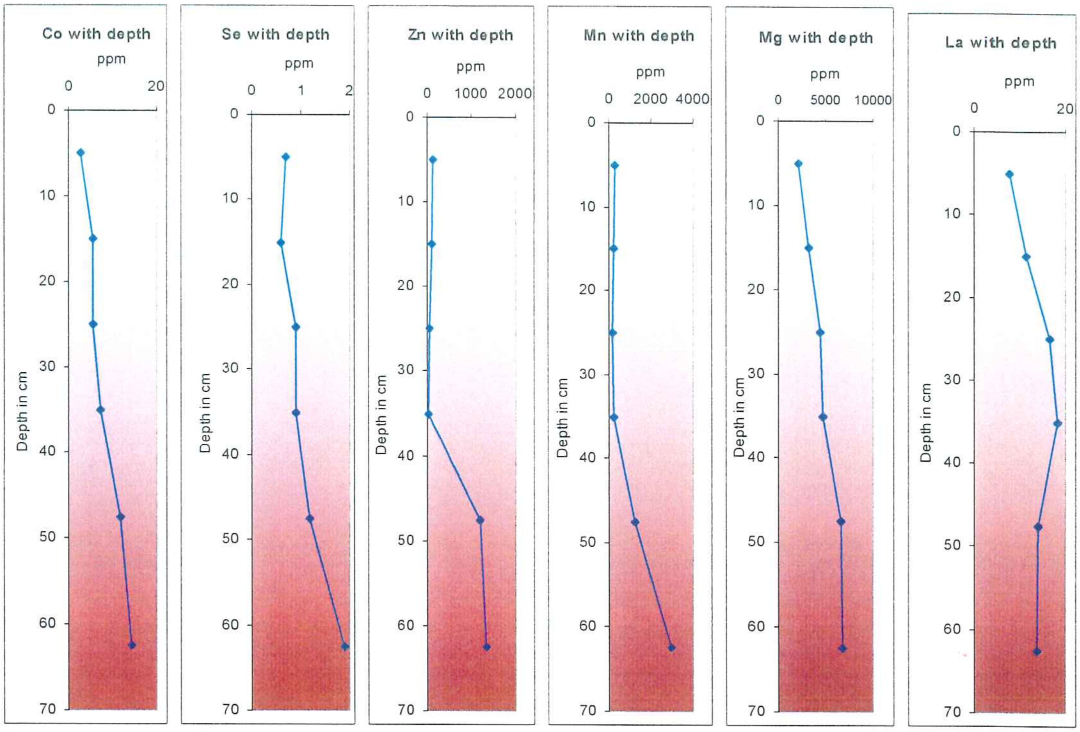


Figure 4.24: Mill site sample location, 2 mm>x>63 μm size: Changes in Co, Se, Zn, Mn, Mg, and La concentrations with depth throughout the soil profile.

4.3 Statistical Correlation Graphs from Geochemical Results

Correlations between elements were calculated from the geochemical analyses. The program R 2.3.0 was used to correlate all the results (R 2.3.0, 2006). The geochemical data were entered to produce pairwise scatterplots and numerical correlations. Pairwise scatterplots are represented in Figures 4.25 – 4.32. These Figures are graphical representations of the correlations between 18 selected elements. These elements include: Mo, Cu, Pb, Zn, Cr, Ni, Se, Co, Mn, Fe, As, Hg, Cd, Sb, V, Ti, Sc, and Tl. These elements were chosen as they are potentially toxic metals and metalloids categorized by various organizations such as the World Health Organization and the U.S. Environmental Protection Agency (Siegel, 2002). Both size fractions were plotted for pairwise scatterplots for each sample site. Correlations of the selected elements at the background site (site 4) are Figures 4.25 - 4.26, Figures 4.27 - 4.28 are up-ice site (site 1) correlations, Figures 4.29 - 4.30 are down-ice site (site 2) correlations, and Figures 4.31 - 4.32 are the mill site (site 3) correlations. The pairwise scatterplot diagrams in Figures 4.25 – 4.32 are symmetrical correlation plots within each of the small cells. Elements with high correlations will have points in linear sequence from bottom left to top right of each individual graph. Elements with poor correlations will not show a linear sequence and will tend to have randomly scattered points throughout each individual graph.

Numerical correlations were obtained for both size fractions of the 18 elements selected as well as between all 53 elements analysed by ICP-MS (Appendix D).

The statistical correlations reveal which elements tend to move throughout the soil profile together. Hg tends to correlate well with the same elements in both size fractions. Conversely, As does not show consistent trends with all metals.

In the smaller size fraction, all four sites were reviewed for correlations between Hg, As, and other elements. Site 3, the mill site, was interesting in that both Hg and As correlated well with all but 12 of the 53 elements. Hg and As had almost identical correlation values with the same elements. For the other 3 sites, As tended to correlate well with: Zn, Cu, Cr, Ni, Co, Mn, Fe, Mg, Ba, Sc, and Li. Hg tended to correlate well with: Mo, Pb, Ag, S, Sn, Cd, V, and Na at the other 3 sample sites (Appendix D).

For the larger size fraction, elements showed the same general trends as in the smaller size fraction. At the mill site (site 3), Hg and As were again almost identical in correlation values for similar elements. For the other three sample sites, Hg tended to correlate well with: Mo, Pb, Ag, S, Sr, Cd, V, P, Na, and Sn. Arsenic is not as consistent throughout the other three sample sites and only Fe is found to have high correlation within all three sites for the coarse size fraction. Other elements which tend to variably correlate with As are: Co, Bi, Mg, Al, Sc, Tl, and Rb (Appendix D).

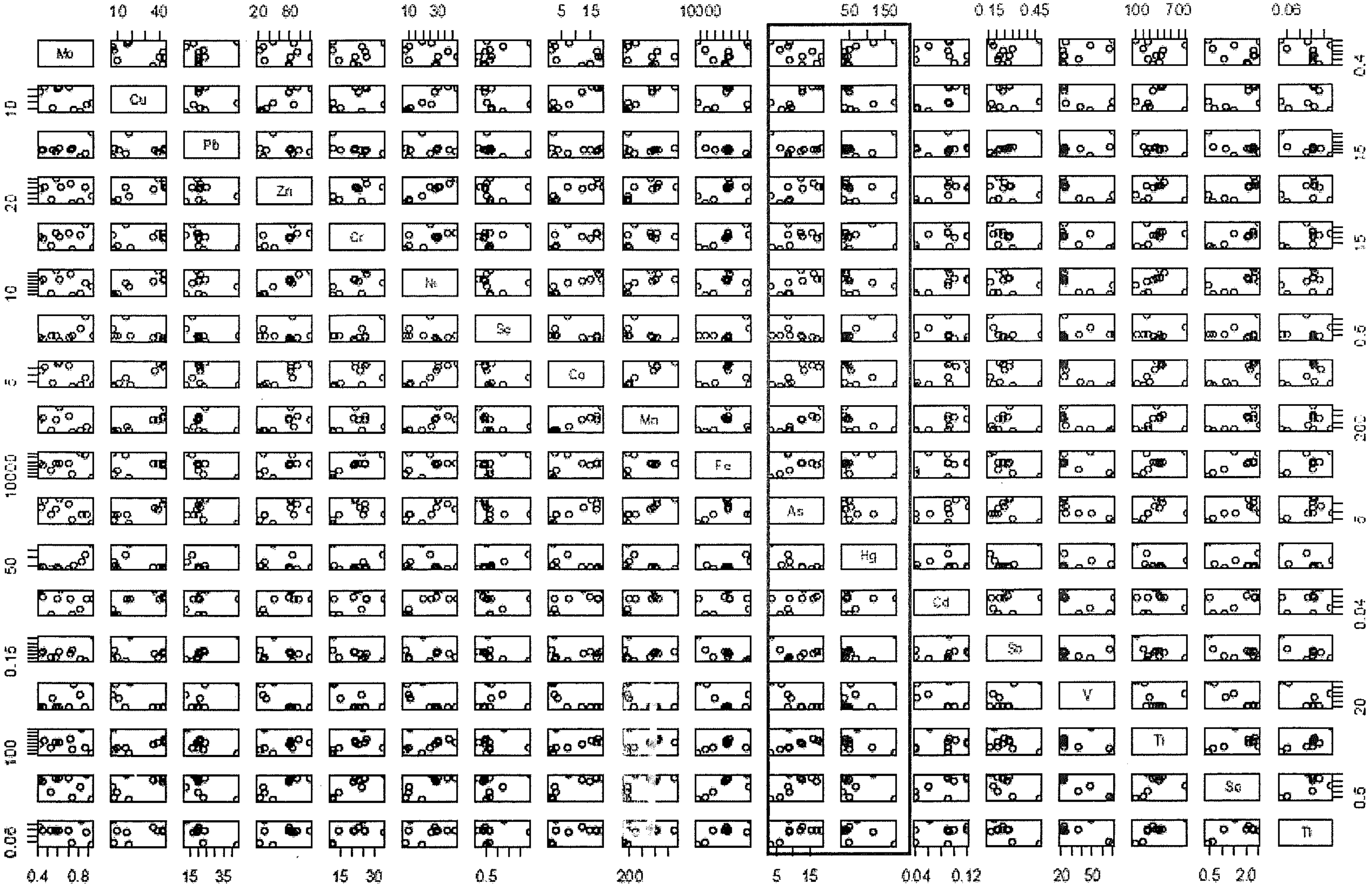


Figure 4.25 Background site (site 4) correlation graph from geochemical results comparing 18 selected elements. <63 μm size.

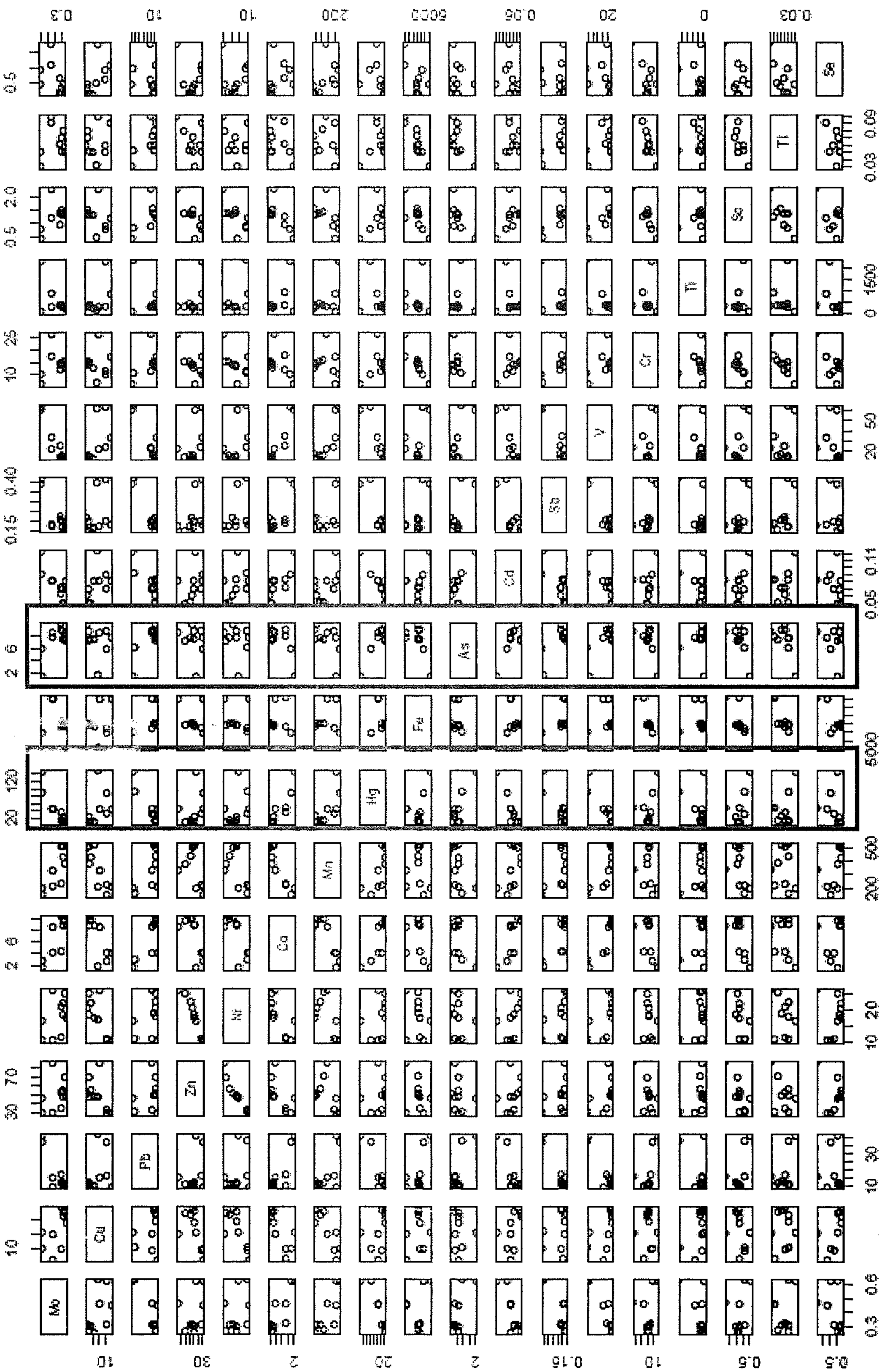


Figure 4.26 Background site (site 4) correlation graph from geochemical results comparing 18 selected elements. 2 mm>x>63 µm size.

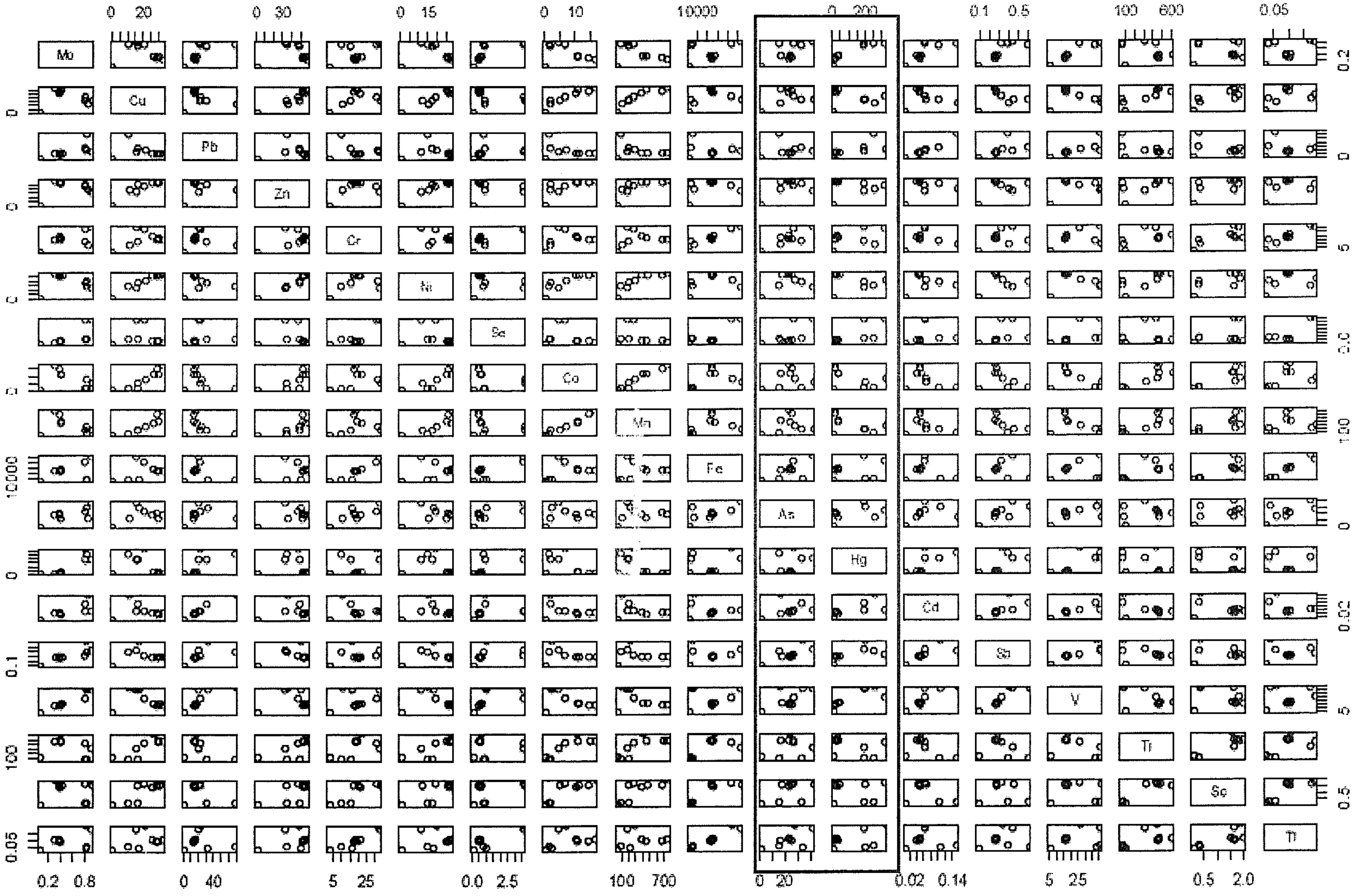


Figure 4.27 Up-ice (site 1) correlation graphs from geochemical results comparing 18 selected elements. <63 μm size.

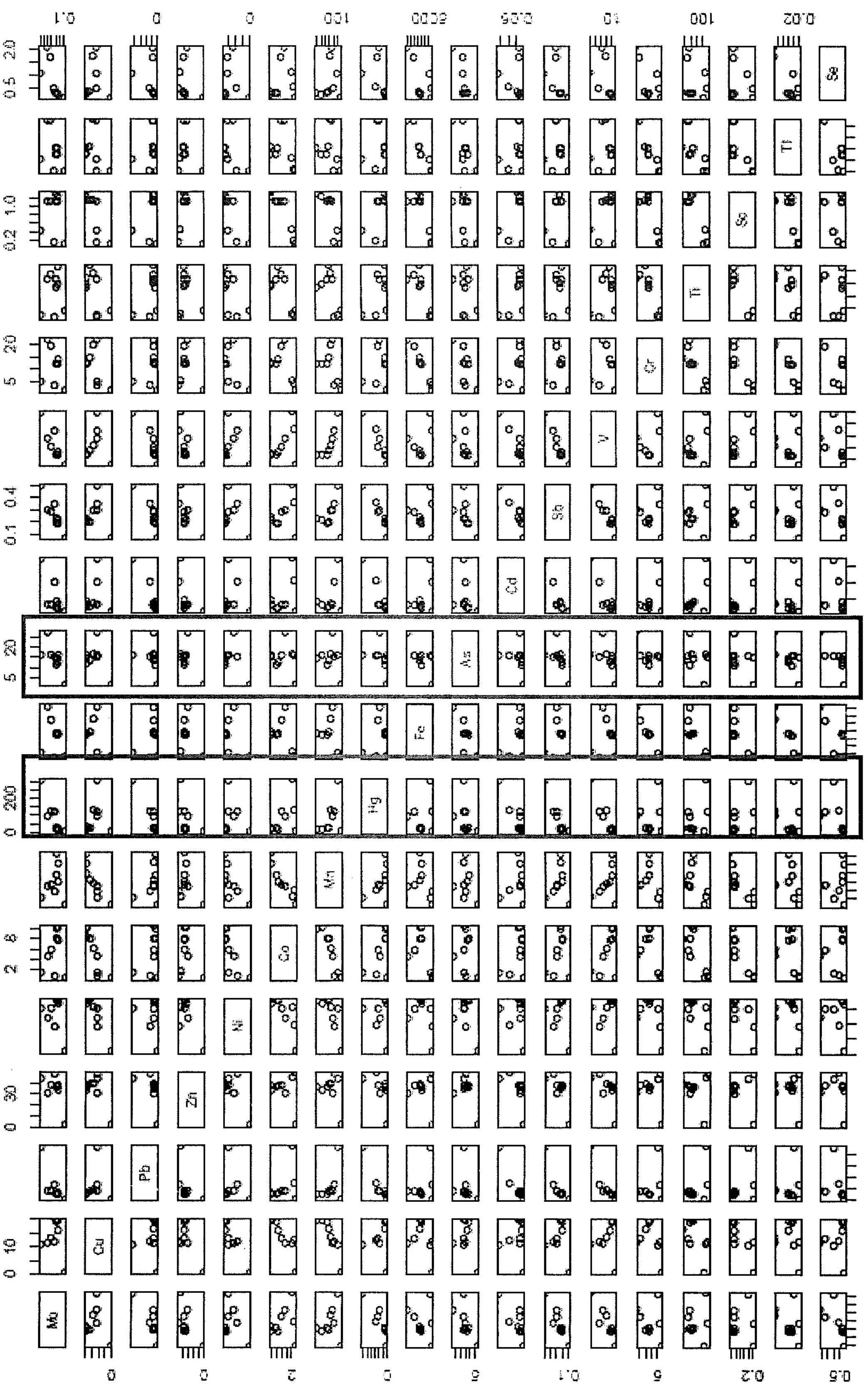


Figure 4.28 Up-ice (site 1) correlation graphs from geochemical results comparing 18 selected elements. 2 mm>x>63 µm size.

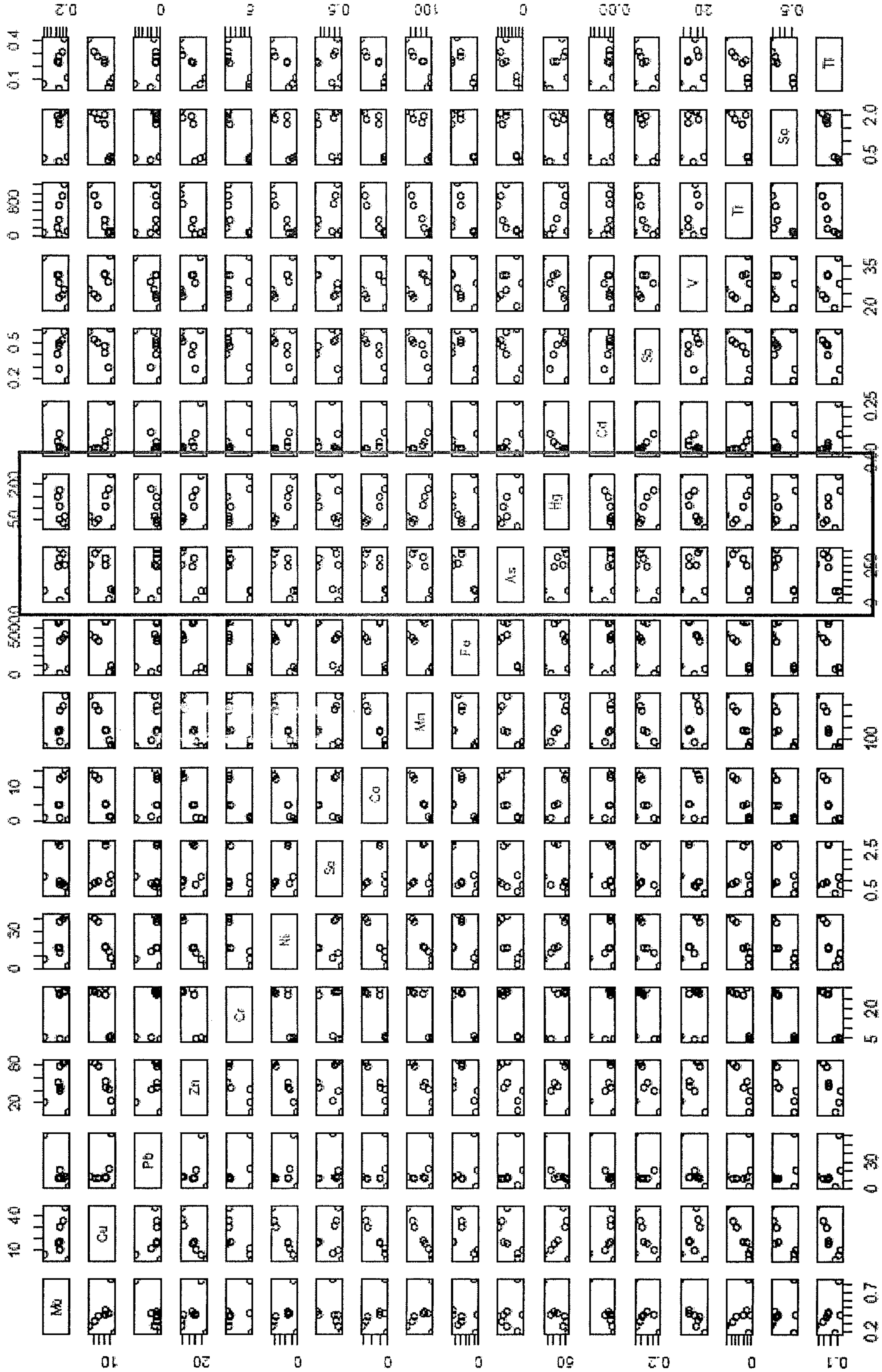


Figure 4.29 Down-ice (site 2) correlation graphs from geochemical results comparing 18 selected elements. <63 µm size.

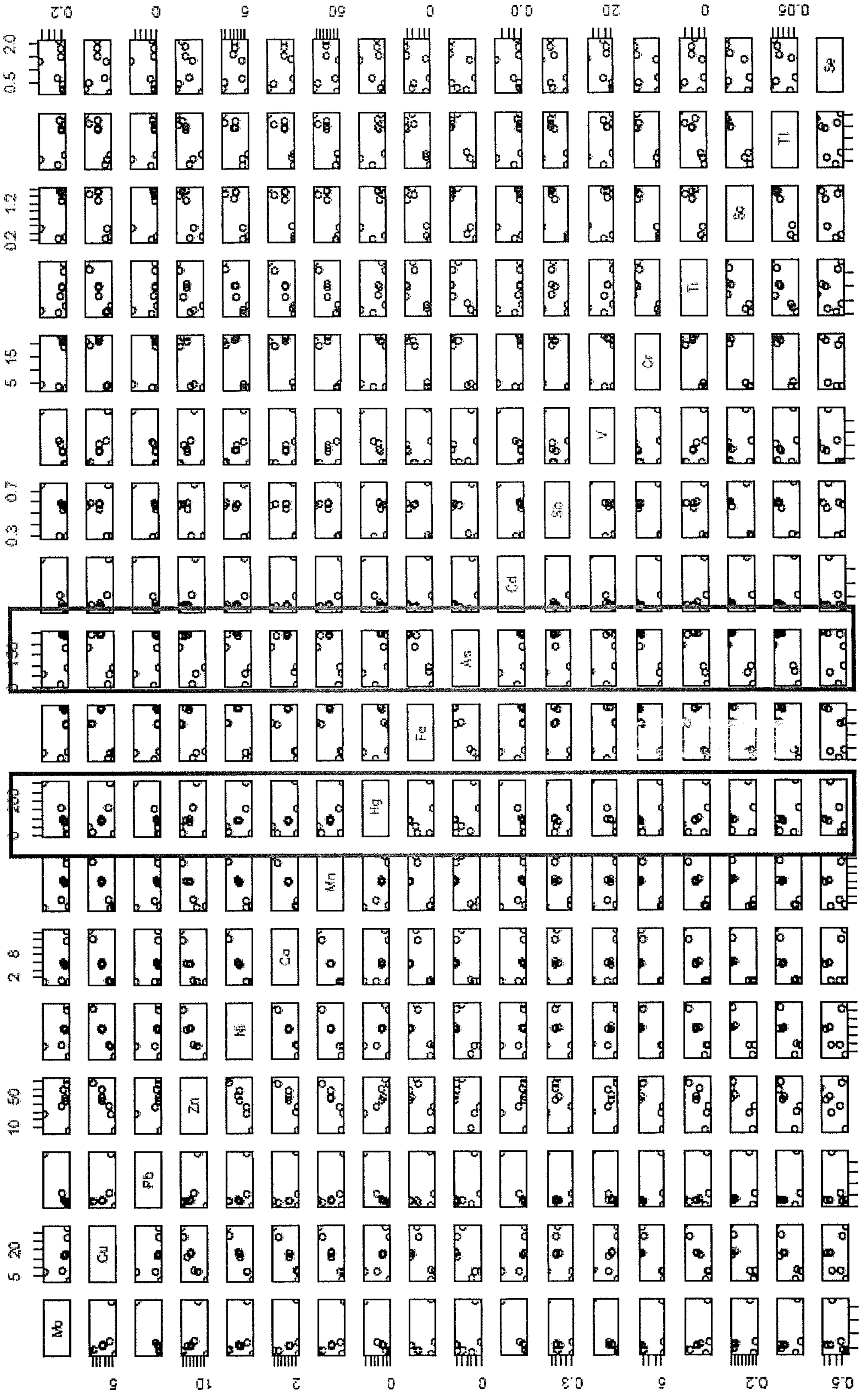


Figure 4.30 Down-ice (site 2) correlation graphs from geochemical results comparing 18 selected elements. 2 mm>X>63 µm size.

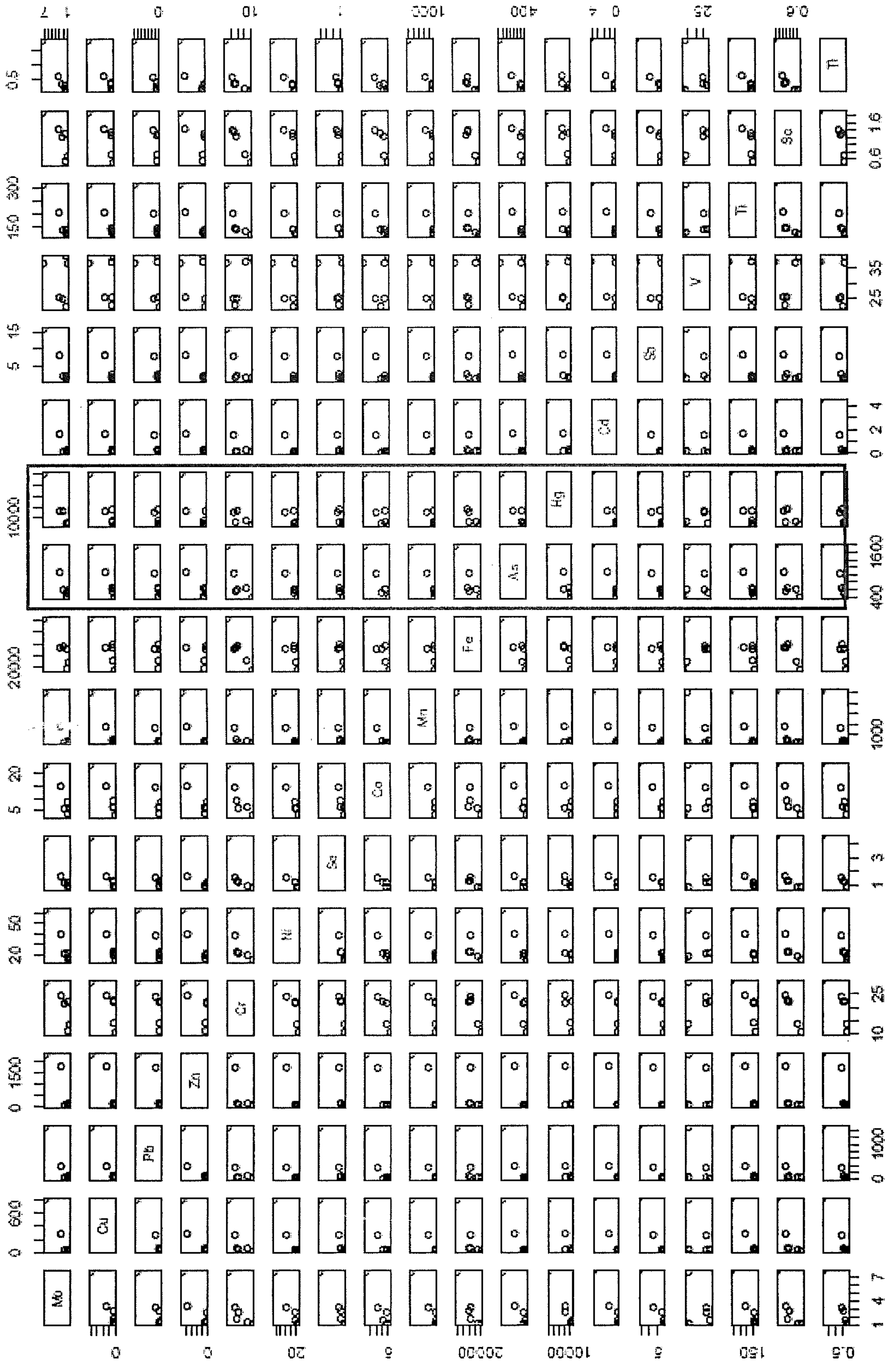


Figure 4.31 Mill site (site 3) correlation graphs from geochemical results comparing 18 selected elements. <63 µm size.

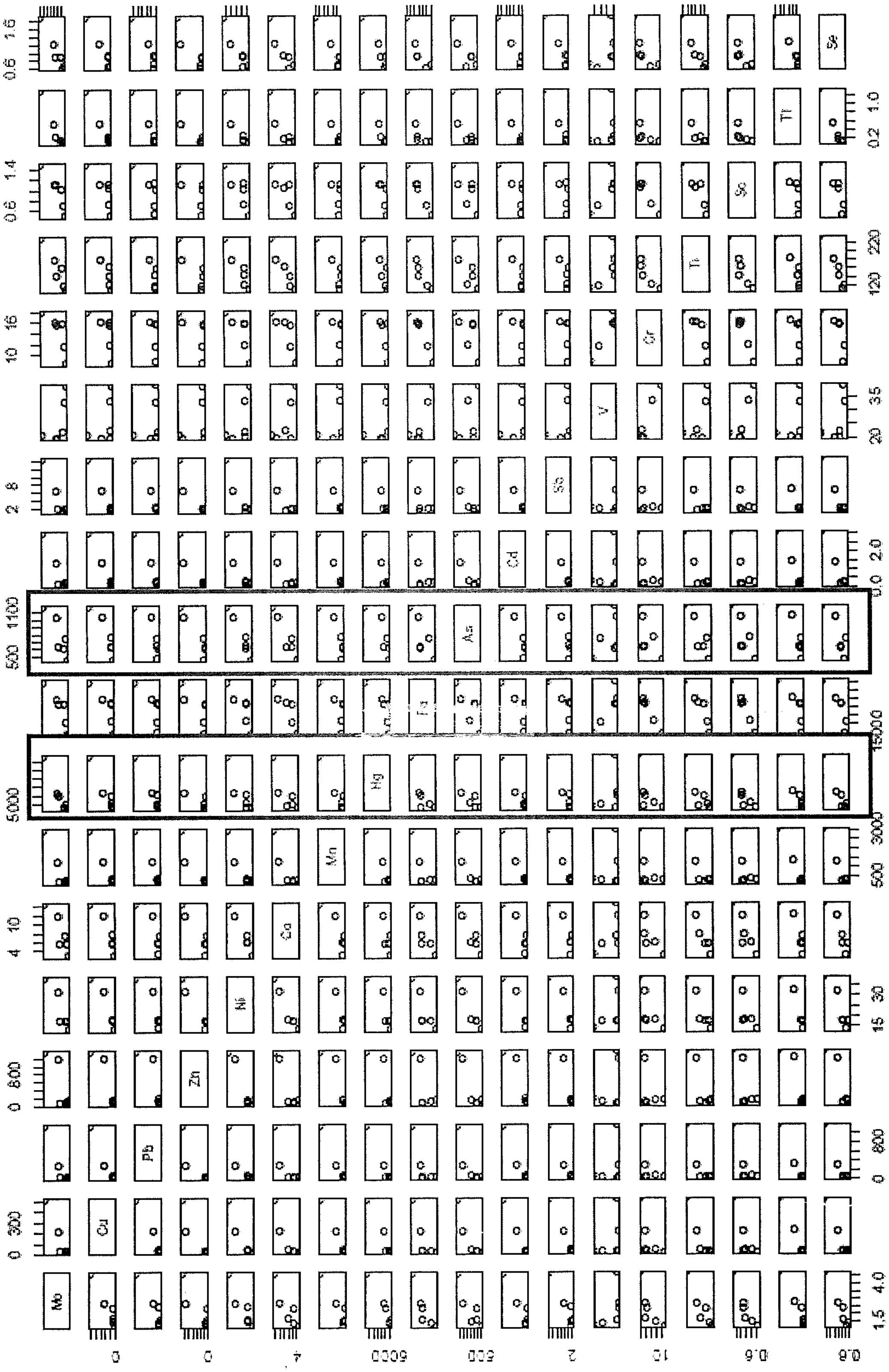


Figure 4.32 Mill site (site 3) correlation graphs from geochemical results comparing 18 selected elements. 2 mm>x>63 µm size.

4.4 Carbon Determination

Data for organic carbon and total carbon content were determined for both size fractions, <2mm and <63µm, of all samples. Inorganic carbon was calculated by subtracting organic carbon from total carbon (Appendix B).

Total carbon percentages generally decrease with depth in the soil profiles, and are highest within the surficial organic layers, followed by the B horizon, A_2, and finally decreasing significantly within the C horizon. Organic carbon is significantly higher than inorganic carbon throughout.

Duplicate samples were included in the analysis for quality control. The percentage difference between original and duplicate samples was calculated (Appendix B).

The bulk samples of the top 0-5 cm and top 0-30 cm of each soil profile were also analysed for carbon content. On average these samples were higher in total carbon content than the C horizon and lower in total carbon content than the surficial A_{00} horizons.

4.4.1 Background Sample Site (site 4, Figure 3.1)

For the <63 µm size fraction, the highest total carbon concentration is 20.3 wt.% and is found in the A_{00} horizon. The lowest total carbon concentrations obtained from this size fraction are from horizon C (0.38-0.83 wt.%).

The <2 mm size fraction has higher total carbon concentrations within the A_{00} horizon averaging 39 wt.% followed by the A_0 horizon (8.5 wt.%). The total carbon percentages for horizon C are low (0.15-0.61 wt.%) (Appendix B).

4.4.2 Up-ice Sample Site (site 1, Figure 3.1)

Horizons A_0 and A_{00} could not be sieved to <63 μm size fraction. The organics were too coarse and contained no clay-sized fraction. The highest total carbon concentrations from this size fraction are in horizon B (4-5 wt.%). The lowest total carbon values are in horizon C (0.29-0.52 wt.%).

All samples were sieved to <2 mm size fraction including horizons A_0 and A_{00}. In this larger size fraction the highest carbon values are in the A_0 and A_{00} surficial layers (33.9-43.5 wt.%). The lowest carbon concentrations are in the C horizon (0.29-0.52 wt.%) (Appendix B).

4.4.3 Down-ice Sample Site (site 2, Figure 3.1)

Horizon A_{00} could not be sieved to <63 μm size fraction. The highest total carbon value for <63 μm size is found in the A_0 horizon (20.7 wt.%). The lowest total carbon value is found in the A_2 horizon (0.77 wt.%).

All samples were sieved to <2 mm size fraction including horizons A_0 and A_{00}. The highest total carbon concentrations are found in the A_{00} horizon (37.3 wt.%).

The lowest total carbon value for <2 mm size fractions is in the A_2 horizon (0.71 wt.%) (Appendix B).

4.4.4 Mill Sample Site (site 3, Figure 3.1)

The mill site did not have a well-developed profile. The only horizon which was noticeable was A_{00}. There was no pattern in total carbon concentrations at this site. The deepest sample taken at 55-70 cm was found to have the highest total carbon value (18.3 wt.%) from the <2 mm size fraction.

4.5 Total Carbon vs. Mercury Correlations

The top organic layers of a soil profile are carbon-rich and have a tendency to adsorb metals (Mantoura *et al.,* 1978 cited in Lollar, 2005). The decay of organics can lead to reducing conditions which would allow for metals to concentrate in the carbon. Within the horizons sampled, the top organic layers were found to contain the most total carbon.

Mercury tends to form exceptionally strong associations with natural organic matter (Mantoura *et al.,* 1978 cited in Lollar, 2005). With the total carbon results obtained, correlation graphs were produced for total carbon against Hg within each sample (Figures 4.33-4.34).

Positive correlations were found and are plotted on each graph. Both size fractions are represented in the correlation graphs.

Correlations between carbon and Hg at the mill site were less defined, as the sample site lacked a proper soil profile as a result of active re-working of the land during mining processing. The addition of liquid Hg and/or Hg^{2+} and Hg^0 gas from the mill would also mask the natural partitioning of Hg to organic matter at this site. The correlations were calculated for site 3 but results comparing sample sites will be between sites 1, 2, and 4.

The <63 µm size fraction for the up-ice (site 1), down-ice (site 2) and background (site 4) sites show high correlations between total carbon vs. Hg. The mean correlation for the three sample sites mentioned is approximately 0.87.

Calculations between sites 1, 2, and 4 for the <2 mm size fraction also show high correlations between total carbon and Hg (mean = 0.65).

The size fractions used for total carbon are slightly different than from the size fractions used for the geochemical analysis, as mentioned in section 3.6.1 and 3.6.2. This error must be taken into account when interpreting the plotted data.

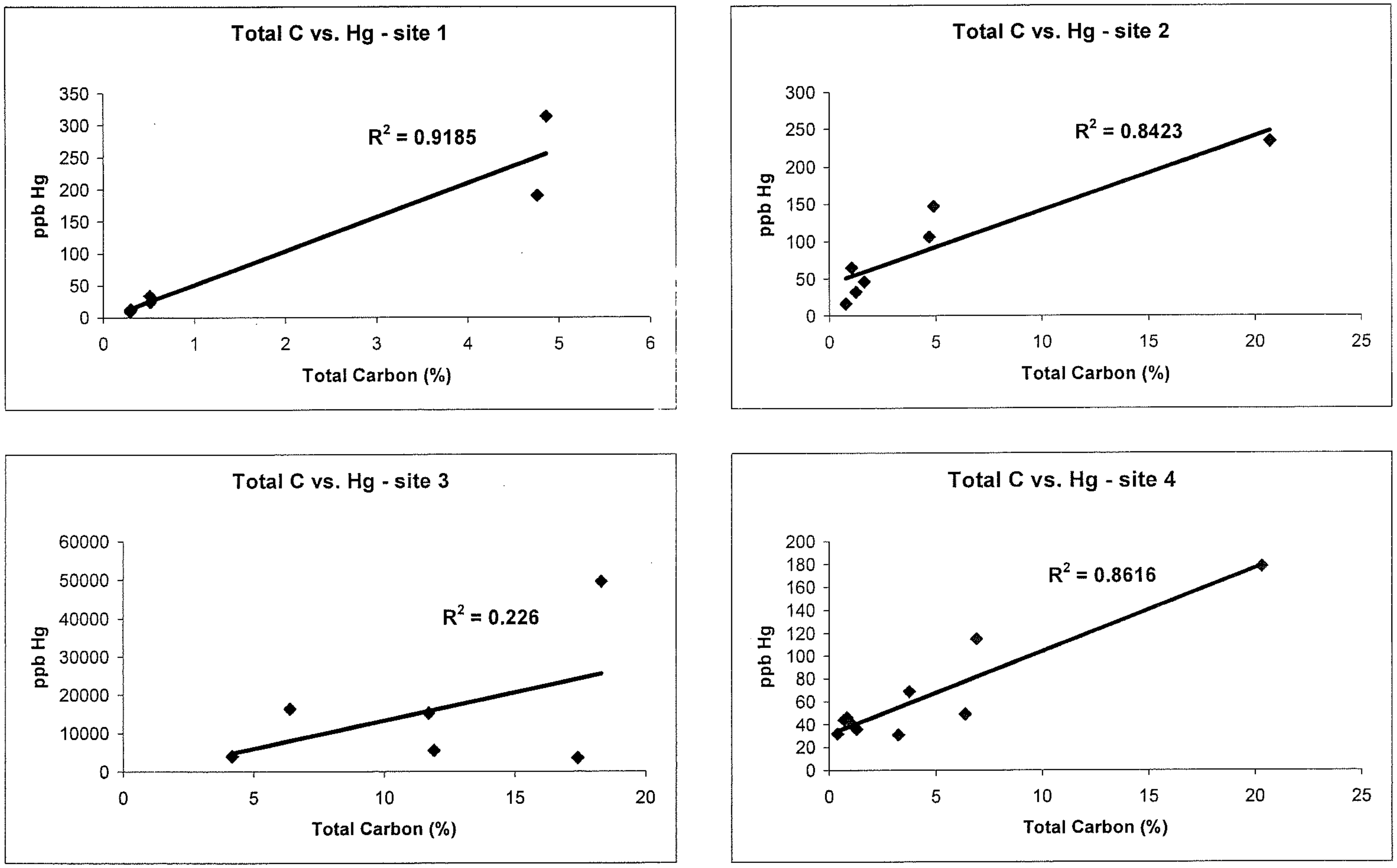


Figure 4.33 Total Carbon vs. Mercury Concentrations for each sample site - <63μm size fraction

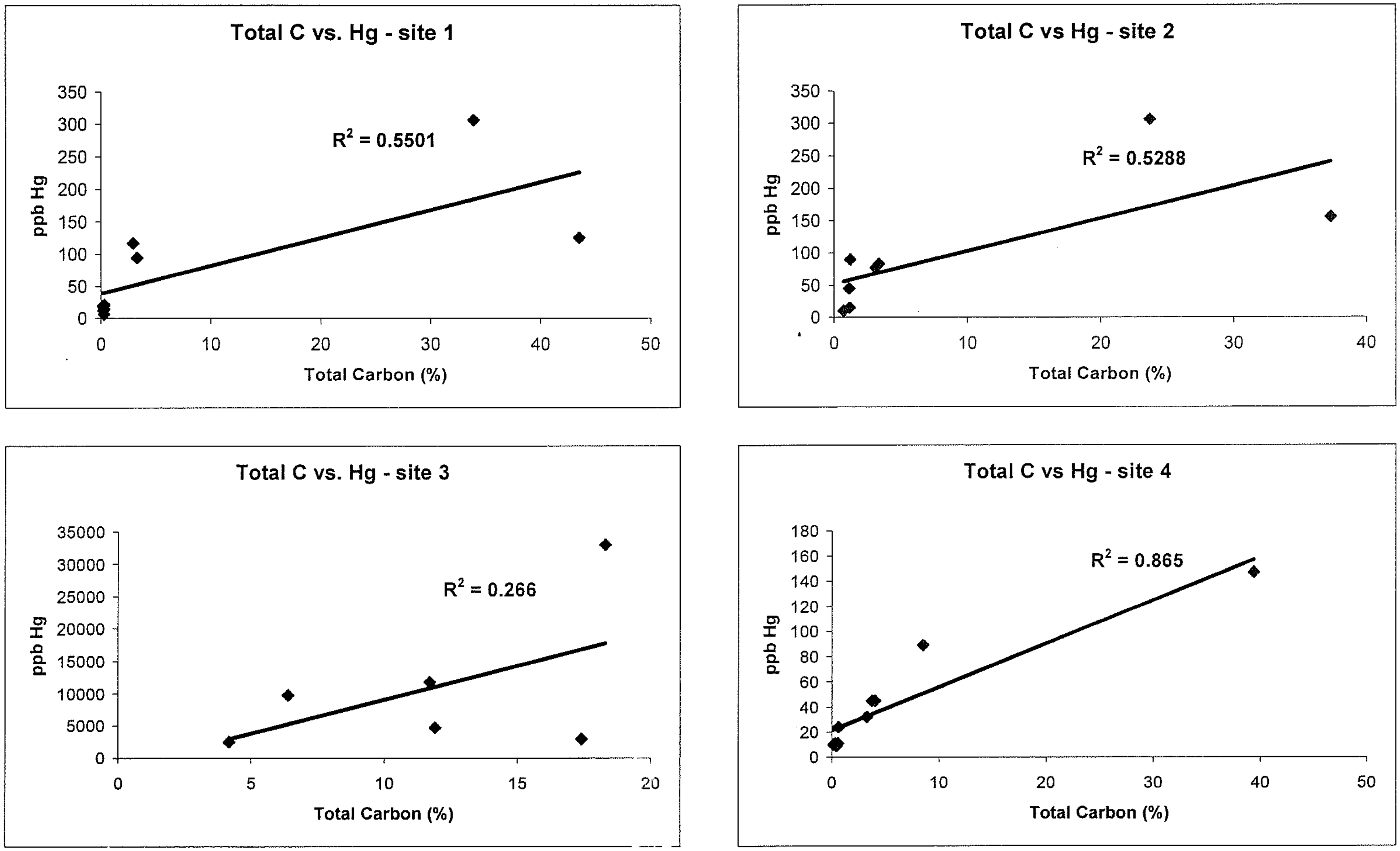


Figure 4.34 Total Carbon vs. Mercury Concentrations for each sample site - 2mm>x>63μm size fraction

4.6 Summary

Examination of geochemical results from each sample site reveal metal and element concentrations generally increasing in the order of: background (site 4), up-ice (site 1), down-ice (site 2), and finally to the high concentrations of the mill site (site 3) (Appendix C).

Concentrations were found to differ between the smaller and larger size fractions. In general, the smaller size fraction, <63 μm, was found to have higher concentrations than the larger size fraction, 2 mm>x>63 μm.

Statistical correlations between all 53 elements analysed via ICP-MS show Hg and As correlating well with a number of elements throughout a sample site profile (Appendix D).

The highest total carbon content found throughout the sample sites tended to be within horizons A_{00}, A_0, and B. Carbon concentrations tended to decrease in horizons A_2 and C (Appendix B).

Horizons with high organic content tend to adsorb metals, in particular, mercury. Total carbon percentages correlate positively with the Hg concentrations at each sample site (Figures 4.33-4.34). The lack of soil profile development at the mill site (site 3) accounts for the poor inter-element correlations in this profile.

CHAPTER 5: DISCUSSION

5.1 Introduction

The potentially toxic metals and metalloids categorized by various organizations such as the World Health Organization and the U.S. Environmental Protection Agency are As, Be, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Sc, Se, Ti, Tl, V and Zn (Siegel, 2002). As a result of historical mining practices at Montague Gold District, the chemistry of the environment has been altered and the concentrations of a variety of elements have increased. The soil samples analysed within Montague District reveal levels of Hg and As in excess of CCME (Canadian Council of Ministers of the Environment) standards; 6.6 ppm Hg and 12 ppm As concentrations in soils (CCME, 2006). These levels raise concerns about the potential for adverse impacts on human health and the ecosystem within and surrounding Montague District. Ingestion of metals can move up the food chain to higher trophic levels and may bioaccumulate. This process is how health threats begin as some metals may reach critical concentrations toxic to various life forms (Siegel, 2002).

The distribution of metals within the soils in and surrounding Montague District are clearly represented in the data obtained during this study. Additional research must be conducted to further assess environmental related effects including bioavailability and bioaccessibility at Montague and other abandoned Gold Districts within the province of Nova Scotia.

5.2 Metal(loid) Concentrations in Soil

The geochemical results obtained in this study have confirmed the effects mining practices have had on element distribution throughout soils, specifically Hg and As. The working hypotheses outlined in section 4.5 are consistent with the data obtained, as summarised below.

5.2.1 Mercury

The concentrations of Hg which were measured in and surrounding Montague District are highly variable. At the former mill site within the District, levels of Hg measured exceed the background levels characteristic of the local geology (~100 ppb background vs. ~ 49500 ppb at the mill site) (Appendix C). The use of Hg during mining practices is evident in the concentrations measured within the non-uniform profile at the mill site. Results from the mill site also indicate a general decrease in metal concentration towards the surface. This trend could represent a decrease in the use of Hg and other materials during extraction or episodic periods of material flushed out of the mill. The periodic workings of the mine during the ~80 years of production could also be reason for the highly variable levels of Hg within the soil profile seen at the mill site.

There has not been enough time geologically to allow for the development of a zoned profile, in which we might observe correlations between metals either within a given horizon or with depth. It takes significant time for horizons to develop within a soil profile and these abandoned mill sites are just recovering from mining production relative to geologic time. The concentrations of Hg found at the mill site are orders of magnitude above the health standard of 6.6 ppm within soils (CCME, 2006) (Appendix C).

The background sample site contains the highest concentrations of Hg within the A_{00} horizon (Appendix C). This is primarily due to the reducing environment characteristic of this decomposing organic-rich horizon. Mercury becomes immobile in reducing environments which is why it is in higher concentrations within the decomposing organic material.

The up-ice (site 1) and down-ice (site 2) locations show slight variances in Hg concentrations (Appendix C). Mercury concentrations are slightly higher down-ice but show the same trend throughout the soil profiles at both locations. The highest concentration of Hg at both sites is found within the A_0 horizon. The slight increase in Hg concentration at the down-ice sample location (Figures 4.13 and 4.16) is possibly due to the larger concentrations of sulphide minerals present near the anticline. Concentrations of Hg found within sulphide minerals of the Meguma Group are located in Table 1.1 The concentrations of Hg within both the up-ice and down-ice samples are below the CCME soil limit of 6.6 ppm (CCME, 2006).

5.2.2 Arsenic

Concentrations of As found within the soil samples taken in and around Montague District show levels generally exceeding the CCME soil limit of 12 ppm (CCME, 2006). Since As is naturally found near gold deposits in the form of arsenopyrite, it is not surprising to find high levels of the element surrounding Montague District.

At the mill site (site 3) location, arsenic is also found in highest concentrations at the bottom of the soil profile (Figures 4.19, 4.22). As discussed in section 5.2.1 this trend could be the result of episodic flushing of materials out of the mill as well as periodic workings of the mine during the ~80 years of production.

The background (site 4) sample site has 5 out of 10 samples above the soil limit of 12 ppm in the <63µm size fraction. All samples within the coarser size fraction are below the soil limit (Appendix C).

The up-ice and down-ice locations show large differences in As concentrations. The increase in As concentrations at the down-ice (site 2) location is significantly higher than the up-ice (site 1) concentrations (Appendix C). The increase is more noticeable than the Hg concentrations primarily because As is naturally more concentrated near gold deposits than Hg. Glacial scouring of the District during the last glaciation redistributed elements and minerals in the direction of transport, generally trending SE. In the case of Montague, glacial advance scoured the mineralized anticline redistributing elements, including As, further down-ice from the main concentration of gold deposits.

5.2.3 Correlations/Trends

The redistribution of elements and minerals during the last glaciation can be clearly seen in comparing the element distributions of the up-ice and down-ice sample locations. The high concentration of mineral deposits focussed near the anticlinal fold of the District within quartz veins (Smith *et al.,* 2005) would have been scoured and redistributed further south of the anticline location. In sampling the soils of the area, it is clear that these concentrations do increase down-ice from the concentrated mineral occurrences.

Highly elevated levels of metals located at the mill site are not surprising due to all the workings carried out during mining production. The lifespan of the mine allowed for a variety of metals to be distributed throughout the environment by various means such as changes in handling of the arsenopyrite concentrate and tailings.

5.3 Carbon

5.3.1 Carbon Content Determination

Carbon contents for sample sites 1, 2, and 4, were highest in horizon A_{00}, as was expected. Generally, the decrease in total carbon content with depth within each profile was found to be: A_{00}, A_0, B, A_2, C.

The mill site does not contain well-developed horizons because there has not been enough time geologically for such a profile to form. This accounts for the poor consistency of carbon content with depth within the mill site profile.

5.3.2 Carbon vs. Mercury Correlations

In all profiles, the highest carbon concentrations were found within the surficial organic layer, the A_{00} horizon. The reducing nature of this layer accounts for the higher concentrations of metals in this layer. Because carbon is a natural adsorber, horizons which have higher carbon concentrations typically also have higher metal concentrations. Carbon content throughout the A_2 horizon decreases consistently between the A_0 and B horizons. The B horizon, which shows an increase in carbon content, is also considered a metal sink.

The correlation values found between total carbon and mercury at sites 1, 2, and 4 tend to be high (Figures 4.33-4.34). The correlation values found at the mill site (site 3) are low. The carbon and metal values found at the mill site are extremely variable throughout. The highest total carbon concentrations were found in the deepest depth samples whereas the highest mercury concentrations were at the surface. Possible explanations for this could include episodic anthropogenic flushing of material of variable proportions from the mill site.

Within the <63µm size fraction there was good correlations between total carbon and mercury concentrations. The larger size fraction generally did not have correlations as high as the smaller size fraction. This is possibly because the finer material has more clays and more reactive surface area than the larger size fraction.

5.4 Environmental Implications from Sampling Protocol

The sampling protocol which was undertaken in this study varied from the frequently used environmental sampling procedures. Soil sampling procedures for environmental purposes have included sampling of the top 5 cm of a profile only or the top 30 cm of a profile only; in both cases, this would involve homogenization of the heterogeneous sample collected. In order to compare the results of these bulk samples, sample collection of these multi-horizon soils were also collected from each site, and analysed together with the depth-specific samples.

5.4.1 Bulk Samples

Sampling each horizon within a soil profile was very effective in this study because it showed variations of metal concentrations within each horizon. Carbon and other geochemical results were obtained for each sample taken characterizing the individual concentrations of the separate horizons of each soil profile. Since metal concentrations within the top ~ 40 cm of a soil profile vary significantly, sampling each horizon separately was useful in obtaining accurate data about metal movement, accumulation, and depletion.

The bulk samples taken for comparison allowed for averaging of the metal concentrations within the 0-5 cm or 0-30 cm sample taken. Problems arise with this method of sampling, in that the homogenization which occurs does not provide information as to where specifically within the profile the metals are concentrated. These data are in Appendix C.

5.4.2 Size Fractions

The two soil size fractions which were analysed for carbon content during this study were <63 µm and <2mm sizes. The size fractions used for soil geochemistry were <63µm and 2mm>x>63µm. Differences are obvious in comparing the metal concentrations between the finer and coarser size fractions used in both analyses. Generally, metal concentrations are higher in the finer size fraction, <63µm. Elevated metal concentrations in the finer fraction are the result of clays having more of a tendency to adsorb metals. Fine metal-rich particles are concentrated more in the finer fraction whereas the larger size fraction is more quartz-rich and is less likely to be enriched in metals. Clays have surplus charges which attract positively charged metals, that is, they have cation exchange capacity. Metals adsorbed onto clays can more easily be mobilized under changing Eh/pH conditions (Lollar, 2005).

The larger size fraction is commonly used for environmental analysis of sediments. Problems associated with only analysing the larger fraction are clear from the results obtained from this study. There are significant differences in metal concentrations when comparing the levels between both sizes. The smaller size fraction tends to have higher concentrations. Mis-interpretation of soil contamination would likely occur if only the large size fraction were to be analysed.

CHAPTER 6: CONCLUSIONS

The results obtained throughout this study have identified various characteristics about soil profiles in and surrounding Montague Gold District. These results are as follows:

1. Glacial transport transferred metals further down-ice from the main concentration of elements within the anticline of the District.
2. The concentration of metals, as well as other potentially toxic elements such as As and Hg, are highest near the former mill structures.
3. Arsenic levels in the soils increased as a result of mining practices.
4. Metal concentrations are lowest outside the District at the background sample site.
5. Within the soil profiles sampled, the highest concentrations of metals are found within the organic-rich horizons, A_{00} and A_0.
6. Mercury is positively correlated with organic carbon.
7. The smaller size fraction of soil sampled (<63µm), shows higher concentrations of metals compared to the larger (2mm>x>63µm) size fraction of soil.
8. Mercury was added to the local environment directly, as a result of former mining activities.

Ongoing research related to bioavailability and bioaccessibilty of metal(loid)s at abandoned gold Districts within Nova Scotia is currently underway

(Parsons, personal communication, 2007). Data from this thesis suggest additional analysis at abandoned Districts should consider including the determination of: (1) the speciation of Hg and As in sediments, water, and the atmosphere; (2) atmospheric dispersion of toxic elements within abandoned Districts; (3) the distribution paths of metals and sediments over time throughout a District; (4) the effects of toxic metal concentrations on aquatic organisms; and (5) toxic metal effects, if any, on local well waters surrounding abandoned gold Districts.

Direct links between As and Hg contaminated soils and human health are not entirely understood (Ullrich *et al.*, 2001; Kim, 2006). Assumptions should not be made relating adverse health effects in residents of the area to the presence of tailings and contaminants within the district. This specific correlation has not been studied in depth and scientific studies have not yet been completed.

Data from this study confirm elevated levels of Hg, As, and other metal(loid)s within the soils in and around the District, and it would be sensible for residents to observe the warning signs on the tailings, as well as check for elevated As levels in their soils and well water. Recommendations for human interaction with the area, as well as related Districts within the province, include: (1) avoiding reworking the tailings by recreational activities, (2) monitoring wells in the local area, (3) avoiding using the mine waste for any sort of construction, and (4) digging wells upslope rather than downslope from the tailings or waste rock piles.

References

Acme Analytical Laboratory. Aqua regia. Glossary. Vancouver, B.C. http://www.acmelab.com/cfm/index.cfm?It=900&Id=1

Anonymous. 1978. Mining activity and the impact on water resources of the Shubenacadie-Stewiacke river basin. Prepared for The Shubenacadie-Stewiacke River Basin Board. Technical Report No. 17. Nova Scotia, Montreal Engineering Co.

Azcue, J.M., Murdoch, F.R. and Hall, G.E.M. 1994. Effects of abandoned gold mine tailings on the arsenic concentrations in water and sediments of Jack of Clubs Lake, B.C. Environmental Technology, 15: 669-678.

Bates, J. 1987. Gold in Nova Scotia. Nova Scotia Department of Natural Resources, Mineral Resources Branch, Information Series ME 13. (available online at: http://www.gov.ns.ca/natr/meb/pdf/is13.htm)

Beauchamp, S., Tordon, R., Wong, H., Witt, J. 1998. Air-surface exchange of gaseous mercury from gold mine tailings in the Atlantic Region. *In* Proceedings of the Conference on Mercury in Eastern Canada and Northeast States, Edited by W. Pilgrim, N. Burgess, and M-F Giguere. Fredericton, NB, Sept. 21-23, 1998, pp. 6-7.

Boyle, R.W., Johasson, I.R. 1973. The geochemistry of arsenic and its use as an indicator element in geochemical prospecting. J. Geochem. Explorat., 2:251-296.

Brooks, R. R., Holzbecher, J., Ryan, D.E. 1981. Horsetails (*Equisetum*) as indirect indicators of gold mineralization. Journal of Geochemical Exploration, 16, pp. 21-26.

Brooks, R. R., Fergusson, J.E., Holzbecher, J., Ryan, D.E., Zhang, H.F., Dale J.M., Freedman, B. 1982. Pollution by arsenic in a gold-mining district in Nova Scotia. Environmental Pollution (Series B), 4, pp. 109-117.

Canadian Council of Ministers of the Environment. 2006. Canadian soil quality guidelines for the protection of environmental and human health: Summary tables. Updated November, 2006. In: Canadian environmental quality guidelines, 1999. [Online] http://www.ccme.ca/assets/pdf/ceqg_soil_summary_table_v6_e.pdf

Canadian Department of Agriculture. 1970. Description of horizons in a soil profile.

Christopherson, R.W., Byrne, M. 2006. Geosystems, An Introduction to Physical Geography. Pearson: Toronto.

Clarke, D.B., Halliday, A.N. 1980. Strontium isotope geology of the South Mountain Batholith, Nova Scotia; Geochimica et Cosmochimica Acta, vol. 44, pp. 1045-1058.

Clarke, D.B., Halliday, A.N., Hamilton, P.J. 1988. Neodymium and Strontium Isotopic Constraints on the Origin of the Peraluminous Granitoids of the South Mountain Batholith, Nova Scotia, Canada; Chemical Geology (Isotope Geoscience Section), Vol. 73, pp. 15-24.

Culgin, B.M. 2002. Mercury in Till and Bedrock, Kijimkujik National Park Area, Nova Scotia. BSc Thesis, Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia.

Dale, J.M., Freedman, B. 1982. Arsenic Pollution Associated with Tailings at an Abandoned Gold Mine in Halifax County, Nova Scotia. Department of Biology and Institute for Research and Environmental Studies, Dalhousie University. Proc. N.S. Institute of Science. Vol. 32, pp. 337-349.

Dawe, D. 1988. Assessment report on 1988 exploration program, general exploration licenses 10357,11305,13483,9943 and 14014, Goldboro, Guysborough County by Seabright Explorations Inc., Nova Scotia Department of Natural Resources Assessement Report AR88-364, p. 19.

Eaton, P. 1978. Investigation of Mercury Related Environmental Effects Associated with Abandoned Amalgamation Operations in Nova Scotia. Environmental Protection Service, Atlantic Region. Montreal Engineering Company, Nova Scotia.

Ebinghaus, R., Tripaht, R.M., Wallschlager, D., Lindberg, S.E. 1999. Natural and Anthropogenic Mercury Sources and Their Impact in the Air-Surface Exchange of Mercury on Regional and Global Scales. *In* Mercury Contaminated Sites: Characterization, Risk Assessment, and Remediation. *Edited by* R. Ebinghaus. p. 3-50.

EPS, 1978. Investigation of mercury related environmental effects associated with abandoned amalgamation operations in Nova Scotia. Environmental Protection Service EPS) Atlantic Region, Environment Canada Report 234, p. 58.

Faribault, E.R. 1902. Plan and Section, Montague Gold District, Halifax County, Nova Scotia. Geological Survey of Canada, Multicoloured Geological Map, 740.

Fisher, B.E., Keppie, J.D. 2006. Geological Map of the Province of Nova Scotia. Digital Version of Nova Scotia Department of Natural Resources Map ME 2000-1.

Government of Nova Scotia. 2006. Environment and Labour, Historic Gold Mine Tailings. http://www.gov.ns.ca/enla/contaminatedsites/goldmines.asp

Gregory, 1975. A brief history of mining and geology of Nova Scotia. Nova Scotia Department of the Environment.

Grantham, D.A., Jones, J.F. 1976. Arsenic contamination of water wells in Nova Scotia. Journal of the American Water Works Association, 69, pp. 653-657.

Harrington, G.S., McKenzie, N. 1927. Montague Gold District, Nova Scotia Department of Public Works and Mines. Office of King's Printer, Halifax, Nova Scotia.

Health Canada. 2006. Arsenic in Drinking Water. Available online at http://www.hc-sc.gc.ca/iyh-vsv/environ/arsenic_e.html

Henderson, E.H. 1935. Stamp-milling and amalgamation practices at Goldenville, N.S. Canadian Institute of Mining and Metallurgy Bulletin, 278, pp.222-242.

Hindmarsh, J.T., McLetchie, O.R., Heffernan, L.P.M., Hayn, O.A., Ellenberger, H.A., McCurdy, R.F., Thiebaux, H.J. 1977. Electromyographic abnormalities in chronic environmental arsenicalism. Journal of Analytical Toxicology, 1, pp. 270-276.

Hopper, D.B., Bonner, F.J., Fisher, B.E., Murphy, A.N. 2002. Mineral Resource Land-Use Maps. DP ME 047, Version 2, 2002, Digital Version of Nova Scotia Department of Natural Resources Open File Maps ME 2000-4 (2000).

INCO Ltd. 2002. Environmental, Health and Safety Report. Glossary: *waste rock.* http://www.inco.com/development/reports/ehs/archives/2002/glossary/

Jagodits, F.L., Walker, J.L. 1974. Report on geochemical and geophysical surveys, P.L. Dufferin Mine Area, Halifax County, Nova Scotia for Tri-Bridge Consolidated Gold Mines Ltd., Nova Scotia Department of Natural Resources Assessment Report 11D/16C 21-H-63(12), p. 18.

Jonasson, I.R., Boyle, R.W. 1972. Geochemistry of Mercury and Origins of Natural Contamination of the Environment. Bull. Can. Inst. Mining and Metallury. 65 (717).

Kim, N. 2006. Finding the real risks of contaminated sites. *In* Catalyst. Carleton University. http://www.carleton.ca/catalyst/s7.html

Kinross Gold Corporation. 2005. Glossary of Mining Terms, *tailings*. http://www.kinross.com/ir/glossary.html

Krabbenhoft, D.P., Rickert, D.A. 1997. Mercury Contamination of Aquatic Ecosystems. U.S Department of the Interior, U.S. Geological Survey, Fact Sheet FS-216-95.

Lane, P.A., Crowell, M.J., Graves, M.C. 1988. Heavy metal removal from gold mining and tailing effluents using indigeneous aquatic macrophytes (Phase 1). *In* Proceedings of the 5th Annual General Meeting of BIOMINET. Edited by R.G.L. McCready. CANMET SP88-23, pp. 3-37.

Lane, P.A., Pett, R.J., Crowell, M.J., MacKinnon, D.S., Graves, M.C. 1989. Further studies on the distribution and fate of arsenic and mercury at a site contaminated by abandoned gold mine tailings. *In* Proceedings of the 6th Annual General Meeting of BIOMINET. Pp. 78-107.

LECO Instruction Manual. 1988. WR-112 Wide Range Carbon Determinator. LECO Corporation; Michigan, USA.

Levinson, A.A. 1974. Introduction to Exploration Geochemistry. Applied Publishing Ltd. Wilmette, Illinois.

Little, M. 2006. Distribution of Arsenic and Mercury in Terrestrial and Marine Environments Impacted by Gold Mine Tailings, Wine Harbour, Nova Scotia. BSc Thesis, Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia.

Lollar, B.S. 2005. Envionmental Geochemistry. Elsevier, New York.

Malcolm,W. 1929. Gold Fields of Nova Scotia. Geological Survey of Canada. Memoir 385. p.124.

Mantoura, R.F.C., Dickson, A., Riley, J.P. 1978. The complexation of metals with humic materials in natural waters. Estuar. Coast. Mar. Sci. Vol. 6. pp. 93-408.

Moggridge Kussisto, K. 1978.Gold mining and milling in the Sherbrooke Gold District 1861-1906. Unpublished curatorial report for the Nova Scotia Museum.

Mudroch, A., Clair, T.A. (Editors) 1985. The impact of past gold mining activities on the Shubenacadie River headwaters ecosystem. Environment Canada / N.S. Department of the Environment Report, IWD-AR-WQB-85-81, p. 195.

Mudroch, A., Clair, T.A. 1986. Transport of arsenic and mercury from gold mining activities through an aquatic system. The Science of the Total Environment, 57, pp. 205-216.

Mudroch, A., Sandilands, R. 1978. Geochemical analyses of lake bottom sediments in the Shubenacadie headwaters. Shubenacadie-Stewiacke River Basin Technical Report #9, Halifax, N.S., p. 89.

National Research Council. 1999. Arsenic in drinking water. National Academy Press, Washington, D.C.

Nordstrom, D.K., Archer, D.G. 2002. Arsenic thermodynamic data and environmental geochemistry: An evaluation of thermodynamic data for modeling the aqueous environmental geochemistry of arsenic. In: Arsenic in Groundwater. Edited by A.H. Welch and K.G. Stollenwerk. Kluwer Publishers.

Nova Scotia Department of Natural Resources. 2003. Digital orthophoto; topographic base layers from Mineral Resources Land Use Atlas (2002 NSDNR). Reproduced courtesy of NSDNR.

Page, K.D. 2001. An examination of Mercury (Hg) Contamination in Kejimkujik National Park: The Role of Geologic Sources. M.Sc. thesis. Dalhousie University. Halifax, Nova Scotia.

Parsons, M. 2006. Presentation on 'Environmental Legacy of Historical Gold Mining Activities in Nova Scotia. Bedford Institute of Oceanography.

Parsons, M. 2007. Ongoing research related to bioavailability and bioaccessibility at abandoned gold districts within Nova Scotia. Personal Communication.

Parsons, M.B., Smith, P.K., Goodwin, T.A., Hall, G.E.M., Sangster, A.L., Percival, J.B. 2004. Distribution, cycling, and fate of mercury and associated elements at historical lode gold mines in Nova Scotia, Canada. *In* Proceedings of the 7th International Conference on Mercury as a Global Pollutant, Ljubljana, Slovenia, June 27-July 2, 2004. *Edited by:* M. Horvat, N. Ogrinc, J. Faganeli, and J. Kotnik. RMZ – Materials and the Geoenvironment, 51, pp. 185-189.

Phillips, J.A. 1867. The mining and metallurgy of gold and silver. E. & F.N. Spon, London, p.532.

Plant, J.A., Kinniburgh, D.G., Smedley, P.L., Fordyce, F.M., Klinck, B.A. 2005. Arsenic and Selenium. British Geological Survey. *In* Environmental Geochemistry. 2005. Edited by B.S. Lollar. pp. 17-66.

R. 2.3.0. 2006. A language and Environment Copyright. The R Development Team.

Reynolds, P.H., Elias, P., Muecke, G.K., Grist, A.M. 1987. Thermal history of the Southwest Meguma zone, Nova Scotia, from a 40Ar/39Ar and fission track dating study of intrusive rocks; Canadian Journal of Earth Sciences, v. 24, pp. 1952-1965.

Reynolds, P.H., Zentilli, M., Muecke, G.K. 1981. K-Ar and 40Ar/39Ar geochronology of granitoid rocks from southern Nova Scotia: its bearing on the geological evolution of the Meguma zone of the Appalachians; Canadian Journal of Earth Sciences, v. 18, pp. 386-394.

Richards, R.H., Locke, C.E. 1940. Textbook of ore dressing, 3rd ed. McGraw-Hill Book Co., New York, p.608.

Schaus, P. Soil Landscapes of Canada. Agriculture and Agri-Food Canada. (pg 614 *in* Christopherson and Byrne, 2006).

Schenk, P.E. 1997. Sequence stratigraphy and provenance on Gondwana's margin; the Meguma Zone (Cambrian to Devonian) of Nova Scotia, Canada. GSA Bulletin; April 1997; v. 109; no. 4; p. 395-409.

Siegel, F. 2002. Environmental Geochemistry of Potentially Toxic Metals. Springer, New York.

Smedley, P.L., Kinninburgh, D.G. 2002. A review of the source, behaviour and distribution of arsenic in natural waters. Appl. Geochem. Vol. 17. pp. 517-568.

Smith, C.M. 1996. Mercury in Massachusetts: An Evaluation of Sources, Emissions, Impacts, and Controls. [Online]. http://www/p2pays.org/ref/11/10112/

Smith, P.K., Haynes, S.J., Reilly, B.A. 1985. Excursion 11, Turbidite hosted gold deposits, Meguma Domain, eastern Nova Scotia; in Geological Association of Canada – Mineralogical Association of Canada, Field Excursions, v.III, Fredericton 85, eds, R.K. Pickerill, C.K. Mawer and L.R. Fyffe, p.67.

Smith, P.K., Kontak, D.J. 1988. Meguma Gold Studies II: Vein morphology, classification and information, a new interpretation of "crack-seal" quartz veins; in Mines and Minerals Branch Report of Activities 1987, Part B; Nova Scotia Department of Mines and Energy.

Smith, P.K., Parsons, M.B., Goodwin, T.A. 2005. Geology and Environmental Geochemistry of Lode Gold Deposits in Nova Scotia. GAC/MAC/CSPG/CSSS Joint Annual Meeting. Halifax, Nova Scotia.

Stea, R.R., Conley, H., Brown, Y., 1992. Surficial Geology Map of the Province of Nova Scotia, 1:500 000. Digital Version of Nova Scotia Department of Natural Resources Map Me 1992-3. Available online at: http://www.gov.ns.ca/natr/meb/download/dp036.htm

Tetford, G. 1999. The problem of mercury in the environment: abandoned gold mines in Nova Scotia. Unpublished B.Sc. thesis, Saint Mary's University, Halifax, NS, p. 37.

Thompson, B.D. 1978. An investigation of Meguma bedrock leaching in the Shubenacadie-Stewiacke River Basin. Prepared for The Shubenacadie-Stewiacke River Basin Board. Technical Report No. 8. N.S., Canada.

Ullrich, S.M., Tanton, T.W., Abdrashitova, S.A. 2001. Mercury in the aquatic environment: a review of factors affecting methylation. Crit. Rev. Environ. Sci. Technol. 31, pp. 241-293.

White, C.E., Barr, S.M., Toole, R.M. 2006. New Insights into the Origin of the Meguma Group in Southwestern Nova Scotia, Canada. Nova Scotia Department of Natural Resources. Annual Meeting.

Wong, H.K.T., Gauthier, A., Beauchamp, S., Tordon, R. 2002. Impact of toxic metals and metalloids from the Caribou gold-mining areas in Nova Scotia, Canada. Geochemistry: Exploration, Environment, Analysis, 2, pp. 235-241.

Wong, H.K.T., Gauthier, A., Nriagu, J.O. 1999. Dispersion and toxicity of metals from abandoned gold mine tailings at Goldenville, Nova Scotia, Canada. The Science of the Total Environment, 228, pp. 35-47.

APPENDIX A

Sample Site Details **All sites UTM NAD 83**

Sample Site 1 (Up-ice)

459014 / 4951948

	Depth	Horizon	Comments
HJ06-01-01	100 cm	C	
HJ06-01-02	75-85 cm	C	
HJ06-01-03	60 cm	C	
HJ06-01-04	40-45 cm	C	JUST below horizon B
HJ06-01-05	27-32 cm	B	
HJ06-01-06	10-15 cm	B	
HJ06-01-07	7-10 cm	A2	
HJ06-01-08	3-7 cm	A0	
HJ06-01-09	0-3 cm	A00	
HJ06-01-10	0-5	bulk sample	
HJ06-01-11	0-30	bulk sample	2nd accumulation sample taken

Sample Site 2 (Down-ice)

459507 / 4951708

	Depth	Horizon	Comments
HJ06-02-01	70-80 cm	C	
HJ06-02-02	60-70 cm	C	
HJ06-02-03	50-60 cm	C	
HJ06-02-04	35-50 cm	B	near boundary of horizon C
HJ06-02-05	20-35 cm	B	
HJ06-02-06	14-24 cm	A2	
HJ06-02-07	6-14 cm	A0	
HJ06-02-08	0-6 cm	A00	
HJ06-02-09	0-5 cm	bulk sample	
HJ06-02-10	0-30 cm	bulk sample	

Sample Site 3 (Mill Site)

458954 / 4951364

	Depth	Horizon	Comments
HJ06-03-01	55-70 cm	N/A	mixed soil horizon
HJ06-03-02	40-55 cm	N/A	mixed soil horizon
HJ06-03-03	30-40 cm	N/A	mixed soil horizon
HJ06-03-04	20-30 cm	N/A	mixed soil horizon
HJ06-03-05	0-10 cm	N/A	mixed soil horizon
HJ06-03-06	10-20 cm	N/A	mixed soil horizon
HJ06-03-07	0-30 cm	bulk sample	mixed soil horizon
HJ06-03-08	0-5 cm	bulk sample	mixed soil horizon

Sample Site 4 (Background)

457620 / 4952459

	Depth	Horizon	Comments
HJ06-04-01	95-100 cm	C	
HJ06-04-02	75-90 cm	C	
HJ06-04-03	60-75 cm	C	
HJ06-04-04	45-60 cm	C	
HJ06-04-05	30-45 cm	C	
HJ06-04-06	20-30 cm	B	
HJ06-04-07	10-20 cm	B	
HJ06-04-08	5-10 cm	A2	
HJ06-04-09	1-2 cm	A0	
HJ06-04-10	0-1 cm	A00	
HJ06-04-11	0-5 cm	bulk sample	
HJ06-04-12	0-30 cm	bulk sample	

APPENDIX B

Sample List for carbon results in weight % of whole sample

Sample	*Size*	*Horizon*	*Organic Carbon (%)*	*Inorganic Carbon (%)*	*Total Carbon (%)*	*Notes*
SAMPLE SITE 1						
HJ06-01-01	<63um	C	0.158	0.134	0.292	
HJ06-01-02	<63um	C	0.182	0.125	0.307	
HJ06-01-03	<63um	C	0.351	0.159	0.51	
HJ06-01-04	<63um	C	0.404	0.114	0.518	
HJ06-01-05	<63um	B	3.92	0.94	4.86	
HJ06-01-06	<63um	B	4.13	0.63	4.76	
HJ06-01-07	<63um	A2	0.292	0.004	0.296	
HJ06-01-10	<63um	0-5	4.46	0.26	4.72	
HJ06-01-11	<63um	0-30	3.26	0.17	3.43	
HJ06-01-25	<63um		3.73	1.38	5.11	duplicate of HJ06-01-06
**NOTE: 08 and 09 could not be sieved to <63 microns						
HJ06-01-01	2 mm	C	0.086	0.083	0.169	
HJ06-01-02	2 mm	C	0.0869	0.1371	0.224	
HJ06-01-03	2 mm	C	0.172	0.142	0.314	
HJ06-01-04	2 mm	C	0.232	0.06	0.292	
HJ06-01-05	2 mm	B	2.73	0.17	2.9	
HJ06-01-06	2 mm	B	2.63	0.66	3.29	
HJ06-01-07	2 mm	A2	0.36	**-0.09	0.27	
HJ06-01-08	2 mm	A0	28.8	5.1	33.9	
HJ06-01-09	2 mm	A00	37.3	6.2	43.5	
HJ06-01-10	2 mm	0-5	7.59	**-0.03**	7.56	
HJ06-01-11	2 mm	0-30	4.31	**-0.06**	4.25	
HJ06-01-24	2 mm		2.84	**-0.03**	2.81	duplicate of HJ06-01-05
SAMPLE SITE 2 **NOTE: 08 and 09 could not be sieved to <63 microns						
HJ06-02-01	<63um	C	0.62	0.41	1.03	
HJ06-02-02	<63um	C	0.81	0.43	1.24	
HJ06-02-03	<63um	C	0.92	0.72	1.64	
HJ06-02-04	<63um	B	2.93	1.76	4.69	
HJ06-02-05	<63um	B	3.6	1.29	4.89	
HJ06-02-06	<63um	A2	0.73	0.04	0.77	
HJ06-02-07	<63um	A0	20.5	0.2	20.7	
HJ06-02-10	<63um	0-30	3.57	0.48	4.05	
HJ06-02-01	2mm	C	0.69	0.42	1.11	
HJ06-02-02	2mm	C	0.55	0.61	1.16	
HJ06-02-03	2mm	C	0.71	0.49	1.2	
HJ06-02-04	2mm	B	1.63	1.46	3.09	
HJ06-02-05	2mm	B	2.17	1.18	3.35	
HJ06-02-06	2mm	A2	0.71	0	0.71	
HJ06-02-07	2mm	A0	22.4	1.3	23.7	
HJ06-02-08	2mm	A00	34.3	3	37.3	
HJ06-02-09	2mm	0-5	39	0	39	
HJ06-02-10	2mm	0-30	4.11	0.18	4.29	
SAMPLE SITE 3- samples could not be sieved to <63 micron size						
HJ06-03-01	2mm	N/A	18.3	0	18.3	
HJ06-03-02	2mm	N/A	9.58	2.12	11.7	
HJ06-03-03	2mm	N/A	3.83	0.34	4.17	
HJ06-03-04	2mm	N/A	5.34	1.04	6.38	
HJ06-03-05	2mm	N/A	17	0.4	17.4	
HJ06-03-06	2mm	N/A	10.4	1.5	11.9	
HJ06-03-07	2mm	0-30	11.7	**-0.9**	10.8	
HJ06-03-08	2mm	0-5	17	0.1	17.1	
HJ06-03-20	2mm		3.85	0.38	4.23	duplicate of HJ06-03-03

SAMPLE SITE 4

HJ06-04-01	<63um	C	0.28	0.107	0.387	
HJ06-04-02	<63um	C	0.75	0.083	0.833	
HJ06-04-03	<63um	C	0.53	0.159	0.689	
HJ06-04-04	<63um	C	0.76	0.52	1.28	
HJ06-04-05	<63um	C	0.93	0.19	1.12	
HJ06-04-06	<63um	B	4.95	1.97	6.92	
HJ06-04-07	<63um	B	2.79	0.96	3.75	
HJ06-04-08	<63um	A2	2.95	0.29	3.24	
HJ06-04-09	<63um	A0	6.4	**-0.01**	6.39	
HJ06-04-10	<63um	A00	18.9	1.4	20.3	
HJ06-04-11	<63um	0-5	5.06	0.34	5.4	
HJ06-04-12	<63um	0-30	4.75	0.12	4.87	
HJ06-04-25	<63um		5.32	1.62	6.94	**duplicate of HJ06-04-06**
HJ06-04-26	<63um		0.85	0.01	0.86	**duplicate of HJ06-04-02**

HJ06-04-01	2mm	C	0.145	0.008	0.153	
HJ06-04-02	2mm	C	0.415	0.197	0.612	
HJ06-04-03	2mm	C	0.209	0.085	0.294	
HJ06-04-04	2mm	C	0.28	0.144	0.424	
HJ06-04-05	2mm	C	0.47	0.099	0.569	
HJ06-04-06	2mm	B	3.24	0.78	4.02	
HJ06-04-07	2mm	B	3.5	0.24	3.74	
HJ06-04-08	2mm	A2	2.95	0.3	3.25	
HJ06-04-09	2mm	A0	8.81	**-0.28**	8.53	
HJ06-04-10	2mm	A00	35.6	3.8	39.4	
HJ06-04-11	2mm	0-5	7.64	2.56	10.2	
HJ06-04-12	2mm	0-30	4.04	1.04	5.08	
HJ06-04-24	2mm		0.12	0.045	0.165	**duplicate of HJ06-04-01**

****BOLD answers are negative inorganic carbon content - obvious errors in machine calculation**

Carbon determination percentage differences

Sample	*Size*	*Horizon*	*Organic Carbon (%)*	*Inorganic Carbon (%)*	*Total Carbon (%)*	*Notes*
HJ06-01-25	<63um		3.73	1.38	5.11	*duplicate of HJ06-01-06*
HJ06-01-06	<63um	B	4.13	0.63	4.76	
Percentage difference			**10.20%**		**7.09%**	
HJ06-01-24	2 mm		2.84	**-0.03**	2.81	*duplicate of HJ06-01-05*
HJ06-01-05	2 mm	B	2.73	0.17	2.9	
Percentage difference			**3.95%**		**3.15%**	
HJ06-03-20	2mm		3.85	0.38	4.23	*duplicate of HJ06-03-03*
HJ06-03-03	2mm	N/A	3.83	0.34	4.17	
Percentage difference			**0.52%**		**1.43%**	
HJ06-04-25	<63um		5.32	1.62	6.94	*duplicate of HJ06-04-06*
HJ06-04-06	<63um	B	4.95	1.97	6.92	
Percentage difference			**7.21%**		**0.29%**	
HJ06-04-26	<63um		0.85	0.01	0.86	*duplicate of HJ06-04-02*
HJ06-04-02	<63um	C	0.75	0.083	0.833	
Percentage difference			**12.50%**		**3.19%**	
HJ06-04-24	2mm		0.12	0.045	0.165	*duplicate of HJ06-04-01*
HJ06-04-01	2mm	C	0.145	0.008	0.153	
Percentage difference			**18.90%**		**7.55%**	

APPENDIX C

ACME ANALYTICAL LABORATORIES LTD. 852 E. HASTINGS ST. VANCOUVER BC V6A 1R6 PHONE(604)253-3158 FAX(604)253-1716
Nova Scotia Dept. Natural Resources
Acme file # A609282A **Page 1 (a)** Received: DEC 13 2006 * 54 samples in this disk file.
Analysis: GROUP 1F15 - 15.00 GM SAMPLE LEACHED WITH 90 ML 2-2-2 HCL-HNO3-H2O AT 95 DEG. C FOR ONE HOUR, DILUTED TO 300 ML, ANALYSED BY ICP/ES & MS.

ELEMENT			**Mo**	**Cu**	**Pb**	**Zn**	**Ag**	**Mg**	**Cr**	**Ni**	**Al**
SAMPLES	**Horizon**	**Depth ave.(cm)**	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm
G-1			0.52	2.27	2.49	44.6	9	5800	55.3	5.7	8200
HJ06-01-01 -63um	C	100	0.3	32.1	14.38	57.5	9	6100	18	27.6	13500
HJ06-01-02 -63um	C	82.5	0.37	28.18	13.45	52.1	9	5700	17.3	26.1	12500
HJ06-01-03 -63um	C	60	0.41	28.93	12.7	52.4	16	5500	19.6	24.7	14800
HJ06-01-04 -63um	C	42.5	0.38	25.44	14.69	54	8	5600	21.4	26.3	16200
HJ06-01-05 -63um	B	29.5	0.8	20.25	22.42	46.7	296	3900	30.8	18.9	34700
HJ06-01-06 -63um	B	12.5	0.88	14.81	19.58	32.9	239	2200	32.9	11.5	27600
HJ06-01-07 -63um	A2	8.5	0.08	0.56	1.24	1.2	8	100	2.1	0.7	1100
	A0 ave.	5	0.815	10.49	68.005	34.65	305	900	9.75	14.85	2050
	A00 ave.	1.5	0.775	16.77	30.205	48.95	186	1200	15.65	17.55	1850
HJ06-01-08 -63um	A0	5	0.79	10.42	67.1	33.9	273	900	9.1	14.5	2000
HJ06-01-08A -63um	A0		0.84	10.56	68.91	35.4	337	900	10.4	15.2	2100
HJ06-01-09 -63um	A00	1.5	0.75	17.77	31.11	48.2	224	1100	14.5	17	1800
HJ06-01-09A -63um	A00		0.8	15.77	29.3	49.7	148	1300	16.8	18.1	1900
HJ06-01-10 -63um	0-5 accum.		0.44	5.18	17.83	11.2	204	600	8	5.9	3100
HJ06-01-10A -63um			0.56	8.51	24.34	18	215	1200	11.3	8.5	6600
HJ06-01-11 -63um	0-30 accum.		0.55	5.62	13.21	11.2	171	800	13.8	5.9	7000
HJ06-01-12 -63um	dup. HJ06-03-03		1.04	26.52	21.59	46.6	62	4700	17.9	19.2	15700
HJ06-01-13 (pulp)	standard LKSD-4		1.43	29.82	81.29	177.3	182	3300	19.3	29.3	10800
HJ06-02-01 -63um	C	75	0.24	46.11	12.41	83.6	32	11000	28	42.7	26800
HJ06-02-02 -63um	C	65	0.31	35.84	10.78	80.3	29	9100	27.4	39.8	27200
HJ06-02-03 -63um	C	55	0.38	30.36	10.18	75.3	29	8100	27.2	36.7	26300
HJ06-02-04 -63um	B	42.5	0.39	16.56	9.67	42.6	110	4600	26.5	16.5	28300
HJ06-02-05 -63um	B	27.5	0.44	15.56	10.16	51	118	4100	29.4	16.1	39200
HJ06-02-06 -63um	A2	19	0.17	2.14	2.22	4.3	20	300	4.1	1.5	6100
HJ06-02-07 -63um	A0	10	0.83	6.26	59.44	21.4	81	600	5.4	7.1	2800
HJ06-02-08 -63um	A00	3	0.39	9.62	20.43	38.2	62	1000	4.7	11.8	1000
HJ06-02-09 -63um	0-5 accum.		0.38	8.61	34.79	37.3	35	900	4	12.2	1200
HJ06-02-10 -63um	0-30 accum.		0.45	6.04	7.61	16	67	1200	14.6	5.2	10300
RE HJ06-02-10 -63um			0.42	6.16	7.7	16.5	54	1100	14.8	5.1	10600
HJ06-02-11 -63um	dup. HJ06-03-04		2.04	37.65	52.01	50.3	131	4400	19.3	17.5	15800
HJ06-03-01 -63um		62.5	7.46	796.88	1464.3	2282.1	877	13400	29.2	62.8	14400
HJ06-03-02 -63um		47.5	3.08	257	318.05	1713.4	365	10200	23.8	38.4	14600
HJ06-03-03 -63um		35	1.5	30.05	26.23	52.3	87	4800	22	20.7	17500
HJ06-03-04 -63um		25	2.5	38.47	58.72	57.4	141	4500	21.2	21	16300
HJ06-03-06 -63um		15	1.16	28.11	57.87	101.2	79	3900	13.8	18.3	10100
HJ06-03-05 -63um		5	1.22	18.31	45.59	109.3	67	2600	10.5	14.4	6800
HJ06-03-08 -63um	0-5 accum.		1.1	16.18	47.67	146	68	2300	8.5	14.8	4600
HJ06-03-07 -63um	0-30 accum.		2.08	53.06	69.67	91.3	114	5200	23.3	25.2	16700
HJ06-03-09 -63um	dup. HJ06-02-04		0.42	17.29	10.27	48.2	116	5000	27.8	18.5	29500
STANDARD DS7			21.15	107.93	69.34	406.2	888	10800	261.1	56.1	10800
G-1			0.18	1.83	2.28	48.1	7	6100	7.3	3.4	8500
HJ06-03-10 (pulp)	standard Stea-1		0.65	34.78	11.72	70.3	32	8600	31	42.4	18900
HJ06-04-01 -63um	C	97.5	0.6	43.14	23.63	80.5	9	5600	21.8	29.6	16700
HJ06-04-02 -63um	C	82.5	0.42	35.57	19.97	77.2	23	5500	22.8	27.3	18100
HJ06-04-03 -63um	C	67.5	0.45	41.8	20.07	79.6	26	5300	20.5	29.1	18200
HJ06-04-04 -63um	C	52.5	0.7	42.49	19.94	94.2	16	6200	26	36.2	25400
HJ06-04-05 -63um	C	37.5	0.57	38.73	19.27	119.1	23	6000	25.9	42.2	27500
HJ06-04-06 -63um	B	25	0.86	15.26	15.85	84.9	56	3100	33.4	24.5	62900
HJ06-04-07 -63um	B	15	0.81	6.5	12.55	28.5	87	2000	24.4	10.4	20800
HJ06-04-08 -63um	A2/B	7.5	0.53	10.01	19.57	32.1	86	1900	14.6	10.5	12200
HJ06-04-09 -63um	A0	1.5	0.74	7.07	22.28	20.4	79	1100	11.4	7.8	9200
HJ06-04-10 -63um	A00	0.5	0.92	18.38	42.73	47.3	106	1700	11.9	19.4	3900
HJ06-04-11 -63um	0-5 accum.		0.84	11.29	24.96	35.4	143	2200	21.2	11.9	15300
RE HJ06-04-11 -63um			0.82	11.45	24.51	34.7	146	2100	20	11.9	15200
HJ06-04-12 -63um	0-30 accum.		0.83	7.97	21.26	29.7	119	1700	20.3	9.9	20000
HJ06-04-13 -63um	dup. HJ06-02-10		0.4	5.95	8.06	16.9	59	1200	13.3	5.1	10500
STANDARD DS7			20.68	107.07	68.1	406.6	879	10500	248.2	55.8	10300

ELEMENT	**Se**	**Co**	**Mn**	**Fe**	**As**	**U**	**S**	**Hg**	**La**	**Au**	**Th**	**Sr**	**Cd**	**Sb**
SAMPLES	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppm	ppb	ppm	ppm	ppm	ppm
G-1	0.1	4.3	495	17500	0.1	1.9	400	<5	5.3	0.7	3.5	44.3	0.01	<.02
HJ06-01-01 -63um	0.4	16.7	746	23900	22.6	0.8	400	12	15.7	2.2	5.9	8.2	0.05	0.25
HJ06-01-02 -63um	0.5	14.6	659	23000	25.3	0.8	400	13	15.1	2.4	5.4	7.6	0.05	0.26
HJ06-01-03 -63um	0.6	10.6	432	22700	16.4	0.7	200	34	15.1	1.8	5.4	5.7	0.04	0.25
HJ06-01-04 -63um	0.6	10.3	378	25000	21.9	0.9	300	24	13.4	3.4	6	5.3	0.05	0.26
HJ06-01-05 -63um	3.6	6.8	264	42600	26.4	1.2	1300	314	10.8	2.5	4.5	3.7	0.06	0.32
HJ06-01-06 -63um	3.6	4.3	171	51400	40.8	1	1300	191	9.1	2.2	4.8	2.9	0.06	0.42
HJ06-01-07 -63um	0.1	0.3	39	2000	1.4	0.2	<100	9	7.4	4.4	1.4	0.6	<.01	0.08
	0.8	1.45	85.5	5500	14.75	0.2	1200	252	5.9	21.05	0.3	11.5	0.15	0.38
	0.85	1.65	187.5	3550	31.85	0.1	1950	189	7.75	5	0.25	14.5	0.1	0.59
HJ06-01-08 -63um	0.8	1.4	85	5500	14.2	0.2	1200	237	5.9	29.2	0.3	10.6	0.14	0.37
HJ06-01-08A -63um	0.8	1.5	86	5500	15.3	0.2	1200	267	5.9	12.9	0.3	11.6	0.15	0.39
HJ06-01-09 -63um	0.8	1.7	201	3700	34.5	0.1	1800	189	7.6	7.4	0.3	13.6	0.11	0.6
HJ06-01-09A -63um	0.9	1.6	174	3400	29.2	0.1	2100	189	7.9	2.6	0.2	14.5	0.13	0.58
HJ06-01-10 -63um	0.5	1	38	5400	10.9	0.2	400	74	5.3	5.5	0.7	2.5	0.13	0.25
HJ06-01-10A -63um	0.6	2.1	79	11100	21.2	0.3	600	82	9	13.6	1.4	3.7	0.13	0.32
HJ06-01-11 -63um	0.9	1.5	59	16400	18.9	0.4	400	76	7.8	1.7	1.7	1.9	0.05	0.28
HJ06-01-12 -63um	0.9	8.1	294	30600	426.9	0.6	500	3063	19.2	199.9	3.6	6.1	0.08	0.83
HJ06-01-13 (pulp)	2.3	8.6	369	22100	12.9	27.1	9200	150	18.2	<.2	1.3	34.5	2.1	1
HJ06-02-01 -63um	0.6	15.6	468	42400	241.2	0.6	200	65	26	68.1	5.7	4.7	0.03	0.58
HJ06-02-02 -63um	0.8	13.5	369	38200	317.4	0.6	300	32	21	136.4	5.5	3.7	0.04	0.52
HJ06-02-03 -63um	0.9	12.7	335	35500	351.7	0.6	500	46	19.3	63.4	5.1	3.2	0.04	0.49
HJ06-02-04 -63um	2.6	4.7	165	55400	289	0.7	1200	106	19	54.8	3.6	1.8	0.05	0.46
HJ06-02-05 -63um	2.8	4.8	150	54100	232.5	0.8	1400	147	19.3	35.1	3.8	1.7	0.07	0.4
HJ06-02-06 -63um	0.3	0.4	22	6700	73.4	0.3	100	16	30	76.7	1.4	1.1	0.01	0.18
HJ06-02-07 -63um	1.1	0.8	22	7600	72.1	0.2	1300	234	9.8	11.6	0.4	4.3	0.26	0.6
HJ06-02-08 -63um	0.7	0.8	70	1600	6.1	0.1	1700	172	3.6	1.7	0.1	8.6	0.11	0.28
HJ06-02-09 -63um	0.8	0.7	20	2000	8.9	0.1	1800	199	3.5	1.5	0.1	8.9	0.16	0.28
HJ06-02-10 -63um	1	1.1	48	38000	187.6	0.4	600	74	23.6	462.6	2.4	1.9	0.04	0.42
RE HJ06-02-10 -63um	1.1	1.2	49	38400	189.8	0.4	700	76	23.4	41.7	2.6	1.8	0.05	0.39
HJ06-02-11 -63um	1.3	5.7	237	36500	580.2	0.6	1100	14255	19.4	492.8	3.2	8.2	0.15	1.74
HJ06-03-01 -63um	4.5	23.7	5111	60900	1746.1	2.6	3200	49521	18.9	1775	2.1	118.1	4.31	15.64
HJ06-03-02 -63um	1.5	14	1612	35600	1034.3	1.8	1800	15259	20	1168	2.4	55	1.54	7.5
HJ06-03-03 -63um	1.2	8.5	315	34700	504.6	0.6	700	3962	22.7	280.1	3.7	6.7	0.09	0.93
HJ06-03-04 -63um	1.2	5.6	242	38300	614.5	0.6	1000	16431	20.6	490.4	3.4	9.2	0.15	1.94
HJ06-03-06 -63um	0.8	5.5	279	23400	591.7	0.3	900	5473	11.7	195.4	1.6	31.6	0.16	1.28
HJ06-03-05 -63um	0.8	3.1	291	17100	390.4	0.2	1100	3544	7.9	96.6	0.8	37.5	0.15	1.46
HJ06-03-08 -63um	0.7	2.7	326	12500	304.3	0.2	1300	1980	6.6	108.9	0.6	52.5	0.16	1.03
HJ06-03-07 -63um	1.2	8.6	363	34900	640.1	0.6	700	5204	19.2	269.8	2.9	15	0.21	1.89
HJ06-03-09 -63um	2.8	4.9	181	58300	301.8	0.7	900	143	21.5	47.5	3.8	2.1	0.06	0.46
STANDARD DS7	3.6	9.8	648	25000	52.9	5.1	1900	200	14.7	71	4.8	81.8	6.74	6.34
G-1	<.1	4.5	545	18700	0.2	1.9	200	<5	5.4	0.9	3.4	44	0.01	<.02
HJ06-03-10 (pulp)	0.1	21.7	1163	41400	15.8	0.8	200	18	21	1.1	6	12	0.21	0.38
HJ06-04-01 -63um	0.1	18.8	922	27200	18.3	1	90	32	17.5	1.5	6.2	4.9	0.12	0.28
HJ06-04-02 -63um	0.4	12.1	544	26400	12.6	0.9	100	46	16.6	1.2	4.7	4	0.12	0.24
HJ06-04-03 -63um	0.3	14.7	595	25400	17	1	90	44	15.7	1.4	6.3	5.4	0.1	0.27
HJ06-04-04 -63um	0.4	16.8	633	27800	15.5	1	200	36	14.6	0.8	6.7	5	0.09	0.24
HJ06-04-05 -63um	0.6	17.2	516	27200	12.2	0.9	100	39	13.2	0.6	6.5	4.5	0.09	0.21
HJ06-04-06 -63um	2.4	7.5	251	39300	8.1	1.2	1000	115	12.5	0.8	6.1	2.1	0.09	0.15
HJ06-04-07 -63um	1.2	3.1	158	40500	8.2	0.8	900	69	7.1	0.3	3.8	1.8	0.06	0.18
HJ06-04-08 -63um	0.6	3.7	150	18500	8.8	0.5	200	31	11.8	0.6	2.6	2.1	0.04	0.21
HJ06-04-09 -63um	0.6	1.8	108	13600	5.6	0.3	300	49	4.8	1.4	1.2	2.3	0.04	0.3
HJ06-04-10 -63um	0.5	2.5	164	8400	3	0.2	1300	178	8.2	2.6	0.2	9.2	0.09	0.48
HJ06-04-11 -63um	1.2	3.8	163	34400	12.4	0.6	700	57	8.8	1.2	3	3.2	0.04	0.33
RE HJ06-04-11 -63um	1	3.8	161	34400	12	0.6	600	55	8.6	0.8	2.9	3.2	0.05	0.3
HJ06-04-12 -63um	1.3	2.9	146	31500	8.1	0.7	600	72	8.8	1.1	2.9	2.2	0.06	0.28
HJ06-04-13 -63um	1.1	1.1	51	41600	197.2	0.3	300	70	22.9	56.6	2.5	1.8	0.05	0.41
STANDARD DS7	3.6	9.5	627	24400	50.8	4.9	1900	201	13.4	65.8	4.6	74.7	6.59	6.14

ELEMENT SAMPLES	Bi ppm	V ppm	Ca ppm	P ppm	Ba ppm	Ti ppm	B ppm	Na ppm	K ppm	W ppm	Sc ppm	Tl ppm	Te ppm	Ga ppm
G-1	0.06	34	4600	890	203.6	1120	1	480	4600	<.1	1.8	0.31	<.02	4.4
HJ06-01-01 -63um	0.2	16	900	760	21.2	460	1	50	600	0.3	2	0.1	0.03	3.4
HJ06-01-02 -63um	0.19	16	800	670	18.7	440	2	30	500	0.2	1.7	0.09	0.03	3.1
HJ06-01-03 -63um	0.18	17	300	340	21.6	460	1	30	500	0.3	1.6	0.09	<.02	3.4
HJ06-01-04 -63um	0.2	17	200	300	19.6	600	2	30	400	0.3	1.5	0.1	0.02	3.4
HJ06-01-05 -63um	0.24	26	200	650	19	420	2	40	400	0.7	1.8	0.19	0.03	5.6
HJ06-01-06 -63um	0.3	40	100	1090	14.8	310	2	40	400	0.8	1.6	0.17	0.02	8.6
HJ06-01-07 -63um	0.03	5	<100	30	2.4	100	2	20	100	<.1	0.1	0.02	<.02	1.3
	0.165	40.5	850	560	28.4	60	3	70	500	0.4	0.3	0.05	<.02	0.05
	0.09	37.5	17500	10400	31.1	60	5	110	900	0.7	0.3	0.03	<.02	0.65
HJ06-01-08 -63um	0.15	39	800	540	27.1	60	3	70	500	0.3	0.3	0.05	<.02	1.1
HJ06-01-08A -63um	0.18	42	900	570	29.7	50	3	70	500	0.5	0.3	0.05	<.02	1
HJ06-01-09 -63um	0.09	34	1700	1010	31.7	50	5	110	800	0.8	0.3	0.03	<.02	0.7
HJ06-01-09A -63um	0.09	41	1800	1060	30.5	60	5	110	1000	0.6	0.3	0.03	<.02	0.6
HJ06-01-10 -63um	0.09	15	100	230	10.4	80	2	20	200	0.3	0.3	0.03	<.02	1.2
HJ06-01-10A -63um	0.13	27	200	340	15.2	110	2	30	400	0.4	0.5	0.06	<.02	2.6
HJ06-01-11 -63um	0.14	21	100	360	8.6	170	2	30	200	0.3	0.5	0.07	<.02	3.7
HJ06-01-12 -63um	0.25	20	500	610	29.6	110	1	30	600	1.6	1.1	0.2	0.04	4.3
HJ06-01-13 (pulp)	0.47	29	7700	1270	121.8	430	9	160	900	0.2	2.4	0.33	0.09	3.5
HJ06-02-01 -63um	0.26	26	400	430	40.1	1210	1	30	3400	2	2.1	0.41	0.03	5.4
HJ06-02-02 -63um	0.22	24	300	410	35.1	940	1	30	2800	1.9	2	0.31	0.02	4.7
HJ06-02-03 -63um	0.21	23	200	390	31.8	730	1	30	2200	2	1.8	0.27	<.02	4.6
HJ06-02-04 -63um	0.24	31	100	640	21.8	380	1	30	1200	1.4	1.6	0.22	0.02	6.3
HJ06-02-05 -63um	0.2	31	100	870	27.3	190	1	30	1000	1.6	1.9	0.24	0.03	6.6
HJ06-02-06 -63um	0.1	19	<100	180	10.4	130	1	20	400	0.5	0.4	0.12	<.02	4.9
HJ06-02-07 -63um	0.22	38	100	540	23.8	90	3	100	400	1	0.3	0.07	0.02	2.4
HJ06-02-08 -63um	0.06	28	700	690	17	30	2	130	600	0.2	0.2	0.03	<.02	0.3
HJ06-02-09 -63um	0.09	27	400	660	19	30	2	160	500	0.2	0.3	0.02	<.02	0.4
HJ06-02-10 -63um	0.23	34	100	570	15.7	230	1	40	600	1.4	0.7	0.15	0.02	7.2
RE HJ06-02-10 -63um	0.23	34	100	570	15.4	200	2	40	500	1.4	0.7	0.14	0.02	7.2
HJ06-02-11 -63um	0.29	25	500	680	36.3	130	1	50	700	1.6	1.2	0.34	0.06	4.6
HJ06-03-01 -63um	0.93	37	7900	2550	1036.1	310	15	170	1300	1.8	1.9	1.85	0.1	4.6
HJ06-03-02 -63um	0.48	25	6200	1210	1409.3	200	7	130	1300	1.8	1.4	0.57	0.08	4.4
HJ06-03-03 -63um	0.29	22	600	660	37	140	2	30	800	1.9	1.3	0.27	0.05	5
HJ06-03-04 -63um	0.3	25	500	690	42.6	140	2	50	800	1.7	1.2	0.37	0.04	4.7
HJ06-03-06 -63um	0.24	37	3600	690	70.1	130	2	40	700	2.9	0.7	0.15	0.04	3.1
HJ06-03-05 -63um	0.19	39	5600	760	86.8	120	2	40	600	0.8	0.5	0.13	0.03	2.2
HJ06-03-08 -63um	0.17	40	8300	790	106.1	110	4	50	700	0.7	0.4	0.13	0.03	1.6
HJ06-03-07 -63um	0.27	28	1400	710	62.6	150	2	50	900	1.7	1.2	0.3	0.07	4.5
HJ06-03-09 -63um	0.24	33	100	640	24.5	420	1	30	1300	1.6	1.7	0.24	0.03	7
STANDARD DS7	4.7	84	10000	840	383.5	1300	39	1110	4800	4	2.7	4.39	1.1	5.2
G-1	0.06	36	4300	880	230.8	1210	1	510	5400	<.1	1.8	0.38	<.02	4.8
HJ06-03-10 (pulp)	0.28	28	2100	850	55.3	120	1	200	1100	<.1	2.6	0.06	0.02	5.8
HJ06-04-01 -63um	0.28	22	600	690	40.8	390	2	50	800	0.2	2.3	0.1	0.02	3.9
HJ06-04-02 -63um	0.22	22	200	330	42.5	340	2	50	700	0.2	2.1	0.11	<.02	4
HJ06-04-03 -63um	0.26	20	400	600	31.5	430	2	50	700	0.2	2	0.1	<.02	3.6
HJ06-04-04 -63um	0.26	20	300	620	39.7	480	2	50	700	0.3	2.3	0.1	<.02	3.9
HJ06-04-05 -63um	0.24	21	200	490	43.2	420	2	60	800	0.2	2.3	0.1	<.02	4
HJ06-04-06 -63um	0.18	22	200	1030	28.4	240	1	70	300	0.2	2.5	0.09	0.02	4.4
HJ06-04-07 -63um	0.34	47	100	420	17.8	800	1	50	300	0.1	1.5	0.13	<.02	10.5
HJ06-04-08 -63um	0.18	37	100	230	17.3	270	1	60	300	0.2	1.1	0.1	<.02	5.6
HJ06-04-09 -63um	0.16	66	100	260	10.5	200	2	70	300	0.2	0.6	0.06	0.02	3.8
HJ06-04-10 -63um	0.12	70	1000	710	29.9	80	3	110	500	1.1	0.4	0.05	<.02	1.5
HJ06-04-11 -63um	0.25	81	200	400	16	330	2	100	400	0.2	1.4	0.11	0.02	7.2
RE HJ06-04-11 -63um	0.25	81	200	400	16.1	320	2	90	400	0.3	1.4	0.11	0.02	7.1
HJ06-04-12 -63um	0.24	53	100	460	16.9	420	1	60	300	0.1	1.4	0.1	0.02	7.9
HJ06-04-13 -63um	0.23	37	100	560	14.6	270	1	40	500	1.4	0.7	0.13	<.02	7
STANDARD DS7	4.6	82	9500	850	378.3	1260	40	1080	4800	4	2.7	4.23	1.11	5

ELEMENT	Cs	Ge	Hf	Nb	Rb	Sn	Ta	Zr	Y	Ce	In	Re	Be	Li
SAMPLES	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppm	ppm
G-1	2.74	0.1	0.07	0.3	38.6	0.4	<.05	0.9	3.39	11.4	0.02	<1	0.2	33.2
HJ06-01-01 -63um	0.95	0.1	0.08	0.65	7.9	0.3	<.05	3.9	5.94	48.7	0.02	<1	0.3	24.7
HJ06-01-02 -63um	0.85	<.1	0.05	0.69	7.4	0.3	<.05	2.4	5.6	44.3	<.02	<1	0.3	23.3
HJ06-01-03 -63um	0.95	<.1	0.05	1	9	0.4	<.05	2.5	5.18	38.6	0.02	<1	0.4	27.7
HJ06-01-04 -63um	1.04	0.1	0.06	1.26	9.1	0.4	<.05	3.5	4.17	37.8	0.02	<1	0.3	29.1
HJ06-01-05 -63um	1.97	<.1	0.06	2.84	9.8	0.8	<.05	1.8	4.02	31.4	0.04	<1	0.3	33.4
HJ06-01-06 -63um	2.91	<.1	0.04	3.67	11.4	1.2	<.05	1.8	2.82	21.3	0.05	1	0.3	30.3
HJ06-01-07 -63um	0.52	<.1	<.02	0.2	1.9	0.3	<.05	0.4	0.99	15.7	<.02	<1	<.1	0.2
	0.355	<.1	<.02	0.25	2.95	2.05	<.05	0.4	0.925	8.35	<.02	1	0.1	1.4
	0.315	<.1	0.02	0.2	4.65	1.2	<.05	0.45	0.74	6.4	<.02	1	<.1	2.05
HJ06-01-08 -63um	0.36	<.1	<.02	0.25	2.9	2	<.05	0.4	0.92	8.3	<.02	<1	0.1	1.4
HJ06-01-08A -63um	0.35	<.1	<.02	0.24	3	2.1	<.05	0.4	0.93	8.4	<.02	1	0.1	1.4
HJ06-01-09 -63um	0.3	<.1	<.02	0.2	4.4	1.1	<.05	0.5	0.72	6.5	<.02	1	<.1	2.1
HJ06-01-09A -63um	0.33	<.1	0.02	0.19	4.9	1.3	<.05	0.4	0.76	6.3	<.02	<1	<.1	2
HJ06-01-10 -63um	0.49	<.1	<.02	0.41	3.7	1.1	<.05	0.3	0.9	10.8	<.02	<1	<.1	2.7
HJ06-01-10A -63um	0.84	<.1	<.02	0.85	6.3	1.2	<.05	0.3	1.64	19.8	<.02	<1	0.1	8
HJ06-01-11 -63um	1.15	<.1	<.02	1.2	4.7	1	<.05	0.5	1.51	17.7	0.02	<1	0.1	5.9
HJ06-01-12 -63um	1.26	<.1	0.02	0.84	10.3	1	<.05	1.4	3.71	40.6	<.02	<1	0.2	24
HJ06-01-13 (pulp)	0.84	0.1	0.03	1.24	8.6	3.5	<.05	1.2	13.74	34.2	0.05	5	0.5	8.5
HJ06-02-01 -63um	5.76	0.1	0.13	1.3	46.7	0.3	<.05	6.5	4.24	52.3	<.02	<1	0.6	42.7
HJ06-02-02 -63um	4.39	0.1	0.14	1.62	36.4	0.3	<.05	6	3.24	43.1	0.02	<1	0.5	36
HJ06-02-03 -63um	3.67	<.1	0.11	1.68	31.7	0.3	<.05	5.1	2.92	41.5	0.02	1	0.5	36.8
HJ06-02-04 -63um	3.16	0.1	0.03	2.72	21.6	0.4	<.05	1.9	2.57	39.4	0.02	<1	0.3	25.3
HJ06-02-05 -63um	3.23	<.1	0.09	2.96	22	0.5	<.05	3.2	2.53	39.5	0.02	<1	0.4	31.6
HJ06-02-06 -63um	2.99	<.1	<.02	0.64	10.7	0.5	<.05	0.4	1.94	60.6	<.02	<1	<.1	1.6
HJ06-02-07 -63um	0.92	<.1	<.02	0.92	4.1	2.1	<.05	0.7	0.8	19.6	<.02	<1	<.1	1.4
HJ06-02-08 -63um	0.19	<.1	<.02	0.11	3.1	0.4	<.05	0.4	0.31	2.9	<.02	<1	<.1	0.6
HJ06-02-09 -63um	0.2	<.1	<.02	0.12	3.2	0.7	<.05	0.4	0.35	3.4	<.02	<1	<.1	0.4
HJ06-02-10 -63um	2.58	<.1	0.03	2.57	13.3	0.7	<.05	1.5	1.65	47.6	<.02	1	0.1	5.4
RE HJ06-02-10 -63um	2.39	<.1	0.03	2.44	12.8	0.7	<.05	1.6	1.67	46.7	<.02	<1	0.1	5.5
HJ06-02-11 -63um	1.42	<.1	0.03	1.09	11.1	3.9	<.05	1.2	3.98	40.4	<.02	<1	0.3	20.6
HJ06-03-01 -63um	1.78	0.3	0.02	0.81	11.9	>100	<.05	0.8	8.44	40.7	0.02	2	1	16.7
HJ06-03-02 -63um	1.59	<.1	<.02	0.81	12.9	30.3	<.05	0.7	4.61	42	<.02	2	0.5	16.6
HJ06-03-03 -63um	1.56	<.1	0.05	1.12	12.2	1.2	<.05	1.4	4.11	46.3	0.02	<1	0.4	24.2
HJ06-03-04 -63um	1.47	<.1	0.02	1.2	11.6	4.8	<.05	1.4	4.22	41.5	<.02	<1	0.3	21.7
HJ06-03-06 -63um	0.86	<.1	0.03	1.03	10	5.3	<.05	1.4	2.2	23.5	<.02	<1	0.3	14.5
HJ06-03-05 -63um	0.58	<.1	0.02	0.77	8.3	4.4	<.05	1	1.37	15.3	<.02	<1	0.2	9.3
HJ06-03-08 -63um	0.51	<.1	0.03	0.6	6.6	3.3	<.05	1.1	1.18	10.5	<.02	<1	0.1	6.9
HJ06-03-07 -63um	1.4	<.1	0.03	1.1	12.1	6.1	<.05	1.3	4.01	38.2	<.02	1	0.3	22.8
HJ06-03-09 -63um	3.79	<.1	0.03	2.87	23.4	0.5	<.05	2.1	2.7	43.6	0.02	<1	0.6	27.1
STANDARD DS7	6.42	0.1	0.14	0.72	37.4	5.4	<.05	5.7	7.04	40.9	1.63	2	1.8	29.5
G-1	3.3	0.1	0.07	0.3	41.5	0.4	<.05	0.9	2.86	11.3	0.02	<1	0.2	32.6
HJ06-03-10 (pulp)	0.86	<.1	0.36	0.04	6.6	0.4	<.05	14.1	6.67	46.4	0.03	<1	0.8	41.4
HJ06-04-01 -63um	1.16	<.1	0.06	0.84	8.3	0.4	<.05	3	5.5	75.2	0.03	<1	0.5	25.5
HJ06-04-02 -63um	1.36	<.1	0.02	1.17	9.6	0.4	<.05	1.3	4.99	84.3	0.02	<1	0.3	33.6
HJ06-04-03 -63um	1.15	<.1	0.04	1.13	8.6	0.4	<.05	2.1	5.35	63.3	0.02	<1	0.5	27.9
HJ06-04-04 -63um	1.3	<.1	0.04	1.62	10.5	0.4	<.05	2.5	5.58	54.1	0.02	<1	0.5	31.7
HJ06-04-05 -63um	1.2	<.1	0.07	1.74	10.4	0.4	<.05	2.6	5.52	42.1	0.03	<1	0.4	35.1
HJ06-04-06 -63um	1.08	<.1	0.18	3.16	8.3	0.4	<.05	5.3	7.27	35.7	0.04	<1	0.7	27
HJ06-04-07 -63um	1.48	<.1	0.04	5.36	7.2	1.1	<.05	1.8	2.99	19.4	0.02	<1	0.3	13.2
HJ06-04-08 -63um	1.47	<.1	<.02	1.82	6.7	0.9	<.05	0.8	2.76	22.2	0.02	<1	0.2	13.2
HJ06-04-09 -63um	0.53	<.1	<.02	1.47	5.3	1.1	<.05	0.4	1.23	11.5	<.02	<1	0.1	7.2
HJ06-04-10 -63um	0.5	<.1	<.02	0.45	5.4	1.5	<.05	0.2	1.18	12.3	0.02	<1	0.1	4.6
HJ06-04-11 -63um	1.03	<.1	0.02	3.12	9	1.3	<.05	1	2.29	22.9	0.03	<1	0.1	15.6
RE HJ06-04-11 -63um	1.01	<.1	0.02	3.1	8.8	1.3	<.05	1	2.24	22.7	0.03	<1	0.2	14.9
HJ06-04-12 -63um	1.2	<.1	0.03	3.61	6.9	1.2	<.05	1.1	3.06	21.2	0.02	<1	0.3	14.2
HJ06-04-13 -63um	2.2	<.1	0.03	2.86	12.3	0.7	<.05	1.6	1.33	45.8	0.02	<1	0.2	5.1
STANDARD DS7	6.33	0.1	0.14	0.7	36.1	5.3	<.05	5.6	5.49	39.2	1.62	3	1.8	29.7

ELEMENT	Pd	Pt	Sample
SAMPLES	ppb	ppb	gm
G-1	<10	<2	15
HJ06-01-01 -63um	<10	<2	15
HJ06-01-02 -63um	<10	<2	15
HJ06-01-03 -63um	<10	<2	15
HJ06-01-04 -63um	<10	<2	15
HJ06-01-05 -63um	<10	<2	15
HJ06-01-06 -63um	<10	<2	7.5
HJ06-01-07 -63um	<10	<2	15
	<10	4	
	<10	8.5	
HJ06-01-08 -63um	<10	4	0.5
HJ06-01-08A -63um	<10	4	0.5
HJ06-01-09 -63um	<10	12	0.5
HJ06-01-09A -63um	<10	5	0.26
HJ06-01-10 -63um	<10	<2	0.5
HJ06-01-10A -63um	<10	<2	7.5
HJ06-01-11 -63um	<10	<2	7.5
HJ06-01-12 -63um	<10	<2	7.5
HJ06-01-13 (pulp)	<10	<2	0.5
HJ06-02-01 -63um	10	2	15
HJ06-02-02 -63um	<10	<2	7.5
HJ06-02-03 -63um	<10	<2	7.5
HJ06-02-04 -63um	<10	<2	7.5
HJ06-02-05 -63um	<10	<2	7.5
HJ06-02-06 -63um	<10	<2	15
HJ06-02-07 -63um	<10	<2	0.5
HJ06-02-08 -63um	<10	2	0.5
HJ06-02-09 -63um	<10	2	0.5
HJ06-02-10 -63um	<10	<2	7.5
RE HJ06-02-10 -63um	<10	<2	7.5
HJ06-02-11 -63um	<10	<2	15
HJ06-03-01 -63um	<10	2	7.5
HJ06-03-02 -63um	<10	<2	15
HJ06-03-03 -63um	<10	<2	15
HJ06-03-04 -63um	<10	<2	15
HJ06-03-06 -63um	<10	<2	0.5
HJ06-03-05 -63um	<10	<2	0.5
HJ06-03-08 -63um	<10	<2	0.5
HJ06-03-07 -63um	<10	<2	7.5
HJ06-03-09 -63um	<10	<2	15
STANDARD DS7	52	40	15
G-1	<10	<2	15
HJ06-03-10 (pulp)	<10	<2	0.5
HJ06-04-01 -63um	<10	<2	15
HJ06-04-02 -63um	<10	<2	15
HJ06-04-03 -63um	<10	<2	15
HJ06-04-04 -63um	<10	<2	15
HJ06-04-05 -63um	<10	<2	15
HJ06-04-06 -63um	<10	<2	15
HJ06-04-07 -63um	<10	<2	15
HJ06-04-08 -63um	<10	<2	15
HJ06-04-09 -63um	<10	<2	7.5
HJ06-04-10 -63um	<10	13	0.5
HJ06-04-11 -63um	<10	<2	7.5
RE HJ06-04-11 -63um	<10	2	7.5
HJ06-04-12 -63um	<10	<2	15
HJ06-04-13 -63um	<10	<2	15
STANDARD DS7	46	35	15

ACME ANALYTICAL LABORATORIES LTD. 852 E. HASTINGS ST. VANCOUVER BC V6A 1R6 PHONE(604)253-3158 FAX(604)253-1716
Nova Scotia Dept. Natural Resources
Acme file # A609282 **Page 1 (a)** Received: DEC 13 2006 * 54 samples in this disk file.
Analysis: GROUP 1F15 - 15.00 GM SAMPLE LEACHED WITH 90 ML 2-2-2 HCL-HNO3-H2O AT 95 DEG. C FOR ONE HOUR, DILUTED TO 300 ML, ANALYSED BY ICP/ES & MS.

ELEMENT			**Mo**	**Cu**	**Pb**	**Zn**	**Ag**	**Ni**	**Co**	**Mn**	**Hg**
SAMPLES	**Horizon**	**Depth Ave. (cm)**	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppb
G-1			0.57	2.22	2.58	48.5	5	6.5	4.6	517	<5
HJ06-01-01 -2mm	C	100	0.29	19.26	8.27	35.8	3	17.4	9.9	617	19
HJ06-01-02 -2mm	C	82.5	0.25	19.17	8.99	33.6	<2	16.5	10.2	497	12
HJ06-01-03 -2mm	C	60	0.3	18.58	8.37	36.6	5	17.4	8.1	360	21
HJ06-01-04 -2mm	C	42.5	0.26	15.89	10.17	37.3	9	17.1	7.6	300	15
HJ06-01-05 -2mm	B	29.5	0.44	13.06	14.17	37.7	129	14.8	5.9	256	117
HJ06-01-06 -2mm	B	12.5	0.53	11.18	14.13	29.9	120	11.3	4.6	232	94
HJ06-01-07 -2mm	A2	8.5	0.08	0.61	1.18	1.2	5	0.5	0.4	26	6
	A0 ave.	5	0.715	10.665	91.635	43.15	277	14.65	1.3	106.5	306.5
	A00 ave.	1.5	0.35	11.49	26	47.9	72	8.95	0.65	180	125
HJ06-01-08 -2mm	A0	5	0.77	11.55	100.54	45	253	15.7	1.3	123	316
HJ06-01-08A -2mm	A0		0.66	9.78	82.73	41.3	301	13.6	1.3	90	297
HJ06-01-09 -2mm	A00	1.5	0.31	11.08	25.22	47.2	51	8.7	0.6	198	121
HJ06-01-09A -2mm	A00		0.39	11.9	26.78	48.6	93	9.2	0.7	162	129
HJ06-01-10 -2mm	0-5 accum.		0.39	6.05	26.41	15.5	227	5.2	1.4	44	91
HJ06-01-10A -2mm			0.38	7.05	24.88	17.3	160	6.4	1.8	77	84
HJ06-01-11 -2mm	0-30 accum.		0.42	6.56	15.85	15.8	126	5.8	2.2	95	73
HJ06-01-12 -2mm	dup. HJ06-03-03		1.1	27.48	21.52	43.3	62	17.2	6.7	242	2886
HJ06-01-13 (pulp)	standard LKSD-4		1.41	27.79	86.42	172	186	28.2	8.5	377	165
HJ06-02-01 -2mm	C	75	0.17	31.91	9.86	71.2	32	33.8	14.2	376	45
HJ06-02-02 -2mm	C	65	0.17	26.39	8.73	65.3	13	30.4	11.5	323	15
HJ06-02-03 -2mm	C	55	0.23	17.26	9.66	44.6	72	18.4	5.2	189	90
HJ06-02-04 -2mm	B	42.5	0.23	17.08	9.41	48.3	59	19.1	5.4	205	77
HJ06-02-05 -2mm	B	27.5	0.24	15.92	11.1	55.7	60	18.6	5.6	206	83
HJ06-02-06 -2mm	A2	19	0.12	2.76	2.83	4.3	11	2	0.8	40	10
HJ06-02-07 -2mm	A0	10	0.87	7.19	95.56	26.4	150	8.5	0.9	25	306
HJ06-02-08 -2mm	A00	3	0.29	7.44	22.16	34.4	25	8.3	0.6	75	156
HJ06-02-09 -2mm	0-5 accum.		0.34	7.03	37.85	34.6	49	9.3	0.7	[illegible]	[illegible]
HJ06-02-10 -2mm	0-30 accum.		0.25	5.93	11.15	14.5	65	4.8	1.3	56	82
HJ06-02-11 -2mm	dup. HJ06-03-04		2.12	32	36.79	41.9	83	16.5	5.2	194	8279
RE HJ06-02-05 -2mm			0.21	15.62	11.42	56.4	63	18.2	5.5	216	71
HJ06-03-01 -2mm		62.5	4.59	509	1140.03	1341.3	605	37.9	14.4	2965	33019
HJ06-03-02 -2mm		47.5	2.64	221.76	301.53	1181.7	279	31.3	11.9	1244	11772
HJ06-03-03 -2mm		35	1.56	28.17	24.44	41.3	62	17.8	7.4	250	2486
HJ06-03-04 -2mm		25	2.33	34.15	43.11	43.9	146	17.3	5.6	196	9796
HJ06-03-06 -2mm		15	1.34	29.14	61.36	109.6	111	17.6	5.5	260	4707
HJ06-03-05 -2mm		5	1.16	17.6	48.93	135.5	73	13.3	2.9	310	2946
HJ06-03-07 -2mm	0-30 accum.		2.03	55.42	73.2	93.7	134	20.6	7.1	288	4609
HJ06-03-08 -2mm	0-5 accum.		1.23	16.51	47.06	152.6	74	14	2.7	376	1918
HJ06-03-09 -2mm	dup. HJ06-02-04		0.19	16.74	8.9	46.1	69	17.7	5.2	197	63
STANDARD DS7			21.05	108.19	70.31	414.1	882	57	9.7	646	214
G-1			0.16	1.94	2.76	45.3	7	3.6	4.3	523	<5
HJ06-03-10 (pulp)	standard Stea-1		0.66	35.87	11.74	65.5	34	44.5	22.5	1125	18
HJ06-04-01 -2mm	C	97.5	0.25	18.89	9.88	47.9	8	17.4	8.9	520	10
HJ06-04-02 -2mm	C	82.5	0.3	22.75	12.38	47.5	24	18.3	8.9	509	24
HJ06-04-03 -2mm	C	67.5	0.31	23.7	11.17	51.1	10	20.1	10.2	498	11
HJ06-04-04 -2mm	C	52.5	0.29	21.06	9.87	54.7	7	22	9.7	427	9
HJ06-04-05 -2mm	C	37.5	0.26	22.1	10.83	69.7	10	24.9	9.7	378	11
HJ06-04-06 -2mm	B	25	0.46	15.1	15.02	85.8	30	25.7	8.4	326	45
HJ06-04-07 -2mm	B	15	0.45	6.01	9.46	28.2	143	10.4	4.2	207	45
HJ06-04-08 -2mm	A2/B	7.5	0.31	9.3	16.32	31.9	106	11.1	4.2	223	32
HJ06-04-09 -2mm	A0	1.5	0.62	9.8	37.39	28.6	176	10.8	2.7	147	89
HJ06-04-10 -2mm	A00	0.5	0.62	15.29	40.74	45.4	103	16.5	1.5	195	147
RE HJ06-04-10 -2mm			0.63	15.84	39.61	42.3	97	16.1	1.5	193	135
HJ06-04-11 -2mm	0-5 accum.		0.56	11.13	25.37	30.8	204	12.5	3.5	191	76
HJ06-04-12 -2mm	0-30 accum.		0.54	8.52	17.39	34.3	102	11.8	4.4	240	52
HJ06-04-13 -2mm	dup. HJ06-02-10		0.25	5.78	9.6	14	56	4.9	1.3	56	72
STANDARD DS7			20.93	108.65	69.42	414.8	868	57.2	9.5	646	203

ELEMENT	Fe	As	U	Au	S	Th	Sr	Cd	Sb	Bi	V	Ca	P
SAMPLES	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
G-1	18100	<.1	2.2	1.4	400	3.7	48.3	0.01	0.02	0.07	35	4800	890
HJ06-01-01 -2mm	17600	14.5	0.6	1.4	300	3.7	4.6	0.04	0.22	0.12	13	600	410
HJ06-01-02 -2mm	16200	15.6	0.5	2	200	3.7	4.1	0.03	0.21	0.17	13	500	340
HJ06-01-03 -2mm	17100	10.9	0.5	1.3	200	3.8	3.9	0.02	0.19	0.12	13	300	220
HJ06-01-04 -2mm	17800	12.9	0.7	0.8	100	4.2	4.3	0.02	0.19	0.13	15	200	160
HJ06-01-05 -2mm	26500	15.9	0.7	2.5	400	3.5	3.5	0.03	0.28	0.17	20	200	290
HJ06-01-06 -2mm	35400	26.8	0.7	6.1	600	4	2.7	0.03	0.29	0.21	27	100	620
HJ06-01-07 -2mm	2200	1.8	0.1	0.9	<100	0.8	0.5	<.01	0.07	0.03	5	100	30
	4550	15.9	0.15	6.7	1500	0.2	13	0.165	0.49	0.16	48.5	1100	800
	1550	15.15	<.1	1.95	1600	0.15	12.75	0.095	0.345	0.05	34	2000	1020
HJ06-01-08 -2mm	5000	17.4	0.2	8.5	1500	0.2	13.4	0.18	0.55	0.17	53	1100	830
HJ06-01-08A -2mm	4100	14.4	0.1	4.9	1500	0.2	12.6	0.15	0.43	0.15	44	1100	770
HJ06-01-09 -2mm	1400	13.7	<.1	2.1	1600	0.1	12.4	0.08	0.33	0.05	32	1900	1020
HJ06-01-09A -2mm	1700	16.6	<.1	1.8	1600	0.2	13.1	0.11	0.36	0.05	36	2100	1010
HJ06-01-10 -2mm	6400	12.3	0.2	4.6	600	0.5	4.1	0.2	0.34	0.1	17	200	310
HJ06-01-10A -2mm	9400	17.4	0.2	4	500	0.7	4	0.15	0.3	0.11	21	200	310
HJ06-01-11 -2mm	19200	20.3	0.4	3	500	1.9	2.3	0.05	0.29	0.15	23	100	370
HJ06-01-12 -2mm	31300	436.8	0.5	179.8	700	3.5	6	0.08	0.95	0.24	20	500	560
HJ06-01-13 (pulp)	21500	12.5	28.6	0.9	8900	1.3	33.9	2.03	0.99	0.48	27	7400	1230
HJ06-02-01 -2mm	31000	180.5	0.5	60.4	100	5.9	3.4	0.03	0.56	0.24	19	400	350
HJ06-02-02 -2mm	29700	236.8	0.5	30.7	100	5.4	2.9	0.04	0.58	0.21	19	200	340
HJ06-02-03 -2mm	43100	248.2	0.6	34	700	4.1	1.9	0.04	0.58	0.23	24	100	480
HJ06-02-04 -2mm	41400	243.2	0.6	23.6	600	4.1	1.9	0.04	0.53	0.22	23	100	420
HJ06-02-05 -2mm	42900	232.2	0.6	23.1	700	4.3	1.8	0.05	0.57	0.26	26	100	710
HJ06-02-06 -2mm	7700	86.5	0.3	16.7	100	1.7	1	0.01	0.29	0.15	19	100	180
HJ06-02-07 -2mm	6000	57.4	0.2	19.6	1200	0.5	5.9	0.38	0.75	0.24	39	100	640
HJ06-02-08 -2mm	1200	4.1	<.1	1.8	1400	0.1	7.9	0.11	0.28	0.05	27	700	760
HJ06-02-09 -2mm	1600	6.9	<.1	2.4	1400	0.1	8.1	0.2	0.31	0.08	25	400	740
HJ06-02-10 -2mm	26000	147.4	0.3	46.7	300	2	2.3	0.09	0.47	0.2	25	100	430
HJ06-02-11 -2mm	30200	466	0.5	131.6	1200	3.1	7.6	0.12	1.6	0.23	19	500	540
RE HJ06-02-05 -2mm	43200	236.5	0.6	47.6	600	4.3	1.8	0.05	0.5	0.25	26	100	670
HJ06-03-01 -2mm	44900	1163.6	1.5	1657	2900	1.7	79.2	2.98	14.29	0.67	21	6600	1430
HJ06-03-02 -2mm	34700	1032.9	1.1	658.7	2200	2.1	44.8	1.31	6.27	0.38	20	5300	910
HJ06-03-03 -2mm	31600	603.6	0.5	129.2	900	3.8	6.9	0.07	1.19	0.25	22	500	590
HJ06-03-04 -2mm	31500	620	0.5	1517	1200	3.4	8.8	0.14	1.85	0.28	20	500	530
HJ06-03-06 -2mm	21300	732.4	0.3	357.2	1200	1.5	35.5	0.25	1.79	0.35	33	3900	770
HJ06-03-05 -2mm	14500	451	0.2	125.7	1400	0.7	46	0.22	2.04	0.2	39	6900	960
HJ06-03-07 -2mm	29600	572.9	0.4	433.6	1200	2.5	19.5	0.24	3.68	0.25	23	2300	640
HJ06-03-08 -2mm	10800	299.2	0.2	193.2	1500	0.6	52.4	0.22	1.15	0.16	39	8600	1020
HJ06-03-09 -2mm	38700	245.3	0.5	36.5	600	4.1	1.9	0.05	0.54	0.21	22	100	460
STANDARD DS7	24900	50.9	5.1	64.1	2000	4.8	78.9	6.53	6.2	4.66	84	10000	880
G-1	18400	0.2	2	0.7	500	3.8	44.5	0.01	<.02	0.07	37	4800	970
HJ06-03-10 (pulp)	42700	15.1	0.8	0.7	700	6.7	13.7	0.2	0.37	0.28	27	2300	890
HJ06-04-01 -2mm	18200	7.3	0.6	1	300	3.8	3.5	0.08	0.16	0.13	13	600	380
HJ06-04-02 -2mm	19100	8.8	0.6	0.4	200	3.6	3.2	0.07	0.2	0.14	15	200	230
HJ06-04-03 -2mm	19600	9.6	0.6	0.7	200	4	3.7	0.06	0.21	0.15	13	400	340
HJ06-04-04 -2mm	18900	7.5	0.6	0.9	200	4.2	3.7	0.05	0.16	0.14	14	300	280
HJ06-04-05 -2mm	19100	7.2	0.6	0.7	300	4.3	3.4	0.05	0.15	0.15	14	200	260
HJ06-04-06 -2mm	34900	8.4	0.8	0.7	800	5.6	3.4	0.08	0.17	0.2	22	200	930
HJ06-04-07 -2mm	35200	7.6	0.6	914.7	800	3.5	2.3	0.08	0.18	0.26	33	100	390
HJ06-04-08 -2mm	16700	8.6	0.4	0.9	400	2.3	2.3	0.07	0.2	0.15	23	200	220
HJ06-04-09 -2mm	14200	5.9	0.3	1.6	800	1	3.6	0.09	0.41	0.17	63	300	380
HJ06-04-10 -2mm	4500	1.5	0.1	1.8	1500	0.3	10.8	0.12	0.39	0.07	60	1600	810
RE HJ06-04-10 -2mm	4400	1.4	0.1	1.7	1600	0.3	10.7	0.12	0.39	0.07	60	1600	830
HJ06-04-11 -2mm	22900	8.4	0.4	1	900	1.8	3.4	0.06	0.32	0.21	56	300	370
HJ06-04-12 -2mm	28600	7.5	0.6	0.5	800	2.9	2.5	0.07	0.23	0.18	31	200	450
HJ06-04-13 -2mm	28900	155.7	0.3	23.6	500	2.1	1.9	0.07	0.45	0.22	25	100	440
STANDARD DS7	24800	49.4	5	104.4	2100	4.6	75.4	6.51	6.1	4.58	85	9700	830

ELEMENT	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	Se	Te
SAMPLES	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
G-1	6	57.9	6000	208.5	1150	1	8600	480	4900	<.1	1.8	0.32	<.1	<.02
HJ06-01-01 -2mm	9.9	11.9	4200	13.5	260	1	8100	20	400	0.7	1.3	0.06	0.3	0.03
HJ06-01-02 -2mm	10	11.9	3700	11.5	280	1	7600	20	400	0.1	1.2	0.05	0.2	0.03
HJ06-01-03 -2mm	10.2	12.1	3900	11.5	320	1	8900	20	300	0.2	1.1	0.05	0.3	0.02
HJ06-01-04 -2mm	10.8	14.1	4000	12	430	1	9600	30	300	0.1	1.1	0.06	0.3	<.02
HJ06-01-05 -2mm	8.8	19.2	3600	12.4	360	1	19200	30	300	0.4	1.1	0.11	1.7	0.03
HJ06-01-06 -2mm	8	21.8	2600	11.1	320	1	18900	30	300	0.6	1.1	0.11	2.1	0.02
HJ06-01-07 -2mm	4.1	1.2	100	1.9	80	1	600	10	100	<.1	0.1	<.02	<.1	<.02
	6	4.95	800	33.55	40	2.5	2050	80	650	0.35	0.4	0.04	1.05	0.02
	4.35	3.3	750	25.15	20	4.5	800	110	1000	0.35	0.15	0.02	0.5	0.02
HJ06-01-08 -2mm	6.6	5.3	900	35	50	3	2400	90	700	0.4	0.5	0.05	1.1	0.02
HJ06-01-08A -2mm	5.4	4.6	700	32.1	30	2	1700	70	600	0.3	0.3	0.03	1	<.02
HJ06-01-09 -2mm	4.1	3.1	700	24.9	20	5	800	100	900	0.3	0.2	0.02	0.5	<.02
HJ06-01-09A -2mm	4.6	3.5	800	25.4	20	4	800	110	1100	0.4	0.1	0.02	0.5	0.02
HJ06-01-10 -2mm	5	5.1	600	15.5	90	3	3000	30	300	0.3	0.3	0.04	0.6	<.02
HJ06-01-10A -2mm	6.5	7.4	1100	14.9	130	2	5000	30	300	0.4	0.4	0.04	0.6	0.02
HJ06-01-11 -2mm	6.7	10.5	1000	9.1	240	2	7500	20	200	0.3	0.6	0.06	1.1	0.03
HJ06-01-12 -2mm	18.6	15.4	4600	30.2	140	1	14200	30	500	1.4	1	0.19	0.9	0.03
HJ06-01-13 (pulp)	17.8	17.5	3200	116.2	370	8	10300	150	900	0.2	2.4	0.35	2	0.14
HJ06-02-01 -2mm	28.8	20.5	8300	27.5	760	<1	19300	30	2300	1.7	1.6	0.26	0.2	0.03
HJ06-02-02 -2mm	23.5	18.5	7500	24.1	630	<1	19200	30	2100	1.5	1.4	0.21	0.4	0.02
HJ06-02-03 -2mm	21.8	21.9	5200	20.6	420	1	21900	30	1100	1.2	1.5	0.2	1.8	0.03
HJ06-02-04 -2mm	21.4	20.3	5400	19.2	410	1	20500	20	1100	1.1	1.3	0.19	1.5	0.05
HJ06-02-05 -2mm	21.9	22.3	4700	24.7	270	1	27200	20	1100	1.4	1.5	0.23	2.1	0.02
HJ06-02-06 -2mm	23.7	3	300	9	150	1	3900	20	300	0.5	0.3	0.08	0.1	0.03
HJ06-02-07 -2mm	8	4.7	600	32.8	80	3	2600	120	400	0.7	0.5	0.06	1.3	0.03
HJ06-02-08 -2mm	2.5	2.9	900	15.8	20	2	700	110	600	0.2	0.2	0.03	0.6	0.02
HJ06-02-09 -2mm	2.8	3.2	800	18.7	20	2	1000	160	600	0.2	0.3	0.03	0.7	<.02
HJ06-02-10 -2mm	21.5	8.8	1200	17.3	220	2	6800	40	500	1.1	0.5	0.1	0.9	0.04
HJ06-02-11 -2mm	15.6	14.5	4200	29.3	140	2	11400	40	600	1	1	0.24	1	0.04
RE HJ06-02-05 -2mm	21.9	22.3	4700	25	280	1	28100	30	1100	1.3	1.6	0.23	1.9	0.03
HJ06-03-01 -2mm	13.6	17.9	6800	626.5	230	12	9900	180	1000	0.9	1.5	1.3	1.9	0.14
HJ06-03-02 -2mm	14.1	16.1	6600	697	180	6	10600	180	1000	1.1	1.1	0.54	1.2	0.1
HJ06-03-03 -2mm	18.4	15.7	4700	28.2	160	1	13700	30	600	1.3	1	0.18	0.9	0.04
HJ06-03-04 -2mm	16.6	15.4	4400	29	140	2	12000	50	600	1.1	1.1	0.25	0.9	0.04
HJ06-03-06 -2mm	11.4	11.7	3300	73.9	120	3	8100	50	700	1.1	0.7	0.15	0.6	0.06
HJ06-03-05 -2mm	7.7	8.4	2200	102.4	110	4	5100	50	700	1.2	0.5	0.13	0.7	0.06
HJ06-03-07 -2mm	14.8	15.4	4300	64.9	140	2	11200	70	700	1.1	1	0.24	0.8	0.05
HJ06-03-08 -2mm	6.7	7.3	1900	111.3	100	6	3900	60	800	0.6	0.5	0.15	0.5	0.06
HJ06-03-09 -2mm	21.5	20.1	5300	19.4	420	1	20000	20	1100	1.1	1.3	0.18	1.4	0.05
STANDARD DS7	15.2	264.7	10700	383.7	1280	41	10800	1110	4700	3.9	2.8	4.32	3.5	1.09
G-1	6.1	7.6	5900	218.9	1290	1	8600	510	4800	<.1	2	0.38	<.1	<.02
HJ06-03-10 (pulp)	26.3	32.6	9000	61.9	180	2	20500	220	1500	<.1	3.3	0.08	0.1	<.02
HJ06-04-01 -2mm	9.2	12.8	4500	14.9	250	1	9200	30	400	<.1	1.3	0.05	<.1	<.02
HJ06-04-02 -2mm	10.2	14	4100	24.6	280	1	11400	30	500	0.1	1.5	0.07	0.3	<.02
HJ06-04-03 -2mm	9.7	13.8	4700	15.7	290	1	11300	30	400	0.1	1.3	0.06	0.1	<.02
HJ06-04-04 -2mm	8.8	14.9	4800	17	330	1	12300	30	400	0.1	1.3	0.05	0.1	<.02
HJ06-04-05 -2mm	8.5	15.6	4700	21.3	320	2	14900	30	500	0.1	1.4	0.08	0.4	<.02
HJ06-04-06 -2mm	10.8	26.4	4300	26.7	300	2	37800	50	400	0.2	2.3	0.1	1.8	0.04
HJ06-04-07 -2mm	6	17.5	2600	12.8	860	1	15800	40	200	<.1	1.2	0.09	1.1	<.02
HJ06-04-08 -2mm	9.9	11.6	2500	13.3	300	1	9700	50	200	0.2	0.9	0.06	0.6	<.02
HJ06-04-09 -2mm	5.2	10.4	1600	15	2300	3	8700	100	300	0.3	0.8	0.05	0.9	0.02
HJ06-04-10 -2mm	6	6	1100	31.3	50	4	2800	120	600	0.8	0.4	0.03	0.4	<.02
RE HJ06-04-10 -2mm	5.9	6.2	1100	30.6	60	3	2800	140	600	0.9	0.4	0.03	0.5	<.02
HJ06-04-11 -2mm	6.6	14.5	2300	14.4	290	2	10600	90	400	0.4	1	0.07	1.1	0.03
HJ06-04-12 -2mm	7.3	17	2700	14.1	440	1	16900	40	200	0.1	1.3	0.07	1.3	<.02
HJ06-04-13 -2mm	20.1	9.4	1200	14.7	260	1	7700	30	400	1.2	0.5	0.1	0.9	<.02
STANDARD DS7	13.8	246.1	10600	382.8	1250	39	10300	1020	4600	4	2.7	4.28	3.5	1.16

ELEMENT	Ga	Cs	Ge	Hf	Nb	Rb	Sn	Ta	Zr	Y	Ce	In	Re	Be	Li
SAMPLES	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppm	ppm
G-1	4.9	2.98	0.2	0.07	0.36	40.1	0.4	<.05	1	3.24	11.8	0.02	<1	0.3	32.6
HJ06-01-01 -2mm	2.4	0.52	<.1	0.08	0.32	4.4	0.2	<.05	3.1	3.76	28.5	<.02	<1	0.2	16.8
HJ06-01-02 -2mm	2.3	0.52	<.1	0.04	0.4	4.2	0.2	<.05	2.3	3.67	27.3	0.02	<1	0.2	16.3
HJ06-01-03 -2mm	2.4	0.56	<.1	0.05	0.51	4.8	0.2	<.05	2.5	3.28	24.3	<.02	<1	0.2	19.6
HJ06-01-04 -2mm	2.6	0.66	<.1	0.06	0.74	5.5	0.3	<.05	3.1	3.22	25.4	<.02	<1	0.2	20.1
HJ06-01-05 -2mm	3.9	1.37	<.1	0.02	1.63	6.5	0.4	<.05	1.5	2.77	22.8	0.03	<1	0.2	24.2
HJ06-01-06 -2mm	5.6	2	<.1	0.05	2.34	7.7	0.6	<.05	2	2.16	17.8	0.03	<1	0.2	23.4
HJ06-01-07 -2mm	0.8	0.37	<.1	<.02	0.17	1.6	0.2	<.05	0.3	0.54	8.3	<.02	<1	<.1	0.1
	0.9	0.29	<.1	<.02	0.21	3.3	1.65	<.05	0.5	0.76	7.6	<.02	<1	0.1	0.95
	0.3	0.125	<.1	<.02	0.055	4.2	0.4	<.05	0.15	0.31	3.15	<.02	<1	<.1	0.55
HJ06-01-08 -2mm	1	0.33	<.1	<.02	0.25	3.6	1.8	<.05	0.7	0.87	8.5	<.02	<1	0.1	1.1
HJ06-01-08A -2mm	0.8	0.25	<.1	<.02	0.17	3	1.5	<.05	0.3	0.65	6.7	<.02	<1	0.1	0.8
HJ06-01-09 -2mm	0.3	0.11	<.1	<.02	0.05	3.6	0.4	<.05	0.1	0.27	2.9	<.02	<1	<.1	0.5
HJ06-01-09A -2mm	0.3	0.14	<.1	<.02	0.06	4.8	0.4	<.05	0.2	0.35	3.4	<.02	<1	<.1	0.6
HJ06-01-10 -2mm	1.2	0.46	<.1	<.02	0.48	3.2	0.9	<.05	0.1	0.82	9.7	<.02	<1	0.1	2.4
HJ06-01-10A -2mm	1.9	0.62	<.1	<.02	0.75	4.4	0.8	<.05	0.2	1.1	13.4	<.02	<1	0.1	5.3
HJ06-01-11 -2mm	3.7	1.12	<.1	<.02	1.55	4.6	0.7	<.05	0.7	1.41	14.1	0.02	<1	0.2	7.8
HJ06-01-12 -2mm	4.2	1.21	0.1	0.04	0.84	9	1	<.05	1.9	2.88	38	0.02	1	0.3	22.2
HJ06-01-13 (pulp)	3.4	0.83	0.1	0.03	1.21	8.2	3.2	<.05	1.2	12.35	32.2	0.04	2	0.4	8
HJ06-02-01 -2mm	4.4	3.72	0.1	0.12	0.86	29	0.2	<.05	6.2	3.1	55.4	<.02	<1	0.4	30.4
HJ06-02-02 -2mm	4	3.1	<.1	0.11	0.86	24.6	0.2	<.05	6.1	2.44	47.1	<.02	<1	0.5	28.1
HJ06-02-03 -2mm	5.5	3.08	0.1	0.04	1.95	20.3	0.3	<.05	2.6	2.17	44	0.02	<1	0.4	25.9
HJ06-02-04 -2mm	5.4	2.9	<.1	0.04	1.8	19.6	0.3	<.05	3	2.08	42.3	<.02	<1	0.3	25.6
HJ06-02-05 -2mm	5.9	3.2	0.1	0.05	2.13	22.3	0.3	<.05	3	2.04	44.3	0.02	<1	0.5	33.3
HJ06-02-06 -2mm	3.6	2.14	<.1	<.02	0.59	8.1	0.3	<.05	0.8	1.33	45.9	<.02	<1	0.1	1.3
HJ06-02-07 -2mm	1.8	0.72	<.1	0.03	0.68	4	2.1	<.05	1.1	0.69	14.3	<.02	<1	0.1	1
HJ06-02-08 -2mm	0.2	0.12	<.1	<.02	0.06	3	0.3	<.05	0.3	0.2	1.9	<.02	<1	<.1	0.3
HJ06-02-09 -2mm	0.3	0.16	<.1	<.02	0.11	3.4	0.6	<.05	0.4	0.27	2.6	<.02	<1	0.1	0.3
HJ06-02-10 -2mm	4.9	2.02	<.1	0.02	1.96	10.6	0.5	<.05	1.6	1.28	41.3	<.02	<1	0.1	4.1
HJ06-02-11 -2mm	3.6	1.04	<.1	0.03	0.77	8.2	2.1	<.05	2.1	2.83	31.8	<.02	<1	0.3	18.6
RE HJ06-02-05 -2mm	5.9	3.14	0.1	0.06	2.02	23.3	0.3	<.05	3	2.07	44.4	0.03	<1	0.4	30.2
HJ06-03-01 -2mm	2.9	1.18	0.1	<.02	0.6	8.1	70.5	<.05	0.7	6.03	27	<.02	1	0.9	12.3
HJ06-03-02 -2mm	3.2	1.13	<.1	0.02	0.65	9.1	20.8	<.05	0.9	3.55	28	<.02	<1	0.5	14
HJ06-03-03 -2mm	4.2	1.16	<.1	0.03	0.86	9.2	0.9	<.05	2.3	2.82	37.9	<.02	<1	0.3	22.8
HJ06-03-04 -2mm	3.8	1.11	<.1	0.04	0.86	8.5	3.1	<.05	2.2	3.04	33.8	<.02	<1	0.4	19.8
HJ06-03-06 -2mm	2.8	0.76	<.1	0.04	0.84	8.5	4.9	<.05	1.8	1.9	21.9	<.02	<1	0.2	14.5
HJ06-03-05 -2mm	1.8	0.53	<.1	0.02	0.68	7.3	4.3	<.05	1.5	1.16	13.3	<.02	<1	0.1	8
HJ06-03-07 -2mm	3.3	0.98	0.1	0.04	0.89	9	9.3	<.05	2	2.86	29.5	<.02	1	0.4	18.9
HJ06-03-08 -2mm	1.4	0.49	<.1	0.04	0.49	6.7	2.6	<.05	1.7	1.01	10.5	<.02	<1	0.1	6.3
HJ06-03-09 -2mm	5.1	2.88	<.1	0.05	1.68	20.4	0.3	<.05	3.3	2.11	44.1	0.02	<1	0.3	26.9
STANDARD DS7	5.2	6.43	0.1	0.15	0.86	36.8	5.4	<.05	5.5	6.6	40.8	1.61	3	1.8	30.1
G-1	4.7	3.25	0.1	0.08	0.38	43.8	0.5	<.05	1.1	3.28	12.8	0.02	<1	0.2	33.1
HJ06-03-10 (pulp)	6.2	1.11	<.1	0.27	0.04	9.3	0.5	<.05	10.8	7.62	56.8	0.04	<1	1	44.1
HJ06-04-01 -2mm	2.7	0.58	0.1	0.05	0.31	4.1	0.2	<.05	2.2	3.45	28.5	<.02	<1	0.3	21.1
HJ06-04-02 -2mm	2.7	0.81	<.1	0.02	0.58	5.8	0.3	<.05	1.3	3.43	39.1	0.02	<1	0.2	21
HJ06-04-03 -2mm	2.7	0.66	0.1	0.03	0.47	4.8	0.2	<.05	1.7	3.44	29.2	<.02	<1	0.3	20.4
HJ06-04-04 -2mm	2.7	0.64	<.1	0.04	0.59	5	0.2	<.05	1.8	3.44	23.4	<.02	<1	0.3	23.1
HJ06-04-05 -2mm	2.8	0.69	<.1	0.05	0.73	5.9	0.3	<.05	2.3	3.35	22.3	0.02	<1	0.3	22.9
HJ06-04-06 -2mm	4.6	1.26	<.1	0.13	2.35	9.7	0.3	<.05	4.7	5.34	27.8	0.03	<1	0.6	33.1
HJ06-04-07 -2mm	7.4	1.18	<.1	0.04	3.94	5.6	0.7	<.05	1.7	2.53	15.5	0.02	<1	0.2	12.6
HJ06-04-08 -2mm	3.7	1.1	<.1	<.02	1.23	5	0.5	<.05	0.8	2.49	17.9	0.02	<1	0.2	12.1
HJ06-04-09 -2mm	3.4	0.54	<.1	<.02	1.47	5.2	1.1	<.05	0.5	1.43	11.5	0.02	<1	0.2	7.5
HJ06-04-10 -2mm	0.7	0.26	<.1	0.02	0.21	3.4	0.8	<.05	0.5	0.9	8	<.02	<1	<.1	1.8
RE HJ06-04-10 -2mm	0.7	0.25	<.1	<.02	0.22	3.5	0.8	<.05	0.5	0.88	7.9	0.02	<1	0.1	1.9
HJ06-04-11 -2mm	4.2	0.7	<.1	0.02	2.12	6.8	0.8	<.05	0.7	1.76	16	0.03	<1	0.1	11.9
HJ06-04-12 -2mm	5.2	0.96	<.1	0.02	2.6	5.7	0.6	<.05	1.2	2.88	16.7	0.02	<1	0.3	14.4
HJ06-04-13 -2mm	4.9	1.76	<.1	0.03	2.24	10.3	0.6	<.05	1.6	1.17	41.3	<.02	<1	0.1	3.9
STANDARD DS7	5	6.34	0.1	0.14	0.71	36.7	5.4	<.05	5.6	5.5	39.6	1.64	3	1.9	29.9

ELEMENT	**Pd**	**Pt**	**Sample**
SAMPLES	ppb	ppb	gm
G-1	<10	<2	15
HJ06-01-01 -2mm	<10	<2	15
HJ06-01-02 -2mm	<10	<2	15
HJ06-01-03 -2mm	<10	<2	15
HJ06-01-04 -2mm	<10	<2	15
HJ06-01-05 -2mm	<10	<2	15
HJ06-01-06 -2mm	<10	<2	15
HJ06-01-07 -2mm	<10	<2	15
	<10	<2	
	<10	<2	
HJ06-01-08 -2mm	<10	2	7.5
HJ06-01-08A -2mm	<10	<2	0.5
HJ06-01-09 -2mm	<10	2	0.5
HJ06-01-09A -2mm	<10	2	0.5
HJ06-01-10 -2mm	<10	<2	15
HJ06-01-10A -2mm	<10	<2	15
HJ06-01-11 -2mm	<10	<2	15
HJ06-01-12 -2mm	<10	<2	15
HJ06-01-13 (pulp)	<10	<2	0.5
HJ06-02-01 -2mm	<10	<2	15
HJ06-02-02 -2mm	<10	<2	15
HJ06-02-03 -2mm	<10	<2	15
HJ06-02-04 -2mm	<10	<2	15
HJ06-02-05 -2mm	<10	<2	15
HJ06-02-06 -2mm	<10	<2	15
HJ06-02-07 -2mm	<10	<2	15
HJ06-02-08 -2mm	<10	<2	15
HJ06-02-09 -2mm	<10	2	15
HJ06-02-10 -2mm	<10	<2	15
HJ06-02-11 -2mm	<10	<2	15
RE HJ06-02-05 -2mm	<10	<2	15
HJ06-03-01 -2mm	<10	<2	15
HJ06-03-02 -2mm	<10	<2	15
HJ06-03-03 -2mm	<10	2	15
HJ06-03-04 -2mm	<10	<2	15
HJ06-03-06 -2mm	<10	<2	15
HJ06-03-05 -2mm	<10	<2	15
HJ06-03-07 -2mm	<10	<2	15
HJ06-03-08 -2mm	<10	2	15
HJ06-03-09 -2mm	<10	<2	15
STANDARD DS7	63	36	15
G-1	<10	<2	15
HJ06-03-10 (pulp)	<10	<2	0.5
HJ06-04-01 -2mm	<10	<2	15
HJ06-04-02 -2mm	<10	<2	15
HJ06-04-03 -2mm	<10	<2	15
HJ06-04-04 -2mm	<10	<2	15
HJ06-04-05 -2mm	<10	<2	15
HJ06-04-06 -2mm	<10	<2	15
HJ06-04-07 -2mm	<10	<2	15
HJ06-04-08 -2mm	<10	<2	15
HJ06-04-09 -2mm	<10	2	15
HJ06-04-10 -2mm	<10	4	7.5
RE HJ06-04-10 -2mm	<10	5	7.5
HJ06-04-11 -2mm	<10	<2	15
HJ06-04-12 -2mm	<10	<2	15
HJ06-04-13 -2mm	<10	<2	15
STANDARD DS7	62	39	15

Percentage difference calculations for selected elements subjected to geochemical analysis

ELEMENT			Mo	Cu	Pb	Zn	Cr	Ni	Se	Co	Mn	Fe	As	Hg	Au	Cd	Sb	V	Ti	Sc	Tl	Be
SAMPLES	horizon/other	depth (in cm)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm
<63um samples																						
HJ06-01-12 -63um	**duplicate of HJ06-03-03**		1.04	26.52	21.59	46.6	17.9	19.2	0.9	8.1	294	30600	426.9	3063	199.9	0.08	0.83	20	110	1.1	0.2	0.2
HJ06-03-03 -63um		35	1.5	30.05	26.23	52.3	22	20.7	1.2	8.5	315	34700	504.6	3962	280.1	0.09	0.93	22	140	1.3	0.27	0.4
			1.27	*28.29*	*23.91*	*49.45*	*19.95*	*19.95*	*1.05*	*8.3*	*304.5*	*32650*	*465.75*	*3512.5*	*240*	*0.085*	*0.88*	*21*	*125*	*1.2*	*0.235*	*0.3*
			0.46	*3.6*	*4.6*	*5.7*	*4.1*	*1.5*	*0.3*	*0.4*	*21*	*4100*	*77.7*	*899*	*80*	*0.01*	*0.1*	*2*	*30*	*0.2*	*0.07*	*0.2*
Percent difference			**36.22%**	**12.73%**	**19.24%**	**11.53%**	**20.55%**	**7.52%**	**28.57%**	**4.82%**	**6.90%**	**12.56%**	**16.68%**	**25.59%**	**33.33%**	**11.76%**	**11.36%**	**9.52%**	**24.00%**	**16.67%**	**29.79%**	**66.67%**
HJ06-02-11 -63um	**duplicate of HJ06-03-04**		2.04	37.65	52.01	50.3	19.3	17.5	1.3	5.7	237	36500	580.2	14255	492.8	0.15	1.74	25	130	1.2	0.34	0.3
HJ06-03-04 -63um		25	2.5	38.47	58.72	57.4	21.2	21	1.2	5.6	242	38300	614.5	16431	490.4	0.15	1.94	25	140	1.2	0.37	0.3
			2.27	*38.06*	*55.365*	*53.85*	*20.25*	*19.25*	*1.25*	*5.65*	*239.5*	*37400*	*597.35*	*15343*	*491.6*	*0.15*	*1.84*	*25*	*135*	*1.2*	*0.355*	*0.3*
			0.46	*0.8*	*6.7*	*7.1*	*1.9*	*3.5*	*0.1*	*0.1*	*5*	*1800*	*34.3*	*2176*	*3*	*0*	*0.2*	*0*	*10*	*0*	*0.03*	*0*
Percent difference			**20.26%**	**2.10%**	**12.10%**	**13.18%**	**9.38%**	**18.18%**	**8.00%**	**1.77%**	**2.09%**	**4.81%**	**5.74%**	**14.18%**	**0.61%**	**0.00%**	**10.87%**	**0.00%**	**7.41%**	**0.00%**	**8.45%**	**0.00%**
HJ06-03-09 -63um	**duplicate of HJ06-02-04**		0.42	17.29	10.27	48.2	27.8	18.5	2.8	4.9	181	58300	301.8	143	47.5	0.06	0.46	33	420	1.7	0.24	0.6
HJ06-02-04 -63um	B	42.5	0.39	16.56	9.67	42.6	26.5	16.5	2.6	4.7	165	55400	289	106	54.8	0.05	0.46	31	380	1.6	0.22	0.3
			0.405	*16.93*	*9.97*	*45.4*	*27.15*	*17.5*	*2.7*	*4.8*	*173*	*56850*	*295.4*	*124.5*	*51.15*	*0.055*	*0.46*	*32*	*400*	*1.65*	*0.23*	*0.45*
			0.03	*0.7*	*0.63*	*5.6*	*1.3*	*2*	*0.2*	*0.2*	*16*	*2900*	*12.8*	*37*	*7.3*	*0.01*	*0*	*2*	*40*	*0.1*	*0.02*	*0.3*
Percent difference			**7.41%**	**4.14%**	**6.32%**	**12.33%**	**4.79%**	**11.43%**	**7.41%**	**4.17%**	**9.25%**	**5.10%**	**4.33%**	**29.72%**	**14.27%**	**18.18%**	**0.00%**	**6.25%**	**10.00%**	**6.06%**	**8.70%**	**66.67%**
HJ06-04-13 -63um	**duplicate of HJ06-02-10**		0.4	5.95	8.06	16.9	13.3	5.1	1.1	1.1	51	41600	197.2	70	56.6	0.05	0.41	37	270	0.7	0.13	0.2
HJ06-02-10 -63um	0-30 accum.		0.45	6.04	7.61	16	14.6	5.2	1	1.1	48	38000	187.6	74	462.6	0.04	0.42	34	230	0.7	0.15	0.1
			0.425	*11.99*	*15.67*	*32.9*	*27.9*	*10.3*	*2.1*	*2.2*	*99*	*79600*	*384.8*	*144*	*519.6*	*0.09*	*0.83*	*71*	*500*	*1.4*	*0.28*	*0.3*
			0.05	*0.09*	*0.45*	*0.9*	*0.7*	*0.1*	*0.1*	*0*	*3*	*3600*	*9.6*	*4*	*406.4*	*0.01*	*0.01*	*3*	*40*	*0*	*0.02*	*0.1*
Percent difference			**11.76%**	**0.75%**	**2.87%**	**2.74%**	**2.51%**	**0.97%**	**4.76%**	**0.00%**	**3.03%**	**4.52%**	**2.49%**	**2.78%**	**78.21%**	**11.11%**	**1.20%**	**4.23%**	**8.00%**	**0.00%**	**7.14%**	**33.33%**
2mm>x>63um size samples																						
HJ06-01-12 -2mm	**duplicate of HJ06-03-03**		1.1	27.48	21.52	43.3	15.4	17.2	0.9	6.7	242	31300	436.8	2886	179.8	0.08	0.95	20	140	1	0.19	0.3
HJ06-03-03 -2mm		35	1.56	28.17	24.44	41.3	15.7	17.8	0.9	7.4	250	31600	603.6	2486	129.2	0.07	1.19	22	160	1	0.18	0.3
			1.33	*27.83*	*22.98*	*42.3*	*15.55*	*17.5*	*0.9*	*7.05*	*246*	*31450*	*520.2*	*2686*	*154.5*	*0.075*	*1.07*	*21*	*150*	*1*	*0.185*	*0.3*
			0.46	*0.7*	*2.9*	*2*	*0.3*	*0.6*	*0*	*0.7*	*8*	*300*	*166.8*	*400*	*51*	*0.01*	*0.24*	*2*	*20*	*0*	*0.01*	*0*
Percent difference			**34.59%**	**2.52%**	**12.62%**	**4.73%**	**1.93%**	**3.43%**	**0.00%**	**9.93%**	**3.25%**	**0.95%**	**32.06%**	**14.89%**	**33.01%**	**13.33%**	**22.43%**	**9.52%**	**13.33%**	**0.00%**	**5.41%**	**0.00%**
HJ06-02-11 -2mm	**duplicate of HJ06-03-04**		2.12	32	36.79	41.9	14.5	16.5	1	5.2	194	30200	466	8279	131.6	0.12	1.6	19	140	1	0.24	0.3
HJ06-03-04 -2mm		25	2.33	34.15	43.11	43.9	15.4	17.3	0.9	5.6	196	31500	620	9796	1517	0.14	1.85	20	140	1.1	0.25	0.4
			2.225	*33.08*	*39.95*	*42.9*	*14.95*	*16.9*	*0.95*	*5.4*	*195*	*30850*	*543*	*9037.5*	*824.3*	*0.13*	*1.725*	*19.5*	*140*	*1.05*	*0.245*	*0.35*
			0.21	*2.2*	*6.3*	*2*	*0.9*	*0.8*	*0.1*	*0.4*	*2*	*1300*	*154*	*1517*	*1385*	*0.02*	*0.25*	*1*	*0*	*0.1*	*0.01*	*0.1*
Percent difference			**9.44%**	**6.65%**	**15.77%**	**4.66%**	**6.02%**	**4.73%**	**10.53%**	**7.41%**	**1.03%**	**4.21%**	**28.36%**	**16.79%**	**168.02%**	**15.38%**	**14.49%**	**5.13%**	**0.00%**	**9.52%**	**4.08%**	**28.57%**
HJ06-03-09 -2mm	**duplicate of HJ06-02-04**		0.19	16.74	8.9	46.1	20.1	17.7	1.4	5.2	197	38700	245.3	63	36.5	0.05	0.54	22	420	1.3	0.18	0.3
HJ06-02-04 -2mm	B	42.5	0.23	17.08	9.41	48.3	20.3	19.1	1.5	5.4	205	41400	243.2	77	23.6	0.04	0.53	23	410	1.3	0.19	0.3
			0.21	*16.91*	*9.155*	*47.2*	*20.2*	*18.4*	*1.45*	*5.3*	*201*	*40050*	*244.25*	*70*	*30.05*	*0.045*	*0.535*	*22.5*	*415*	*1.3*	*0.185*	*0.3*
			0.04	*0.4*	*0.51*	*2.2*	*0.2*	*1.4*	*0.1*	*0.2*	*8*	*2700*	*2.1*	*14*	*12.9*	*0.01*	*0.02*	*1*	*10*	*0*	*0.01*	*0*
Percent difference			**19.05%**	**2.37%**	**5.57%**	**4.66%**	**0.99%**	**7.61%**	**6.90%**	**3.77%**	**3.98%**	**6.74%**	**0.86%**	**20.00%**	**42.93%**	**22.22%**	**3.74%**	**4.44%**	**2.41%**	**0.00%**	**5.41%**	**0.00%**
HJ06-04-13 -2mm	**duplicate of HJ06-02-10**		0.25	5.78	9.6	14	9.4	4.9	0.9	1.3	56	28900	155.7	72	23.6	0.07	0.45	25	260	0.5	0.1	0.1
HJ06-02-10 -2mm	0-30 accum.		0.25	5.93	11.15	14.5	8.8	4.8	0.9	1.3	56	26000	147.4	82	46.7	0.09	0.47	25	220	0.5	0.1	0.1
			0.25	*5.855*	*10.375*	*14.25*	*9.1*	*4.85*	*0.9*	*1.3*	*56*	*27450*	*151.55*	*77*	*35.15*	*0.08*	*0.46*	*25*	*240*	*0.5*	*0.1*	*0.1*
-			*0*	*0.15*	*1.6*	*0.5*	*0.6*	*0.1*	*0*	*0*	*0*	*2900*	*8.3*	*10*	*23.1*	*0.02*	*0.02*	*0*	*40*	*0*	*0*	*0*
Percent difference			**0.00%**	**2.56%**	**15.42%**	**3.51%**	**6.59%**	**2.06%**	**0.00%**	**0.00%**	**0.00%**	**10.56%**	**5.48%**	**12.99%**	**65.72%**	**25.00%**	**4.35%**	**0.00%**	**16.67%**	**0.00%**	**0.00%**	**0.00%**

APPENDIX D

Statistical correlations of all 53 elements analyzed- 63 micron size

Site 1

	Mo	**Cu**	**Pb**	**Zn**	**Ag**	**Mg**	**Cr**	**Ni**	**Al**	**Se**	**Co**	**Mn**	**Fe**
Mo	1.00	-0.11	0.67	0.19	0.91	-0.30	0.56	-0.04	0.37	0.72	-0.39	-0.38	0.37
Cu	-0.11	1.00	-0.22	0.92	-0.38	0.95	0.45	0.96	0.36	-0.09	0.91	0.90	0.37
Pb	0.67	-0.22	1.00	0.08	0.72	-0.38	-0.09	-0.03	-0.23	0.09	-0.38	-0.35	-0.24
Zn	0.19	0.92	0.08	1.00	-0.10	0.79	0.50	0.96	0.32	0.01	0.72	0.73	0.30
Ag	0.91	-0.38	0.72	-0.10	1.00	-0.51	0.36	-0.30	0.29	0.70	-0.57	-0.57	0.24
Mg	-0.30	0.95	-0.38	0.79	-0.51	1.00	0.42	0.90	0.43	-0.10	0.96	0.90	0.43
Cr	0.56	0.45	-0.09	0.50	0.36	0.42	1.00	0.37	0.92	0.82	0.29	0.21	0.93
Ni	-0.04	0.96	-0.03	0.96	-0.30	0.90	0.37	1.00	0.25	-0.16	0.85	0.84	0.24
Al	0.37	0.36	-0.23	0.32	0.29	0.43	0.92	0.25	1.00	0.83	0.31	0.19	0.96
Se	0.72	-0.09	0.09	0.01	0.70	-0.10	0.82	-0.16	0.83	1.00	-0.20	-0.27	0.81
Co	-0.39	0.91	-0.38	0.72	-0.57	0.96	0.29	0.85	0.31	-0.20	1.00	0.98	0.34
Mn	-0.38	0.90	-0.35	0.73	-0.57	0.90	0.21	0.84	0.19	-0.27	0.98	1.00	0.23
Fe	0.37	0.37	-0.24	0.30	0.24	0.43	0.93	0.24	0.96	0.81	0.34	0.23	1.00
As	0.68	0.36	0.09	0.51	0.40	0.19	0.81	0.32	0.55	0.65	0.16	0.18	0.66
U	0.12	0.56	-0.35	0.44	0.01	0.68	0.84	0.46	0.94	0.61	0.58	0.46	0.92
S	0.89	-0.24	0.58	0.10	0.83	-0.48	0.34	-0.17	0.11	0.54	-0.51	-0.43	0.09
Hg	0.90	-0.32	0.66	-0.03	0.98	-0.45	0.40	-0.24	0.35	0.72	-0.53	-0.53	0.26
La	-0.46	0.91	-0.54	0.68	-0.66	0.97	0.30	0.81	0.33	-0.21	0.96	0.92	0.35
Au	0.35	-0.44	0.90	-0.23	0.51	-0.51	-0.44	-0.25	-0.48	-0.17	-0.48	-0.46	-0.48
Th	-0.27	0.77	-0.55	0.55	-0.46	0.90	0.59	0.65	0.66	0.16	0.84	0.74	0.70
Sr	0.38	0.21	0.64	0.48	0.24	-0.06	-0.19	0.37	-0.48	-0.31	-0.02	0.12	-0.47
Cd	0.72	-0.14	0.98	0.19	0.71	-0.35	-0.04	0.05	-0.25	0.09	-0.35	-0.29	-0.24
Sb	0.83	0.03	0.55	0.36	0.63	-0.25	0.37	0.11	0.03	0.36	-0.29	-0.21	0.07
Bi	0.50	0.49	0.09	0.49	0.32	0.49	0.89	0.43	0.83	0.70	0.42	0.32	0.91
V	0.95	-0.17	0.76	0.14	0.85	-0.40	0.38	-0.09	0.12	0.53	-0.44	-0.40	0.19
Ca	0.31	-0.09	0.19	0.17	0.18	-0.34	-0.13	-0.02	-0.41	-0.13	-0.34	-0.18	-0.43
P	0.37	-0.08	0.19	0.18	0.23	-0.34	-0.05	-0.03	-0.34	-0.04	-0.34	-0.19	-0.35
Ba	0.57	0.40	0.68	0.69	0.38	0.14	0.16	0.55	-0.13	-0.04	0.09	0.16	-0.15
Ti	-0.27	0.80	-0.49	0.63	-0.46	0.93	0.55	0.74	0.61	0.09	0.83	0.71	0.60
B	0.49	-0.41	0.48	-0.08	0.46	-0.61	-0.20	-0.26	-0.43	-0.01	-0.62	-0.50	-0.46
Na	0.57	-0.09	0.60	0.23	0.49	-0.39	-0.08	0.02	-0.37	-0.02	-0.36	-0.22	-0.38
K	0.43	0.44	0.37	0.67	0.18	0.14	0.15	0.51	-0.18	-0.08	0.15	0.28	-0.16
W	0.90	-0.07	0.32	0.18	0.78	-0.25	0.71	-0.09	0.52	0.83	-0.34	-0.33	0.52
Sc	-0.02	0.82	-0.38	0.66	-0.21	0.87	0.74	0.70	0.77	0.35	0.84	0.75	0.79
Tl	0.43	0.37	-0.13	0.34	0.35	0.42	0.93	0.27	0.99	0.84	0.32	0.21	0.97
Te	-0.12	0.52	-0.20	0.42	-0.08	0.56	0.27	0.47	0.41	0.15	0.66	0.69	0.34
Ga	0.30	0.25	-0.36	0.14	0.17	0.31	0.87	0.08	0.89	0.79	0.25	0.14	0.97
Cs	0.43	0.09	-0.22	0.04	0.34	0.15	0.86	-0.05	0.88	0.88	0.08	-0.03	0.95
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.23	0.82	-0.40	0.66	-0.35	0.90	0.52	0.74	0.60	0.12	0.88	0.81	0.57
Nb	0.52	0.07	-0.14	0.06	0.44	0.12	0.89	-0.05	0.91	0.93	0.01	-0.10	0.94
Rb	0.27	0.63	-0.31	0.57	0.03	0.65	0.93	0.52	0.88	0.62	0.53	0.43	0.92
Sn	0.81	-0.44	0.92	-0.13	0.86	-0.61	0.03	-0.30	-0.14	0.32	-0.62	-0.59	-0.11
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.34	0.85	-0.43	0.67	-0.53	0.93	0.43	0.78	0.44	-0.07	0.91	0.83	0.48
Y	-0.33	0.89	-0.46	0.67	-0.50	0.96	0.43	0.79	0.50	-0.02	0.96	0.91	0.51
Ce	-0.47	0.83	-0.54	0.58	-0.61	0.95	0.33	0.74	0.43	-0.11	0.96	0.90	0.44
In	0.61	-0.15	-0.03	-0.12	0.59	-0.14	0.78	-0.27	0.79	0.96	-0.20	-0.27	0.84
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.10	0.78	-0.45	0.59	-0.32	0.86	0.67	0.65	0.70	0.26	0.76	0.65	0.72
Li	0.08	0.69	-0.39	0.56	-0.10	0.77	0.84	0.58	0.89	0.51	0.66	0.54	0.89
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	0.42	-0.21	0.44	0.09	0.34	-0.48	-0.22	-0.10	-0.50	-0.14	-0.47	-0.33	-0.52

Site 1

	As	**U**	**S**	**Hg**	**La**	**Au**	**Th**	**Sr**	**Cd**	**Sb**	**Bi**	**V**	**Ca**	**P**	**Ba**
Mo	0.68	0.12	0.89	0.90	-0.46	0.35	-0.27	0.38	0.72	0.83	0.50	0.95	0.31	0.37	0.57
Cu	0.36	0.56	-0.24	-0.32	0.91	-0.44	0.77	0.21	-0.14	0.03	0.49	-0.17	-0.09	-0.08	0.40
Pb	0.09	-0.35	0.58	0.66	-0.54	0.90	-0.55	0.64	0.98	0.55	0.09	0.76	0.19	0.19	0.68
Zn	0.51	0.44	0.10	-0.03	0.68	-0.23	0.55	0.48	0.19	0.36	0.49	0.14	0.17	0.18	0.69
Ag	0.40	0.01	0.83	0.98	-0.66	0.51	-0.46	0.24	0.71	0.63	0.32	0.85	0.18	0.23	0.38
Mg	0.19	0.68	-0.48	-0.45	0.97	-0.51	0.90	-0.06	-0.35	-0.25	0.49	-0.40	-0.34	-0.34	0.14
Cr	0.81	0.84	0.34	0.40	0.30	-0.44	0.59	-0.19	-0.04	0.37	0.89	0.38	-0.13	-0.05	0.16
Ni	0.32	0.46	-0.17	-0.24	0.81	-0.25	0.65	0.37	0.05	0.11	0.43	-0.09	-0.02	-0.03	0.55
Al	0.55	0.94	0.11	0.35	0.33	-0.48	0.66	-0.48	-0.25	0.03	0.83	0.12	-0.41	-0.34	-0.13
Se	0.65	0.61	0.54	0.72	-0.21	-0.17	0.16	-0.31	0.09	0.36	0.70	0.53	-0.13	-0.04	-0.04
Co	0.16	0.58	-0.51	-0.53	0.96	-0.48	0.84	-0.02	-0.35	-0.29	0.42	-0.44	-0.34	-0.34	0.09
Mn	0.18	0.46	-0.43	-0.53	0.92	-0.46	0.74	0.12	-0.29	-0.21	0.32	-0.40	-0.18	-0.19	0.16
Fe	0.66	0.92	0.09	0.26	0.35	-0.48	0.70	-0.47	-0.24	0.07	0.91	0.19	-0.43	-0.35	-0.15
As	1.00	0.47	0.63	0.40	0.10	-0.29	0.28	0.24	0.23	0.73	0.70	0.64	0.32	0.40	0.41
U	0.47	1.00	-0.16	0.06	0.59	-0.55	0.86	-0.49	-0.37	-0.16	0.84	-0.10	-0.54	-0.48	-0.17
S	0.63	-0.16	1.00	0.84	-0.58	0.28	-0.52	0.53	0.68	0.91	0.15	0.88	0.66	0.71	0.58
Hg	0.40	0.06	0.84	1.00	-0.60	0.42	-0.42	0.23	0.65	0.63	0.31	0.79	0.22	0.27	0.40
La	0.10	0.59	-0.58	-0.60	1.00	-0.62	0.88	-0.13	-0.50	-0.35	0.36	-0.53	-0.32	-0.33	0.00
Au	-0.29	-0.55	0.28	0.42	-0.62	1.00	-0.66	0.46	0.82	0.22	-0.19	0.49	0.03	-0.01	0.39
Th	0.28	0.86	-0.52	-0.42	0.88	-0.66	1.00	-0.43	-0.55	-0.36	0.66	-0.40	-0.55	-0.52	-0.19
Sr	0.24	-0.49	0.53	0.23	-0.13	0.46	-0.43	1.00	0.76	0.71	-0.18	0.52	0.71	0.69	0.90
Cd	0.23	-0.37	0.68	0.65	-0.50	0.82	-0.55	0.76	1.00	0.70	0.08	0.82	0.37	0.37	0.79
Sb	0.73	-0.16	0.91	0.63	-0.35	0.22	-0.36	0.71	0.70	1.00	0.22	0.88	0.74	0.78	0.76
Bi	0.70	0.84	0.15	0.31	0.36	-0.19	0.66	-0.18	0.08	0.22	1.00	0.38	-0.41	-0.34	0.16
V	0.64	-0.10	0.88	0.79	-0.53	0.49	-0.40	0.52	0.82	0.88	0.38	1.00	0.41	0.46	0.63
Ca	0.32	-0.54	0.66	0.22	-0.32	0.03	-0.55	0.71	0.37	0.74	-0.41	0.41	1.00	1.00	0.55
P	0.40	-0.48	0.71	0.27	-0.33	-0.01	-0.52	0.69	0.37	0.78	-0.34	0.46	1.00	1.00	0.55
Ba	0.41	-0.17	0.58	0.40	0.00	0.39	-0.19	0.90	0.79	0.76	0.16	0.63	0.55	0.55	1.00
Ti	0.21	0.83	-0.51	-0.39	0.88	-0.59	0.96	-0.34	-0.48	-0.34	0.59	-0.42	-0.49	-0.48	-0.08
B	0.25	-0.61	0.78	0.47	-0.66	0.38	-0.77	0.67	0.61	0.75	-0.40	0.59	0.87	0.86	0.50
Na	0.36	-0.53	0.81	0.49	-0.45	0.40	-0.63	0.87	0.74	0.86	-0.21	0.69	0.87	0.87	0.78
K	0.53	-0.21	0.59	0.21	0.10	0.06	-0.16	0.89	0.54	0.80	0.04	0.51	0.78	0.78	0.88
W	0.80	0.25	0.87	0.80	-0.36	-0.03	-0.13	0.19	0.41	0.80	0.50	0.81	0.40	0.48	0.39
Sc	0.45	0.91	-0.26	-0.16	0.83	-0.59	0.94	-0.27	-0.36	-0.15	0.79	-0.18	-0.45	-0.41	0.00
Tl	0.60	0.93	0.15	0.39	0.31	-0.40	0.64	-0.42	-0.15	0.08	0.90	0.20	-0.43	-0.35	-0.07
Te	0.16	0.53	-0.11	-0.01	0.54	-0.32	0.47	-0.03	-0.19	-0.19	0.31	-0.27	-0.22	-0.22	0.00
Ga	0.63	0.84	0.06	0.17	0.28	-0.56	0.65	-0.56	-0.36	0.03	0.82	0.14	-0.40	-0.32	-0.30
Cs	0.63	0.78	0.19	0.33	0.09	-0.42	0.50	-0.54	-0.23	0.11	0.81	0.27	-0.38	-0.29	-0.27
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.23	0.79	-0.39	-0.29	0.85	-0.54	0.89	-0.21	-0.39	-0.28	0.57	-0.36	-0.42	-0.40	0.00
Nb	0.64	0.78	0.27	0.45	0.04	-0.37	0.45	-0.51	-0.15	0.17	0.81	0.33	-0.33	-0.24	-0.20
Rb	0.68	0.91	0.00	0.07	0.58	-0.59	0.82	-0.31	-0.27	0.12	0.88	0.11	-0.30	-0.23	0.03
Sn	0.24	-0.36	0.74	0.78	-0.74	0.80	-0.65	0.49	0.91	0.67	0.12	0.90	0.27	0.29	0.53
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.21	0.69	-0.51	-0.50	0.90	-0.53	0.92	-0.18	-0.41	-0.30	0.53	-0.40	-0.41	-0.40	0.00
Y	0.17	0.73	-0.52	-0.45	0.97	-0.57	0.92	-0.20	-0.45	-0.35	0.53	-0.45	-0.46	-0.45	-0.02
Ce	0.06	0.69	-0.63	-0.55	0.97	-0.58	0.92	-0.28	-0.54	-0.48	0.43	-0.58	-0.50	-0.51	-0.14
In	0.63	0.60	0.43	0.57	-0.20	-0.24	0.21	-0.44	-0.05	0.26	0.69	0.46	-0.21	-0.12	-0.21
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.32	0.84	-0.39	-0.26	0.84	-0.62	0.93	-0.36	-0.45	-0.23	0.70	-0.26	-0.48	-0.45	-0.05
Li	0.48	0.97	-0.21	-0.04	0.70	-0.61	0.92	-0.42	-0.39	-0.12	0.83	-0.12	-0.48	-0.42	-0.07
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	0.24	-0.66	0.73	0.36	-0.49	0.30	-0.71	0.80	0.59	0.78	-0.43	0.55	0.96	0.95	0.64

Site 1

	Ti	B	Na	K	W	Sc	Tl	Te	Ga	Cs	Ge	Hf	Nb	Rb
Mo	-0.27	0.49	0.57	0.43	0.90	-0.02	0.43	-0.12	0.30	0.43	NA	-0.23	0.52	0.27
Cu	0.80	-0.41	-0.09	0.44	-0.07	0.82	0.37	0.52	0.25	0.09	NA	0.82	0.07	0.63
Pb	-0.49	0.48	0.60	0.37	0.32	-0.38	-0.13	-0.20	-0.36	-0.22	NA	-0.40	-0.14	-0.31
Zn	0.63	-0.08	0.23	0.67	0.18	0.66	0.34	0.42	0.14	0.04	NA	0.66	0.06	0.57
Ag	-0.46	0.46	0.49	0.18	0.78	-0.21	0.35	-0.08	0.17	0.34	NA	-0.35	0.44	0.03
Mg	0.93	-0.61	-0.39	0.14	-0.25	0.87	0.42	0.56	0.31	0.15	NA	0.90	0.12	0.65
Cr	0.55	-0.20	-0.08	0.15	0.71	0.74	0.93	0.27	0.87	0.86	NA	0.52	0.89	0.93
Ni	0.74	-0.26	0.02	0.51	-0.09	0.70	0.27	0.47	0.08	-0.05	NA	0.74	-0.05	0.52
Al	0.61	-0.43	-0.37	-0.18	0.52	0.77	0.99	0.41	0.89	0.88	NA	0.60	0.91	0.88
Se	0.09	-0.01	-0.02	-0.08	0.83	0.35	0.84	0.15	0.79	0.88	NA	0.12	0.93	0.62
Co	0.83	-0.62	-0.36	0.15	-0.34	0.84	0.32	0.66	0.25	0.08	NA	0.88	0.01	0.53
Mn	0.71	-0.50	-0.22	0.28	-0.33	0.75	0.21	0.69	0.14	-0.03	NA	0.81	-0.10	0.43
Fe	0.60	-0.46	-0.38	-0.16	0.52	0.79	0.97	0.34	0.97	0.95	NA	0.57	0.94	0.92
As	0.21	0.25	0.36	0.53	0.80	0.45	0.60	0.16	0.63	0.63	NA	0.23	0.64	0.68
U	0.83	-0.61	-0.53	-0.21	0.25	0.91	0.93	0.53	0.84	0.78	NA	0.79	0.78	0.91
S	-0.51	0.78	0.81	0.59	0.87	-0.26	0.15	-0.11	0.06	0.19	NA	-0.39	0.27	0.00
Hg	-0.39	0.47	0.49	0.21	0.80	-0.16	0.39	-0.01	0.17	0.33	NA	-0.29	0.45	0.07
La	0.88	-0.66	-0.45	0.10	-0.36	0.83	0.31	0.54	0.28	0.09	NA	0.85	0.04	0.58
Au	-0.59	0.38	0.40	0.06	-0.03	-0.59	-0.40	-0.32	-0.56	-0.42	NA	-0.54	-0.37	-0.59
Th	0.96	-0.77	-0.63	-0.16	-0.13	0.94	0.64	0.47	0.65	0.50	NA	0.89	0.45	0.82
Sr	-0.34	0.67	0.87	0.89	0.19	-0.27	-0.42	-0.03	-0.56	-0.54	NA	-0.21	-0.51	-0.31
Cd	-0.48	0.61	0.74	0.54	0.41	-0.36	-0.15	-0.19	-0.36	-0.23	NA	-0.39	-0.15	-0.27
Sb	-0.34	0.75	0.86	0.80	0.80	-0.15	0.08	-0.19	0.03	0.11	NA	-0.28	0.17	0.12
Bi	0.59	-0.40	-0.21	0.04	0.50	0.79	0.90	0.31	0.82	0.81	NA	0.57	0.81	0.88
V	-0.42	0.59	0.69	0.51	0.81	-0.18	0.20	-0.27	0.14	0.27	NA	-0.36	0.33	0.11
Ca	-0.49	0.87	0.87	0.78	0.40	-0.45	-0.43	-0.22	-0.40	-0.38	NA	-0.42	-0.33	-0.30
P	-0.48	0.86	0.87	0.78	0.48	-0.41	-0.35	-0.22	-0.32	-0.29	NA	-0.40	-0.24	-0.23
Ba	-0.08	0.50	0.78	0.88	0.39	0.00	-0.07	0.00	-0.30	-0.27	NA	0.00	-0.20	0.03
Ti	1.00	-0.68	-0.57	-0.11	-0.17	0.89	0.59	0.43	0.52	0.37	NA	0.89	0.36	0.77
B	-0.68	1.00	0.85	0.56	0.44	-0.67	-0.43	-0.35	-0.45	-0.35	NA	-0.68	-0.27	-0.46
Na	-0.57	0.85	1.00	0.84	0.52	-0.44	-0.33	-0.18	-0.41	-0.33	NA	-0.39	-0.28	-0.31
K	-0.11	0.56	0.84	1.00	0.42	0.03	-0.14	0.08	-0.23	-0.25	NA	0.02	-0.23	0.05
W	-0.17	0.44	0.52	0.42	1.00	0.10	0.54	-0.07	0.50	0.60	NA	-0.09	0.67	0.44
Sc	0.89	-0.67	-0.44	0.03	0.10	1.00	0.78	0.62	0.70	0.58	NA	0.91	0.55	0.88
Tl	0.59	-0.43	-0.33	-0.14	0.54	0.78	1.00	0.43	0.90	0.90	NA	0.60	0.92	0.88
Te	0.43	-0.35	-0.18	0.08	-0.07	0.62	0.43	1.00	0.22	0.14	NA	0.67	0.12	0.29
Ga	0.52	-0.45	-0.41	-0.23	0.50	0.70	0.90	0.22	1.00	0.98	NA	0.47	0.95	0.88
Cs	0.37	-0.35	-0.33	-0.25	0.60	0.58	0.90	0.14	0.98	1.00	NA	0.34	0.98	0.80
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA
Hf	0.89	-0.68	-0.39	0.02	-0.09	0.91	0.60	0.67	0.47	0.34	NA	1.00	0.30	0.69
Nb	0.36	-0.27	-0.28	-0.23	0.67	0.55	0.92	0.12	0.95	0.98	NA	0.30	1.00	0.80
Rb	0.77	-0.46	-0.31	0.05	0.44	0.88	0.88	0.29	0.88	0.80	NA	0.69	0.80	1.00
Sn	-0.63	0.58	0.63	0.30	0.55	-0.47	-0.05	-0.38	-0.16	0.01	NA	-0.57	0.08	-0.25
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.92	-0.67	-0.42	0.04	-0.22	0.86	0.45	0.45	0.41	0.25	NA	0.94	0.20	0.67
Y	0.90	-0.73	-0.50	0.02	-0.26	0.92	0.50	0.65	0.42	0.25	NA	0.90	0.20	0.67
Ce	0.91	-0.77	-0.58	-0.09	-0.38	0.87	0.42	0.64	0.36	0.19	NA	0.91	0.13	0.59
In	0.08	-0.10	-0.13	-0.20	0.75	0.35	0.81	0.07	0.87	0.95	NA	0.09	0.96	0.62
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.90	-0.73	-0.54	-0.06	0.00	0.92	0.68	0.37	0.67	0.53	NA	0.79	0.51	0.87
Li	0.89	-0.63	-0.50	-0.10	0.22	0.95	0.87	0.44	0.81	0.72	NA	0.82	0.71	0.96
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	-0.63	0.93	0.94	0.76	0.40	-0.59	-0.49	-0.32	-0.51	-0.45	NA	-0.56	-0.39	-0.43

Site 1

	Sn	Ta	Zr	Y	Ce	In	Re	Be	Li	Pd	Pt
Mo	0.81	NA	-0.34	-0.33	-0.47	0.61	NA	-0.10	0.08	NA	0.42
Cu	-0.44	NA	0.85	0.89	0.83	-0.15	NA	0.78	0.69	NA	-0.21
Pb	0.92	NA	-0.43	-0.46	-0.54	-0.03	NA	-0.45	-0.39	NA	0.44
Zn	-0.13	NA	0.67	0.67	0.58	-0.12	NA	0.59	0.56	NA	0.09
Ag	0.86	NA	-0.53	-0.50	-0.61	0.59	NA	-0.32	-0.10	NA	0.34
Mg	-0.61	NA	0.93	0.96	0.95	-0.14	NA	0.86	0.77	NA	-0.48
Cr	0.03	NA	0.43	0.43	0.33	0.78	NA	0.67	0.84	NA	-0.22
Ni	-0.30	NA	0.78	0.79	0.74	-0.27	NA	0.65	0.58	NA	-0.10
Al	-0.14	NA	0.44	0.50	0.43	0.79	NA	0.70	0.89	NA	-0.50
Se	0.32	NA	-0.07	-0.02	-0.11	0.96	NA	0.26	0.51	NA	-0.14
Co	-0.62	NA	0.91	0.96	0.96	-0.20	NA	0.76	0.66	NA	-0.47
Mn	-0.59	NA	0.83	0.91	0.90	-0.27	NA	0.65	0.54	NA	-0.33
Fe	-0.11	NA	0.48	0.51	0.44	0.84	NA	0.72	0.89	NA	-0.52
As	0.24	NA	0.21	0.17	0.06	0.63	NA	0.32	0.48	NA	0.24
U	-0.36	NA	0.69	0.73	0.69	0.60	NA	0.84	0.97	NA	-0.66
S	0.74	NA	-0.51	-0.52	-0.63	0.43	NA	-0.39	-0.21	NA	0.73
Hg	0.78	NA	-0.50	-0.45	-0.55	0.57	NA	-0.26	-0.04	NA	0.36
La	-0.74	NA	0.90	0.97	0.97	-0.20	NA	0.84	0.70	NA	-0.49
Au	0.80	NA	-0.53	-0.57	-0.58	-0.24	NA	-0.62	-0.61	NA	0.30
Th	-0.65	NA	0.92	0.92	0.92	0.21	NA	0.93	0.92	NA	-0.71
Sr	0.49	NA	-0.18	-0.20	-0.28	-0.44	NA	-0.36	-0.42	NA	0.80
Cd	0.91	NA	-0.41	-0.45	-0.54	-0.05	NA	-0.45	-0.39	NA	0.59
Sb	0.67	NA	-0.30	-0.35	-0.48	0.26	NA	-0.23	-0.12	NA	0.78
Bi	0.12	NA	0.53	0.53	0.43	0.69	NA	0.70	0.83	NA	-0.43
V	0.90	NA	-0.40	-0.45	-0.58	0.46	NA	-0.26	-0.12	NA	0.55
Ca	0.27	NA	-0.41	-0.46	-0.50	-0.21	NA	-0.48	-0.48	NA	0.96
P	0.29	NA	-0.40	-0.45	-0.51	-0.12	NA	-0.45	-0.42	NA	0.95
Ba	0.53	NA	0.00	-0.02	-0.14	-0.21	NA	-0.05	-0.07	NA	0.64
Ti	-0.63	NA	0.92	0.90	0.91	0.08	NA	0.90	0.89	NA	-0.63
B	0.58	NA	-0.67	-0.73	-0.77	-0.10	NA	-0.73	-0.63	NA	0.93
Na	0.63	NA	-0.42	-0.50	-0.58	-0.13	NA	-0.54	-0.50	NA	0.94
K	0.30	NA	0.04	0.02	-0.09	-0.20	NA	-0.06	-0.10	NA	0.76
W	0.55	NA	-0.22	-0.26	-0.38	0.75	NA	0.00	0.22	NA	0.40
Sc	-0.47	NA	0.86	0.92	0.87	0.35	NA	0.92	0.95	NA	-0.59
Tl	-0.05	NA	0.45	0.50	0.42	0.81	NA	0.68	0.87	NA	-0.49
Te	-0.38	NA	0.45	0.65	0.64	0.07	NA	0.37	0.44	NA	-0.32
Ga	-0.16	NA	0.41	0.42	0.36	0.87	NA	0.67	0.81	NA	-0.51
Cs	0.01	NA	0.25	0.25	0.19	0.95	NA	0.53	0.72	NA	-0.45
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.57	NA	0.94	0.90	0.91	0.09	NA	0.79	0.82	NA	-0.56
Nb	0.08	NA	0.20	0.20	0.13	0.96	NA	0.51	0.71	NA	-0.39
Rb	-0.25	NA	0.67	0.67	0.59	0.62	NA	0.87	0.96	NA	-0.43
Sn	1.00	NA	-0.61	-0.65	-0.74	0.24	NA	-0.52	-0.41	NA	0.50
Ta	NA	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.61	NA	1.00	0.90	0.92	-0.04	NA	0.80	0.77	NA	-0.54
Y	-0.65	NA	0.90	1.00	0.98	-0.02	NA	0.89	0.80	NA	-0.60
Ce	-0.74	NA	0.92	0.98	1.00	-0.10	NA	0.83	0.75	NA	-0.66
In	0.24	NA	-0.04	-0.02	-0.10	1.00	NA	0.27	0.50	NA	-0.24
Re	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA
Be	-0.52	NA	0.80	0.89	0.83	0.27	NA	1.00	0.93	NA	-0.62
Li	-0.41	NA	0.77	0.80	0.75	0.50	NA	0.93	1.00	NA	-0.61
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA
Pt	0.50	NA	-0.54	-0.60	-0.66	-0.24	NA	-0.62	-0.61	NA	1.00

Statistical correlations of all 53 elements analyzed- 63 micron size

Site 2

	Mo	Cu	Pb	Zn	Ag	Mg	Cr	Ni	Al	Se	Co	Mn	Fe	As
Mo	1.00	-0.36	0.92	-0.26	0.52	-0.38	-0.26	-0.32	-0.26	0.28	-0.37	-0.41	-0.20	-0.24
Cu	-0.36	1.00	-0.30	0.95	-0.37	0.99	0.76	0.98	0.60	-0.14	0.98	0.99	0.56	0.72
Pb	0.92	-0.30	1.00	-0.29	0.26	-0.38	-0.46	-0.30	-0.50	-0.06	-0.35	-0.37	-0.44	-0.44
Zn	-0.26	0.95	-0.29	1.00	-0.23	0.95	0.82	0.98	0.67	0.01	0.94	0.95	0.61	0.76
Ag	0.52	-0.37	0.26	-0.23	1.00	-0.33	0.15	-0.40	0.28	0.91	-0.43	-0.40	0.39	-0.03
Mg	-0.38	0.99	-0.38	0.95	-0.33	1.00	0.83	0.98	0.69	-0.05	0.99	0.99	0.66	0.81
Cr	-0.26	0.76	-0.46	0.82	0.15	0.83	1.00	0.76	0.96	0.48	0.78	0.78	0.95	0.93
Ni	-0.32	0.98	-0.30	0.98	-0.40	0.98	0.76	1.00	0.59	-0.15	0.99	0.98	0.54	0.76
Al	-0.26	0.60	-0.50	0.67	0.28	0.69	0.96	0.59	1.00	0.61	0.63	0.63	0.96	0.86
Se	0.28	-0.14	-0.06	0.01	0.91	-0.05	0.48	-0.15	0.61	1.00	-0.16	-0.14	0.69	0.33
Co	-0.37	0.98	-0.35	0.94	-0.43	0.99	0.78	0.99	0.63	-0.16	1.00	0.99	0.57	0.79
Mn	-0.41	0.99	-0.37	0.95	-0.40	0.99	0.78	0.98	0.63	-0.14	0.99	1.00	0.58	0.76
Fe	-0.20	0.56	-0.44	0.61	0.39	0.66	0.95	0.54	0.96	0.69	0.57	0.58	1.00	0.84
As	-0.24	0.72	-0.44	0.76	-0.03	0.81	0.93	0.76	0.86	0.33	0.79	0.76	0.84	1.00
U	-0.28	0.55	-0.52	0.59	0.28	0.65	0.95	0.53	0.99	0.63	0.59	0.58	0.97	0.87
S	0.62	-0.51	0.45	-0.30	0.80	-0.53	-0.23	-0.48	-0.17	0.55	-0.59	-0.55	-0.09	-0.39
Hg	0.86	-0.46	0.81	-0.35	0.67	-0.53	-0.37	-0.47	-0.34	0.34	-0.56	-0.54	-0.26	-0.52
La	-0.66	0.34	-0.62	0.14	-0.40	0.41	0.38	0.27	0.44	-0.10	0.41	0.39	0.39	0.44
Au	-0.57	0.56	-0.54	0.47	-0.54	0.62	0.48	0.58	0.43	-0.23	0.64	0.60	0.37	0.62
Th	-0.44	0.89	-0.52	0.87	-0.22	0.95	0.92	0.89	0.85	0.13	0.93	0.92	0.80	0.92
Sr	0.18	0.09	0.36	0.16	-0.15	-0.04	-0.35	0.11	-0.49	-0.41	-0.02	0.03	-0.49	-0.45
Cd	0.95	-0.43	0.98	-0.37	0.39	-0.50	-0.49	-0.41	-0.50	0.06	-0.47	-0.50	-0.44	-0.49
Sb	0.48	0.61	0.48	0.59	0.10	0.59	0.50	0.60	0.35	0.14	0.58	0.56	0.41	0.50
Bi	0.21	0.63	0.12	0.58	0.18	0.68	0.74	0.59	0.66	0.37	0.64	0.62	0.73	0.74
V	0.89	-0.26	0.79	-0.18	0.77	-0.29	-0.08	-0.29	-0.07	0.53	-0.34	-0.33	0.06	-0.21
Ca	-0.22	0.23	-0.04	0.28	-0.29	0.11	-0.20	0.24	-0.33	-0.44	0.12	0.19	-0.35	-0.32
P	0.42	-0.15	0.19	0.06	0.87	-0.15	0.23	-0.15	0.31	0.77	-0.23	-0.19	0.35	-0.04
Ba	-0.03	0.93	-0.03	0.92	-0.16	0.92	0.77	0.92	0.63	0.02	0.91	0.91	0.59	0.70
Ti	-0.42	0.97	-0.33	0.87	-0.49	0.97	0.69	0.95	0.53	-0.25	0.97	0.98	0.51	0.71
B	0.84	-0.48	0.95	-0.45	0.22	-0.57	-0.67	-0.47	-0.71	-0.16	-0.54	-0.55	-0.65	-0.66
Na	0.57	-0.42	0.68	-0.32	0.18	-0.53	-0.66	-0.39	-0.71	-0.19	-0.52	-0.48	-0.67	-0.72
K	-0.41	0.99	-0.34	0.92	-0.44	0.98	0.73	0.97	0.57	-0.20	0.98	0.99	0.53	0.71
W	-0.11	0.84	-0.22	0.84	-0.07	0.89	0.91	0.84	0.83	0.23	0.88	0.85	0.79	0.92
Sc	-0.34	0.83	-0.49	0.85	0.01	0.89	0.99	0.82	0.94	0.35	0.85	0.85	0.91	0.92
Tl	-0.45	0.91	-0.47	0.83	-0.23	0.95	0.87	0.87	0.80	0.08	0.92	0.93	0.77	0.82
Te	-0.17	0.42	-0.19	0.38	0.24	0.40	0.50	0.31	0.57	0.31	0.35	0.39	0.51	0.19
Ga	-0.36	0.34	-0.55	0.28	0.19	0.46	0.74	0.29	0.83	0.52	0.40	0.39	0.84	0.70
Cs	-0.58	0.81	-0.57	0.68	-0.35	0.86	0.77	0.75	0.72	-0.02	0.84	0.84	0.68	0.75
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.34	0.91	-0.36	0.92	-0.35	0.93	0.79	0.93	0.70	-0.07	0.94	0.92	0.58	0.76
Nb	0.02	0.24	-0.30	0.34	0.60	0.36	0.80	0.24	0.89	0.87	0.28	0.27	0.92	0.72
Rb	-0.48	0.95	-0.47	0.88	-0.33	0.98	0.84	0.92	0.74	-0.03	0.96	0.97	0.70	0.81
Sn	0.88	-0.47	0.94	-0.50	0.28	-0.51	-0.51	-0.48	-0.50	0.00	-0.48	-0.53	-0.44	-0.46
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.34	0.97	-0.35	0.94	-0.36	0.98	0.82	0.97	0.70	-0.08	0.99	0.97	0.62	0.80
Y	-0.53	0.85	-0.55	0.74	-0.28	0.90	0.83	0.79	0.78	0.06	0.87	0.87	0.75	0.81
Ce	-0.62	0.35	-0.60	0.17	-0.38	0.43	0.42	0.29	0.47	-0.07	0.44	0.41	0.43	0.50
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.36	0.94	-0.42	0.93	-0.21	0.97	0.91	0.93	0.82	0.10	0.96	0.95	0.75	0.86
Li	-0.34	0.89	-0.45	0.90	-0.08	0.94	0.96	0.88	0.89	0.24	0.91	0.91	0.85	0.91
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 2

	U	S	Hg	La	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	Ba
Mo	-0.28	0.62	0.86	-0.66	-0.57	-0.44	0.18	0.95	0.48	0.21	0.89	-0.22	0.42	-0.03
Cu	0.55	-0.51	-0.46	0.34	0.56	0.89	0.09	-0.43	0.61	0.63	-0.26	0.23	-0.15	0.93
Pb	-0.52	0.45	0.81	-0.62	-0.54	-0.52	0.36	0.98	0.48	0.12	0.79	-0.04	0.19	-0.03
Zn	0.59	-0.30	-0.35	0.14	0.47	0.87	0.16	-0.37	0.59	0.58	-0.18	0.28	0.06	0.92
Ag	0.28	0.80	0.67	-0.40	-0.54	-0.22	-0.15	0.39	0.10	0.18	0.77	-0.29	0.87	-0.16
Mg	0.65	-0.53	-0.53	0.41	0.62	0.95	-0.04	-0.50	0.59	0.68	-0.29	0.11	-0.15	0.92
Cr	0.95	-0.23	-0.37	0.38	0.48	0.92	-0.35	-0.49	0.50	0.74	-0.08	-0.20	0.23	0.77
Ni	0.53	-0.48	-0.47	0.27	0.58	0.89	0.11	-0.41	0.60	0.59	-0.29	0.24	-0.15	0.92
Al	0.99	-0.17	-0.34	0.44	0.43	0.85	-0.49	-0.50	0.35	0.66	-0.07	-0.33	0.31	0.63
Se	0.63	0.55	0.34	-0.10	-0.23	0.13	-0.41	0.06	0.14	0.37	0.53	-0.44	0.77	0.02
Co	0.59	-0.59	-0.56	0.41	0.64	0.93	-0.02	-0.47	0.58	0.64	-0.34	0.12	-0.23	0.91
Mn	0.58	-0.55	-0.54	0.39	0.60	0.92	0.03	-0.50	0.56	0.62	-0.33	0.19	-0.19	0.91
Fe	0.97	-0.09	-0.26	0.39	0.37	0.80	-0.49	-0.44	0.41	0.73	0.06	-0.35	0.35	0.59
As	0.87	-0.39	-0.52	0.44	0.62	0.92	-0.45	-0.49	0.50	0.74	-0.21	-0.32	-0.04	0.70
U	1.00	-0.22	-0.39	0.52	0.46	0.83	-0.60	-0.52	0.34	0.69	-0.08	-0.44	0.24	0.57
S	-0.22	1.00	0.87	-0.84	-0.80	-0.56	0.39	0.60	-0.06	-0.24	0.74	0.20	0.86	-0.32
Hg	-0.39	0.87	1.00	-0.81	-0.83	-0.62	0.42	0.89	0.22	-0.07	0.91	0.10	0.68	-0.20
La	0.52	-0.84	-0.81	1.00	0.69	0.57	-0.74	-0.71	-0.09	0.31	-0.62	-0.49	-0.58	0.18
Au	0.46	-0.80	-0.83	0.69	1.00	0.70	-0.42	-0.63	0.13	0.34	-0.62	-0.19	-0.56	0.41
Th	0.83	-0.56	-0.62	0.57	0.70	1.00	-0.33	-0.61	0.48	0.70	-0.35	-0.13	-0.13	0.83
Sr	-0.60	0.39	0.42	-0.74	-0.42	-0.33	1.00	0.36	0.06	-0.37	0.18	0.91	0.22	0.07
Cd	-0.52	0.60	0.89	-0.71	-0.63	-0.61	0.36	1.00	0.36	0.02	0.84	-0.04	0.33	-0.14
Sb	0.34	-0.06	0.22	-0.09	0.13	0.48	0.06	0.36	1.00	0.87	0.50	-0.14	0.11	0.80
Bi	0.69	-0.24	-0.07	0.31	0.34	0.70	-0.37	0.02	0.87	1.00	0.32	-0.45	0.06	0.77
V	-0.08	0.74	0.91	-0.62	-0.62	-0.35	0.18	0.84	0.50	0.32	1.00	-0.15	0.68	0.04
Ca	-0.44	0.20	0.10	-0.49	-0.19	-0.13	0.91	-0.04	-0.14	-0.45	-0.15	1.00	0.13	0.09
P	0.24	0.86	0.68	-0.58	-0.56	-0.13	0.22	0.33	0.11	0.06	0.68	0.13	1.00	0.05
Ba	0.57	-0.32	-0.20	0.18	0.41	0.83	0.07	-0.14	0.80	0.77	0.04	0.09	0.05	1.00
Ti	0.51	-0.67	-0.59	0.48	0.68	0.89	-0.02	-0.48	0.58	0.64	-0.36	0.13	-0.34	0.87
B	-0.73	0.55	0.83	-0.74	-0.65	-0.73	0.51	0.96	0.22	-0.18	0.70	0.13	0.19	-0.26
Na	-0.78	0.70	0.77	-0.92	-0.72	-0.75	0.83	0.74	-0.05	-0.48	0.51	0.59	0.36	-0.32
K	0.53	-0.59	-0.54	0.41	0.64	0.89	0.05	-0.48	0.57	0.61	-0.34	0.21	-0.24	0.90
W	0.81	-0.43	-0.38	0.43	0.55	0.94	-0.34	-0.32	0.71	0.86	-0.06	-0.28	-0.02	0.90
Sc	0.92	-0.37	-0.47	0.48	0.58	0.97	-0.35	-0.54	0.50	0.74	-0.18	-0.17	0.11	0.81
Tl	0.79	-0.59	-0.58	0.62	0.65	0.97	-0.30	-0.58	0.52	0.73	-0.30	-0.11	-0.15	0.85
Te	0.52	-0.04	0.03	0.30	-0.06	0.42	-0.11	-0.20	0.22	0.36	0.10	0.00	0.38	0.49
Ga	0.90	-0.41	-0.50	0.78	0.50	0.69	-0.85	-0.57	0.15	0.61	-0.19	-0.66	-0.02	0.33
Cs	0.74	-0.76	-0.73	0.81	0.74	0.92	-0.45	-0.68	0.35	0.64	-0.46	-0.21	-0.34	0.70
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.64	-0.52	-0.51	0.40	0.65	0.91	-0.08	-0.45	0.51	0.57	-0.33	0.08	-0.11	0.90
Nb	0.92	0.10	-0.08	0.29	0.21	0.57	-0.64	-0.25	0.31	0.64	0.22	-0.58	0.47	0.35
Rb	0.72	-0.63	-0.62	0.58	0.67	0.97	-0.20	-0.59	0.51	0.68	-0.36	-0.01	-0.21	0.86
Sn	-0.47	0.34	0.72	-0.41	-0.47	-0.57	0.06	0.93	0.35	0.11	0.73	-0.33	0.08	-0.19
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.65	-0.55	-0.52	0.43	0.64	0.94	-0.08	-0.46	0.59	0.66	-0.30	0.07	-0.15	0.93
Y	0.79	-0.69	-0.68	0.75	0.70	0.95	-0.42	-0.66	0.42	0.69	-0.40	-0.20	-0.26	0.75
Ce	0.56	-0.84	-0.80	1.00	0.70	0.60	-0.77	-0.69	-0.04	0.37	-0.60	-0.54	-0.57	0.22
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.78	-0.47	-0.50	0.45	0.57	0.97	-0.17	-0.52	0.55	0.69	-0.26	0.00	-0.03	0.91
Li	0.86	-0.41	-0.48	0.45	0.56	0.98	-0.25	-0.53	0.54	0.73	-0.21	-0.09	0.05	0.87
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 2

	Ti	B	Na	K	W	Sc	Tl	Te	Ga	Cs	Ge	Hf	Nb	Rb
Mo	-0.42	0.84	0.57	-0.41	-0.11	-0.34	-0.45	-0.17	-0.36	-0.58	NA	-0.34	0.02	-0.48
Cu	0.97	-0.48	-0.42	0.99	0.84	0.83	0.91	0.42	0.34	0.81	NA	0.91	0.24	0.95
Pb	-0.33	0.95	0.68	-0.34	-0.22	-0.49	-0.47	-0.19	-0.55	-0.57	NA	-0.36	-0.30	-0.47
Zn	0.87	-0.45	-0.32	0.92	0.84	0.85	0.83	0.38	0.28	0.68	NA	0.92	0.34	0.88
Ag	-0.49	0.22	0.18	-0.44	-0.07	0.01	-0.23	0.24	0.19	-0.35	NA	-0.35	0.60	-0.33
Mg	0.97	-0.57	-0.53	0.98	0.89	0.89	0.95	0.40	0.46	0.86	NA	0.93	0.36	0.98
Cr	0.69	-0.67	-0.66	0.73	0.91	0.99	0.87	0.50	0.74	0.77	NA	0.79	0.80	0.84
Ni	0.95	-0.47	-0.39	0.97	0.84	0.82	0.87	0.31	0.29	0.75	NA	0.93	0.24	0.92
Al	0.53	-0.71	-0.71	0.57	0.83	0.94	0.80	0.57	0.83	0.72	NA	0.70	0.89	0.74
Se	-0.25	-0.16	-0.19	-0.20	0.23	0.35	0.08	0.31	0.52	-0.02	NA	-0.07	0.87	-0.03
Co	0.97	-0.54	-0.52	0.98	0.88	0.85	0.92	0.35	0.40	0.84	NA	0.94	0.28	0.96
Mn	0.98	-0.55	-0.48	0.99	0.85	0.85	0.93	0.39	0.39	0.84	NA	0.92	0.27	0.97
Fe	0.51	-0.65	-0.67	0.53	0.79	0.91	0.77	0.51	0.84	0.68	NA	0.58	0.92	0.70
As	0.71	-0.66	-0.72	0.71	0.92	0.92	0.82	0.19	0.70	0.75	NA	0.76	0.72	0.81
U	0.51	-0.73	-0.78	0.53	0.81	0.92	0.79	0.52	0.90	0.74	NA	0.64	0.92	0.72
S	-0.67	0.55	0.70	-0.59	-0.43	-0.37	-0.59	-0.04	-0.41	-0.76	NA	-0.52	0.10	-0.63
Hg	-0.59	0.83	0.77	-0.54	-0.38	-0.47	-0.58	0.03	-0.50	-0.73	NA	-0.51	-0.08	-0.62
La	0.48	-0.74	-0.92	0.41	0.43	0.48	0.62	0.30	0.78	0.81	NA	0.40	0.29	0.58
Au	0.68	-0.65	-0.72	0.64	0.55	0.58	0.65	-0.06	0.50	0.74	NA	0.65	0.21	0.67
Th	0.89	-0.73	-0.75	0.89	0.94	0.97	0.97	0.42	0.69	0.92	NA	0.91	0.57	0.97
Sr	-0.02	0.51	0.83	0.05	-0.34	-0.35	-0.30	-0.11	-0.85	-0.45	NA	-0.08	-0.64	-0.20
Cd	-0.48	0.96	0.74	-0.48	-0.32	-0.54	-0.58	-0.20	-0.57	-0.68	NA	-0.45	-0.25	-0.59
Sb	0.58	0.22	-0.05	0.57	0.71	0.50	0.52	0.22	0.15	0.35	NA	0.51	0.31	0.51
Bi	0.64	-0.18	-0.48	0.61	0.86	0.74	0.73	0.36	0.61	0.64	NA	0.57	0.64	0.68
V	-0.36	0.70	0.51	-0.34	-0.06	-0.18	-0.30	0.10	-0.19	-0.46	NA	-0.33	0.22	-0.36
Ca	0.13	0.13	0.59	0.21	-0.28	-0.17	-0.11	0.00	-0.66	-0.21	NA	0.08	-0.58	-0.01
P	-0.34	0.19	0.36	-0.24	-0.02	0.11	-0.15	0.38	-0.02	-0.34	NA	-0.11	0.47	-0.21
Ba	0.87	-0.26	-0.32	0.90	0.90	0.81	0.85	0.49	0.33	0.70	NA	0.90	0.35	0.88
Ti	1.00	-0.51	-0.52	0.99	0.82	0.78	0.92	0.33	0.39	0.87	NA	0.88	0.18	0.96
B	-0.51	1.00	0.84	-0.51	-0.49	-0.71	-0.68	-0.31	-0.74	-0.76	NA	-0.54	-0.50	-0.67
Na	-0.52	0.84	1.00	-0.47	-0.64	-0.71	-0.73	-0.30	-0.92	-0.84	NA	-0.53	-0.60	-0.67
K	0.99	-0.51	-0.47	1.00	0.82	0.81	0.92	0.37	0.36	0.84	NA	0.91	0.21	0.96
W	0.82	-0.49	-0.64	0.82	1.00	0.93	0.91	0.42	0.65	0.81	NA	0.87	0.63	0.89
Sc	0.78	-0.71	-0.71	0.81	0.93	1.00	0.94	0.53	0.74	0.85	NA	0.87	0.73	0.91
Tl	0.92	-0.68	-0.73	0.92	0.91	0.94	1.00	0.56	0.69	0.96	NA	0.89	0.51	0.99
Te	0.33	-0.31	-0.30	0.37	0.42	0.53	0.56	1.00	0.47	0.50	NA	0.47	0.40	0.49
Ga	0.39	-0.74	-0.92	0.36	0.65	0.74	0.69	0.47	1.00	0.76	NA	0.43	0.82	0.60
Cs	0.87	-0.76	-0.84	0.84	0.81	0.85	0.96	0.50	0.76	1.00	NA	0.81	0.44	0.95
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA
Hf	0.88	-0.54	-0.53	0.91	0.87	0.87	0.89	0.47	0.43	0.81	NA	1.00	0.35	0.91
Nb	0.18	-0.50	-0.60	0.21	0.63	0.73	0.51	0.40	0.82	0.44	NA	0.35	1.00	0.41
Rb	0.96	-0.67	-0.67	0.96	0.89	0.91	0.99	0.49	0.60	0.95	NA	0.91	0.41	1.00
Sn	-0.44	0.88	0.49	-0.49	-0.27	-0.54	-0.51	-0.20	-0.37	-0.53	NA	-0.46	-0.22	-0.54
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.94	-0.55	-0.54	0.97	0.91	0.89	0.94	0.44	0.46	0.85	NA	0.98	0.35	0.96
Y	0.88	-0.76	-0.82	0.87	0.86	0.90	0.98	0.51	0.76	0.99	NA	0.83	0.51	0.97
Ce	0.50	-0.74	-0.94	0.42	0.48	0.52	0.64	0.29	0.80	0.82	NA	0.43	0.34	0.60
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.90	-0.63	-0.61	0.93	0.94	0.96	0.96	0.53	0.58	0.87	NA	0.95	0.51	0.97
Li	0.84	-0.67	-0.66	0.87	0.95	0.99	0.95	0.52	0.66	0.86	NA	0.90	0.63	0.95
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 2

	Sn	Ta	Zr	Y	Ce	In	Re	Be	Li	Pd	Pt
Mo	0.88	NA	-0.34	-0.53	-0.62	NA	NA	-0.36	-0.34	NA	NA
Cu	-0.47	NA	0.97	0.85	0.35	NA	NA	0.94	0.89	NA	NA
Pb	0.94	NA	-0.35	-0.55	-0.60	NA	NA	-0.42	-0.45	NA	NA
Zn	-0.50	NA	0.94	0.74	0.17	NA	NA	0.93	0.90	NA	NA
Ag	0.28	NA	-0.36	-0.28	-0.38	NA	NA	-0.21	-0.08	NA	NA
Mg	-0.51	NA	0.98	0.90	0.43	NA	NA	0.97	0.94	NA	NA
Cr	-0.51	NA	0.82	0.83	0.42	NA	NA	0.91	0.96	NA	NA
Ni	-0.48	NA	0.97	0.79	0.29	NA	NA	0.93	0.88	NA	NA
Al	-0.50	NA	0.70	0.78	0.47	NA	NA	0.82	0.89	NA	NA
Se	0.00	NA	-0.08	0.06	-0.07	NA	NA	0.10	0.24	NA	NA
Co	-0.48	NA	0.99	0.87	0.44	NA	NA	0.96	0.91	NA	NA
Mn	-0.53	NA	0.97	0.87	0.41	NA	NA	0.95	0.91	NA	NA
Fe	-0.44	NA	0.62	0.75	0.43	NA	NA	0.75	0.85	NA	NA
As	-0.46	NA	0.80	0.81	0.50	NA	NA	0.86	0.91	NA	NA
U	-0.47	NA	0.65	0.79	0.56	NA	NA	0.78	0.86	NA	NA
S	0.34	NA	-0.55	-0.69	-0.84	NA	NA	-0.47	-0.41	NA	NA
Hg	0.72	NA	-0.52	-0.68	-0.80	NA	NA	-0.50	-0.48	NA	NA
La	-0.41	NA	0.43	0.75	1.00	NA	NA	0.45	0.45	NA	NA
Au	-0.47	NA	0.64	0.70	0.70	NA	NA	0.57	0.56	NA	NA
Th	-0.57	NA	0.94	0.95	0.60	NA	NA	0.97	0.98	NA	NA
Sr	0.06	NA	-0.08	-0.42	-0.77	NA	NA	-0.17	-0.25	NA	NA
Cd	0.93	NA	-0.46	-0.66	-0.69	NA	NA	-0.52	-0.53	NA	NA
Sb	0.35	NA	0.59	0.42	-0.04	NA	NA	0.55	0.54	NA	NA
Bi	0.11	NA	0.66	0.69	0.37	NA	NA	0.69	0.73	NA	NA
V	0.73	NA	-0.30	-0.40	-0.60	NA	NA	-0.26	-0.21	NA	NA
Ca	-0.33	NA	0.07	-0.20	-0.54	NA	NA	0.00	-0.09	NA	NA
P	0.08	NA	-0.15	-0.26	-0.57	NA	NA	-0.03	0.05	NA	NA
Ba	-0.19	NA	0.93	0.73	0.22	NA	NA	0.91	0.87	NA	NA
Ti	-0.44	NA	0.94	0.88	0.50	NA	NA	0.90	0.84	NA	NA
B	0.88	NA	-0.55	-0.76	-0.74	NA	NA	-0.63	-0.67	NA	NA
Na	0.49	NA	-0.54	-0.82	-0.94	NA	NA	-0.61	-0.66	NA	NA
K	-0.49	NA	0.97	0.87	0.42	NA	NA	0.93	0.87	NA	NA
W	-0.27	NA	0.91	0.86	0.48	NA	NA	0.94	0.95	NA	NA
Sc	-0.54	NA	0.89	0.90	0.52	NA	NA	0.96	0.99	NA	NA
Tl	-0.51	NA	0.94	0.98	0.64	NA	NA	0.96	0.95	NA	NA
Te	-0.20	NA	0.44	0.51	0.29	NA	NA	0.53	0.52	NA	NA
Ga	-0.37	NA	0.46	0.76	0.80	NA	NA	0.58	0.66	NA	NA
Cs	-0.53	NA	0.85	0.99	0.82	NA	NA	0.87	0.86	NA	NA
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.46	NA	0.98	0.83	0.43	NA	NA	0.95	0.90	NA	NA
Nb	-0.22	NA	0.35	0.51	0.34	NA	NA	0.51	0.63	NA	NA
Rb	-0.54	NA	0.96	0.97	0.60	NA	NA	0.97	0.95	NA	NA
Sn	1.00	NA	-0.46	-0.54	-0.39	NA	NA	-0.52	-0.54	NA	NA
Ta	NA	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.46	NA	1.00	0.88	0.45	NA	NA	0.98	0.94	NA	NA
Y	-0.54	NA	0.88	1.00	0.76	NA	NA	0.91	0.91	NA	NA
Ce	-0.39	NA	0.45	0.76	1.00	NA	NA	0.48	0.48	NA	NA
In	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA
Be	-0.52	NA	0.98	0.91	0.48	NA	NA	1.00	0.99	NA	NA
Li	-0.54	NA	0.94	0.91	0.48	NA	NA	0.99	1.00	NA	NA
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00

Statistical correlations of all 53 elements analyzed- 63 micron size

Site 3

	Mo	Cu	Pb	Zn	Ag	Mg	Cr	Ni	Al	Se	Co	Mn	Fe
Mo	1.00	0.98	0.98	0.88	0.99	0.91	0.81	0.97	0.30	0.98	0.94	0.98	0.93
Cu	0.98	1.00	0.99	0.92	1.00	0.93	0.76	0.98	0.20	0.98	0.96	1.00	0.87
Pb	0.98	0.99	1.00	0.87	0.98	0.89	0.72	0.96	0.16	0.99	0.94	1.00	0.86
Zn	0.88	0.92	0.87	1.00	0.93	0.98	0.75	0.96	0.20	0.84	0.94	0.91	0.75
Ag	0.99	1.00	0.98	0.93	1.00	0.95	0.79	0.99	0.24	0.98	0.97	0.99	0.89
Mg	0.91	0.93	0.89	0.98	0.95	1.00	0.86	0.98	0.38	0.88	0.98	0.92	0.86
Cr	0.81	0.76	0.72	0.75	0.79	0.86	1.00	0.84	0.79	0.78	0.87	0.74	0.94
Ni	0.97	0.98	0.96	0.96	0.99	0.98	0.84	1.00	0.32	0.95	0.99	0.98	0.90
Al	0.30	0.20	0.16	0.20	0.24	0.38	0.79	0.32	1.00	0.28	0.39	0.18	0.63
Se	0.98	0.98	0.99	0.84	0.98	0.88	0.78	0.95	0.28	1.00	0.94	0.98	0.91
Co	0.94	0.96	0.94	0.94	0.97	0.98	0.87	0.99	0.39	0.94	1.00	0.96	0.90
Mn	0.98	1.00	1.00	0.91	0.99	0.92	0.74	0.98	0.18	0.98	0.96	1.00	0.86
Fe	0.93	0.87	0.86	0.75	0.89	0.86	0.94	0.90	0.63	0.91	0.90	0.86	1.00
As	0.97	0.98	0.96	0.95	0.99	0.97	0.81	0.99	0.28	0.95	0.98	0.98	0.89
U	0.93	0.94	0.90	0.98	0.96	1.00	0.86	0.98	0.38	0.89	0.98	0.93	0.87
S	0.96	0.99	0.97	0.94	0.99	0.92	0.69	0.97	0.10	0.94	0.93	0.98	0.81
Hg	0.99	0.96	0.97	0.83	0.97	0.87	0.78	0.94	0.29	0.97	0.90	0.96	0.92
La	0.35	0.26	0.21	0.29	0.30	0.46	0.83	0.39	0.99	0.32	0.45	0.24	0.65
Au	0.95	0.94	0.91	0.97	0.97	0.99	0.86	0.98	0.37	0.90	0.97	0.93	0.88
Th	0.04	-0.08	-0.11	-0.10	-0.04	0.09	0.57	0.03	0.95	0.02	0.10	-0.10	0.40
Sr	0.89	0.95	0.95	0.90	0.94	0.85	0.53	0.91	-0.10	0.89	0.87	0.95	0.67
Cd	0.98	1.00	0.99	0.93	1.00	0.94	0.75	0.98	0.18	0.97	0.96	1.00	0.85
Sb	0.97	0.99	0.97	0.96	1.00	0.96	0.76	0.99	0.20	0.95	0.97	0.99	0.85
Bi	0.99	0.99	0.98	0.92	1.00	0.95	0.83	0.99	0.32	0.98	0.98	0.99	0.92
V	0.19	0.28	0.34	0.13	0.23	0.00	-0.41	0.13	-0.83	0.24	0.05	0.30	-0.14
Ca	0.61	0.72	0.70	0.79	0.70	0.66	0.20	0.68	-0.43	0.60	0.63	0.72	0.29
P	0.98	1.00	1.00	0.91	0.99	0.91	0.72	0.97	0.14	0.98	0.95	1.00	0.84
Ba	0.66	0.71	0.63	0.93	0.74	0.89	0.65	0.80	0.20	0.58	0.79	0.70	0.55
Ti	0.98	0.99	0.98	0.94	1.00	0.96	0.82	1.00	0.29	0.97	0.99	0.99	0.90
B	0.97	1.00	0.98	0.95	1.00	0.95	0.76	0.99	0.20	0.96	0.97	0.99	0.85
Na	0.91	0.93	0.89	0.99	0.95	0.98	0.76	0.96	0.21	0.85	0.94	0.92	0.78
K	0.80	0.81	0.74	0.95	0.85	0.97	0.86	0.90	0.46	0.74	0.91	0.80	0.78
W	-0.04	-0.01	-0.01	-0.02	-0.01	0.08	0.12	0.05	0.23	-0.02	0.09	-0.02	0.09
Sc	0.85	0.80	0.77	0.77	0.83	0.88	1.00	0.87	0.74	0.83	0.90	0.79	0.96
Tl	0.99	0.99	0.99	0.87	0.99	0.90	0.79	0.97	0.28	1.00	0.95	0.99	0.92
Te	0.89	0.92	0.87	0.97	0.93	1.00	0.87	0.97	0.41	0.87	0.98	0.91	0.85
Ga	0.43	0.34	0.30	0.34	0.38	0.51	0.87	0.45	0.99	0.41	0.52	0.32	0.73
Cs	0.67	0.60	0.55	0.61	0.64	0.75	0.98	0.70	0.90	0.63	0.75	0.58	0.87
Ge	0.95	0.96	0.98	0.76	0.94	0.79	0.65	0.89	0.14	0.98	0.87	0.96	0.84
Hf	-0.39	-0.35	-0.34	-0.43	-0.38	-0.31	-0.01	-0.33	0.39	-0.26	-0.20	-0.34	-0.14
Nb	-0.38	-0.50	-0.47	-0.62	-0.48	-0.46	0.00	-0.46	0.55	-0.37	-0.42	-0.51	-0.05
Rb	0.44	0.39	0.31	0.51	0.43	0.64	0.87	0.53	0.90	0.38	0.59	0.36	0.67
Sn	0.98	1.00	1.00	0.91	0.99	0.92	0.73	0.97	0.16	0.98	0.95	1.00	0.85
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.60	-0.67	-0.61	-0.85	-0.68	-0.73	-0.38	-0.69	0.15	-0.54	-0.65	-0.66	-0.36
Y	0.94	0.90	0.89	0.81	0.92	0.90	0.95	0.93	0.60	0.93	0.94	0.89	0.99
Ce	0.42	0.33	0.28	0.37	0.38	0.53	0.87	0.46	0.98	0.38	0.52	0.31	0.70
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	0.79	0.83	0.77	0.98	0.86	0.95	0.73	0.90	0.23	0.73	0.89	0.82	0.68
Be	0.96	0.98	0.97	0.89	0.98	0.94	0.84	0.98	0.36	0.98	0.99	0.98	0.92
Li	0.06	-0.04	-0.06	-0.10	-0.01	0.10	0.58	0.06	0.95	0.07	0.13	-0.06	0.43
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 3

	As	U	S	Hg	La	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	Ba
Mo	0.97	0.93	0.96	0.99	0.35	0.95	0.04	0.89	0.98	0.97	0.99	0.19	0.61	0.98	0.66
Cu	0.98	0.94	0.99	0.96	0.26	0.94	-0.08	0.95	1.00	0.99	0.99	0.28	0.72	1.00	0.71
Pb	0.96	0.90	0.97	0.97	0.21	0.91	-0.11	0.95	0.99	0.97	0.98	0.34	0.70	1.00	0.63
Zn	0.95	0.98	0.94	0.83	0.29	0.97	-0.10	0.90	0.93	0.96	0.92	0.13	0.79	0.91	0.93
Ag	0.99	0.96	0.99	0.97	0.30	0.97	-0.04	0.94	1.00	1.00	1.00	0.23	0.70	0.99	0.74
Mg	0.97	1.00	0.92	0.87	0.46	0.99	0.09	0.85	0.94	0.96	0.95	0.00	0.66	0.91	0.89
Cr	0.81	0.86	0.69	0.78	0.83	0.86	0.57	0.53	0.75	0.76	0.83	-0.41	0.20	0.72	0.65
Ni	0.99	0.98	0.97	0.94	0.39	0.98	0.03	0.91	0.98	0.99	0.99	0.13	0.68	0.97	0.80
Al	0.28	0.38	0.10	0.29	0.99	0.37	0.95	-0.10	0.18	0.20	0.32	-0.83	-0.43	0.14	0.20
Se	0.95	0.89	0.94	0.97	0.32	0.90	0.02	0.89	0.97	0.95	0.98	0.24	0.60	0.98	0.58
Co	0.98	0.98	0.93	0.90	0.45	0.97	0.10	0.87	0.96	0.97	0.98	0.05	0.63	0.95	0.79
Mn	0.98	0.93	0.98	0.96	0.24	0.93	-0.10	0.95	1.00	0.99	0.99	0.30	0.72	1.00	0.70
Fe	0.89	0.87	0.81	0.92	0.65	0.88	0.40	0.67	0.85	0.85	0.92	-0.14	0.29	0.84	0.55
As	1.00	0.97	0.97	0.95	0.34	0.98	-0.01	0.92	0.99	0.99	0.99	0.18	0.68	0.97	0.78
U	0.97	1.00	0.94	0.89	0.45	0.99	0.08	0.86	0.95	0.97	0.96	0.01	0.66	0.92	0.88
S	0.97	0.94	1.00	0.94	0.17	0.95	-0.19	0.97	0.99	0.99	0.97	0.33	0.80	0.99	0.76
Hg	0.95	0.89	0.94	1.00	0.32	0.92	0.03	0.87	0.95	0.95	0.97	0.22	0.57	0.96	0.60
La	0.34	0.45	0.17	0.32	1.00	0.44	0.92	-0.03	0.24	0.27	0.38	-0.83	-0.34	0.20	0.31
Au	0.98	0.99	0.95	0.92	0.44	1.00	0.08	0.86	0.95	0.97	0.97	0.03	0.65	0.93	0.86
Th	-0.01	0.08	-0.19	0.03	0.92	0.08	1.00	-0.38	-0.11	-0.09	0.04	-0.90	-0.68	-0.14	-0.07
Sr	0.92	0.86	0.97	0.87	-0.03	0.86	-0.38	1.00	0.96	0.95	0.91	0.51	0.89	0.96	0.72
Cd	0.99	0.95	0.99	0.95	0.24	0.95	-0.11	0.96	1.00	0.99	0.99	0.28	0.74	1.00	0.74
Sb	0.99	0.97	0.99	0.95	0.27	0.97	-0.09	0.95	0.99	1.00	0.98	0.24	0.75	0.99	0.79
Bi	0.99	0.96	0.97	0.97	0.38	0.97	0.04	0.91	0.99	0.98	1.00	0.16	0.64	0.98	0.72
V	0.18	0.01	0.33	0.22	-0.83	0.03	-0.90	0.51	0.28	0.24	0.16	1.00	0.62	0.33	-0.05
Ca	0.68	0.66	0.80	0.57	-0.34	0.65	-0.68	0.89	0.74	0.75	0.64	0.62	1.00	0.75	0.73
P	0.97	0.92	0.99	0.96	0.20	0.93	-0.14	0.96	1.00	0.99	0.98	0.33	0.75	1.00	0.70
Ba	0.78	0.88	0.76	0.60	0.31	0.86	-0.07	0.72	0.74	0.79	0.72	-0.05	0.73	0.70	1.00
Ti	0.99	0.97	0.98	0.95	0.35	0.97	0.01	0.92	0.99	0.99	1.00	0.17	0.68	0.98	0.76
B	0.99	0.96	0.99	0.94	0.26	0.96	-0.09	0.96	1.00	1.00	0.99	0.25	0.75	0.99	0.77
Na	0.96	0.98	0.96	0.87	0.30	0.98	-0.09	0.91	0.94	0.97	0.93	0.14	0.77	0.92	0.91
K	0.88	0.96	0.82	0.75	0.54	0.95	0.18	0.73	0.83	0.87	0.85	-0.18	0.58	0.79	0.94
W	0.10	0.01	-0.09	-0.01	0.18	0.01	0.21	-0.05	-0.02	-0.03	0.04	-0.07	-0.20	-0.05	-0.03
Sc	0.84	0.89	0.74	0.82	0.78	0.88	0.52	0.59	0.79	0.80	0.87	-0.34	0.25	0.77	0.65
Tl	0.97	0.92	0.96	0.98	0.33	0.93	0.02	0.90	0.98	0.97	0.99	0.22	0.62	0.98	0.64
Te	0.95	0.99	0.90	0.84	0.49	0.97	0.12	0.83	0.92	0.94	0.94	-0.03	0.64	0.90	0.88
Ga	0.42	0.50	0.24	0.41	0.99	0.49	0.90	0.04	0.32	0.34	0.46	-0.76	-0.31	0.29	0.31
Cs	0.67	0.75	0.53	0.64	0.93	0.74	0.72	0.34	0.59	0.61	0.70	-0.59	0.01	0.55	0.56
Ge	0.90	0.80	0.92	0.95	0.16	0.82	-0.10	0.90	0.94	0.91	0.93	0.40	0.62	0.96	0.47
Hf	-0.37	-0.34	-0.49	-0.43	0.34	-0.41	0.51	-0.48	-0.38	-0.43	-0.31	-0.44	-0.59	-0.38	-0.43
Nb	-0.44	-0.47	-0.60	-0.32	0.45	-0.44	0.74	-0.71	-0.53	-0.55	-0.41	-0.57	-0.94	-0.54	-0.63
Rb	0.50	0.62	0.32	0.40	0.94	0.60	0.76	0.15	0.38	0.42	0.50	-0.74	-0.10	0.33	0.57
Sn	0.98	0.93	0.99	0.96	0.22	0.93	-0.12	0.96	1.00	0.99	0.99	0.32	0.73	1.00	0.69
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.66	-0.75	-0.76	-0.53	0.04	-0.73	0.40	-0.77	-0.70	-0.74	-0.63	-0.23	-0.89	-0.68	-0.89
Y	0.92	0.91	0.85	0.93	0.63	0.92	0.35	0.72	0.89	0.89	0.95	-0.12	0.37	0.88	0.62
Ce	0.41	0.52	0.25	0.38	1.00	0.51	0.89	0.05	0.32	0.34	0.45	-0.79	-0.27	0.28	0.37
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	0.88	0.95	0.87	0.74	0.33	0.94	-0.06	0.82	0.85	0.90	0.84	0.02	0.76	0.82	0.98
Be	0.97	0.94	0.93	0.94	0.41	0.93	0.09	0.88	0.97	0.96	0.99	0.13	0.59	0.97	0.68
Li	0.02	0.09	-0.17	0.06	0.91	0.08	0.99	-0.35	-0.07	-0.07	0.08	-0.84	-0.67	-0.10	-0.10
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 3

	Ti	B	Na	K	W	Sc	Tl	Te	Ga	Cs	Ge	Hf	Nb	Rb	Sn
Mo	0.98	0.97	0.91	0.80	-0.04	0.85	0.99	0.89	0.43	0.67	0.95	-0.39	-0.38	0.44	0.98
Cu	0.99	1.00	0.93	0.81	-0.01	0.80	0.99	0.92	0.34	0.60	0.96	-0.35	-0.50	0.39	1.00
Pb	0.98	0.98	0.89	0.74	-0.01	0.77	0.99	0.87	0.30	0.55	0.98	-0.34	-0.47	0.31	1.00
Zn	0.94	0.95	0.99	0.95	-0.02	0.77	0.87	0.97	0.34	0.61	0.76	-0.43	-0.62	0.51	0.91
Ag	1.00	1.00	0.95	0.85	-0.01	0.83	0.99	0.93	0.38	0.64	0.94	-0.38	-0.48	0.43	0.99
Mg	0.96	0.95	0.98	0.97	0.08	0.88	0.90	1.00	0.51	0.75	0.79	-0.31	-0.46	0.64	0.92
Cr	0.82	0.76	0.76	0.86	0.12	1.00	0.79	0.87	0.87	0.98	0.65	-0.01	0.00	0.87	0.73
Ni	1.00	0.99	0.96	0.90	0.05	0.87	0.97	0.97	0.45	0.70	0.89	-0.33	-0.46	0.53	0.97
Al	0.29	0.20	0.21	0.46	0.23	0.74	0.28	0.41	0.99	0.90	0.14	0.39	0.55	0.90	0.16
Se	0.97	0.96	0.85	0.74	-0.02	0.83	1.00	0.87	0.41	0.63	0.98	-0.26	-0.37	0.38	0.98
Co	0.99	0.97	0.94	0.91	0.09	0.90	0.95	0.98	0.52	0.75	0.87	-0.20	-0.42	0.59	0.95
Mn	0.99	0.99	0.92	0.80	-0.02	0.79	0.99	0.91	0.32	0.58	0.96	-0.34	-0.51	0.36	1.00
Fe	0.90	0.85	0.78	0.78	0.09	0.96	0.92	0.85	0.73	0.87	0.84	-0.14	-0.05	0.67	0.85
As	0.99	0.99	0.96	0.88	0.10	0.84	0.97	0.95	0.42	0.67	0.90	-0.37	-0.44	0.50	0.98
U	0.97	0.96	0.98	0.96	0.01	0.89	0.92	0.99	0.50	0.75	0.80	-0.34	-0.47	0.62	0.93
S	0.98	0.99	0.96	0.82	-0.09	0.74	0.96	0.90	0.24	0.53	0.92	-0.49	-0.60	0.32	0.99
Hg	0.95	0.94	0.87	0.75	-0.01	0.82	0.98	0.84	0.41	0.64	0.95	-0.43	-0.32	0.40	0.96
La	0.35	0.26	0.30	0.54	0.18	0.78	0.33	0.49	0.99	0.93	0.16	0.34	0.45	0.94	0.22
Au	0.97	0.96	0.98	0.95	0.01	0.88	0.93	0.97	0.49	0.74	0.82	-0.41	-0.44	0.60	0.93
Th	0.01	-0.09	-0.09	0.18	0.21	0.52	0.02	0.12	0.90	0.72	-0.10	0.51	0.74	0.76	-0.12
Sr	0.92	0.96	0.91	0.73	-0.05	0.59	0.90	0.83	0.04	0.34	0.90	-0.48	-0.71	0.15	0.96
Cd	0.99	1.00	0.94	0.83	-0.02	0.79	0.98	0.92	0.32	0.59	0.94	-0.38	-0.53	0.38	1.00
Sb	0.99	1.00	0.97	0.87	-0.03	0.80	0.97	0.94	0.34	0.61	0.91	-0.43	-0.55	0.42	0.99
Bi	1.00	0.99	0.93	0.85	0.04	0.87	0.99	0.94	0.46	0.70	0.93	-0.31	-0.41	0.50	0.99
V	0.17	0.25	0.14	-0.18	-0.07	-0.34	0.22	-0.03	-0.76	-0.59	0.40	-0.44	-0.57	-0.74	0.32
Ca	0.68	0.75	0.77	0.58	-0.20	0.25	0.62	0.64	-0.31	0.01	0.62	-0.59	-0.94	-0.10	0.73
P	0.98	0.99	0.92	0.79	-0.05	0.77	0.98	0.90	0.29	0.55	0.96	-0.38	-0.54	0.33	1.00
Ba	0.76	0.77	0.91	0.94	-0.03	0.65	0.64	0.88	0.31	0.56	0.47	-0.43	-0.63	0.57	0.69
Ti	1.00	0.99	0.95	0.87	0.02	0.86	0.98	0.95	0.43	0.68	0.92	-0.33	-0.46	0.49	0.99
B	0.99	1.00	0.96	0.85	-0.02	0.80	0.98	0.94	0.34	0.60	0.93	-0.37	-0.54	0.41	0.99
Na	0.95	0.96	1.00	0.94	-0.03	0.78	0.89	0.95	0.34	0.62	0.78	-0.50	-0.58	0.50	0.92
K	0.87	0.85	0.94	1.00	0.08	0.86	0.78	0.96	0.56	0.78	0.61	-0.31	-0.41	0.75	0.79
W	0.02	-0.02	-0.03	0.08	1.00	0.10	-0.01	0.10	0.23	0.15	-0.01	0.33	0.42	0.29	-0.01
Sc	0.86	0.80	0.78	0.86	0.10	1.00	0.84	0.89	0.83	0.96	0.71	-0.02	-0.05	0.83	0.77
Tl	0.98	0.98	0.89	0.78	-0.01	0.84	1.00	0.89	0.42	0.65	0.97	-0.32	-0.39	0.41	0.99
Te	0.95	0.94	0.95	0.96	0.10	0.89	0.89	1.00	0.53	0.77	0.78	-0.22	-0.44	0.66	0.90
Ga	0.43	0.34	0.34	0.56	0.23	0.83	0.42	0.53	1.00	0.95	0.27	0.32	0.45	0.93	0.30
Cs	0.68	0.60	0.62	0.78	0.15	0.96	0.65	0.77	0.95	1.00	0.49	0.11	0.17	0.94	0.56
Ge	0.92	0.93	0.78	0.61	-0.01	0.71	0.97	0.78	0.27	0.49	1.00	-0.27	-0.39	0.22	0.96
Hf	-0.33	-0.37	-0.50	-0.31	0.33	-0.02	-0.32	-0.22	0.32	0.11	-0.27	1.00	0.51	0.19	-0.38
Nb	-0.46	-0.54	-0.58	-0.41	0.42	-0.05	-0.39	-0.44	0.45	0.17	-0.39	0.51	1.00	0.23	-0.51
Rb	0.49	0.41	0.50	0.75	0.29	0.83	0.41	0.66	0.93	0.94	0.22	0.19	0.23	1.00	0.35
Sn	0.99	0.99	0.92	0.79	-0.01	0.77	0.99	0.90	0.30	0.56	0.96	-0.38	-0.51	0.35	1.00
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.67	-0.72	-0.83	-0.75	0.39	-0.41	-0.58	-0.71	0.04	-0.25	-0.48	0.58	0.89	-0.19	-0.66
Y	0.93	0.89	0.83	0.83	0.08	0.97	0.94	0.90	0.70	0.87	0.85	-0.14	-0.14	0.68	0.89
Ce	0.43	0.34	0.37	0.61	0.18	0.83	0.40	0.56	0.99	0.95	0.23	0.30	0.39	0.96	0.29
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	0.87	0.88	0.97	0.97	-0.02	0.74	0.77	0.94	0.35	0.62	0.63	-0.43	-0.62	0.57	0.82
Be	0.99	0.97	0.89	0.83	0.10	0.88	0.98	0.94	0.49	0.71	0.94	-0.17	-0.37	0.52	0.97
Li	0.04	-0.06	-0.09	0.16	0.29	0.53	0.06	0.14	0.90	0.72	-0.04	0.58	0.76	0.75	-0.08
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 3

	Ta	Zr	Y	Ce	In	Re	Be	Li	Pd	Pt
Mo	NA	-0.60	0.94	0.42	NA	0.79	0.96	0.06	NA	NA
Cu	NA	-0.67	0.90	0.33	NA	0.83	0.98	-0.04	NA	NA
Pb	NA	-0.61	0.89	0.28	NA	0.77	0.97	-0.06	NA	NA
Zn	NA	-0.85	0.81	0.37	NA	0.98	0.89	-0.10	NA	NA
Ag	NA	-0.68	0.92	0.38	NA	0.86	0.98	-0.01	NA	NA
Mg	NA	-0.73	0.90	0.53	NA	0.95	0.94	0.10	NA	NA
Cr	NA	-0.38	0.95	0.87	NA	0.73	0.84	0.58	NA	NA
Ni	NA	-0.69	0.93	0.46	NA	0.90	0.98	0.06	NA	NA
Al	NA	0.15	0.60	0.98	NA	0.23	0.36	0.95	NA	NA
Se	NA	-0.54	0.93	0.38	NA	0.73	0.98	0.07	NA	NA
Co	NA	-0.65	0.94	0.52	NA	0.89	0.99	0.13	NA	NA
Mn	NA	-0.66	0.89	0.31	NA	0.82	0.98	-0.06	NA	NA
Fe	NA	-0.36	0.99	0.70	NA	0.68	0.92	0.43	NA	NA
As	NA	-0.66	0.92	0.41	NA	0.88	0.97	0.02	NA	NA
U	NA	-0.75	0.91	0.52	NA	0.95	0.94	0.09	NA	NA
S	NA	-0.76	0.85	0.25	NA	0.87	0.93	-0.17	NA	NA
Hg	NA	-0.53	0.93	0.38	NA	0.74	0.94	0.06	NA	NA
La	NA	0.04	0.63	1.00	NA	0.33	0.41	0.91	NA	NA
Au	NA	-0.73	0.92	0.51	NA	0.94	0.93	0.08	NA	NA
Th	NA	0.40	0.35	0.89	NA	-0.06	0.09	0.99	NA	NA
Sr	NA	-0.77	0.72	0.05	NA	0.82	0.88	-0.35	NA	NA
Cd	NA	-0.70	0.89	0.32	NA	0.85	0.97	-0.07	NA	NA
Sb	NA	-0.74	0.89	0.34	NA	0.90	0.96	-0.07	NA	NA
Bi	NA	-0.63	0.95	0.45	NA	0.84	0.99	0.08	NA	NA
V	NA	-0.23	-0.12	-0.79	NA	0.02	0.13	-0.84	NA	NA
Ca	NA	-0.89	0.37	-0.27	NA	0.76	0.59	-0.67	NA	NA
P	NA	-0.68	0.88	0.28	NA	0.82	0.97	-0.10	NA	NA
Ba	NA	-0.89	0.62	0.37	NA	0.98	0.68	-0.10	NA	NA
Ti	NA	-0.67	0.93	0.43	NA	0.87	0.99	0.04	NA	NA
B	NA	-0.72	0.89	0.34	NA	0.88	0.97	-0.06	NA	NA
Na	NA	-0.83	0.83	0.37	NA	0.97	0.89	-0.09	NA	NA
K	NA	-0.75	0.83	0.61	NA	0.97	0.83	0.16	NA	NA
W	NA	0.39	0.08	0.18	NA	-0.02	0.10	0.29	NA	NA
Sc	NA	-0.41	0.97	0.83	NA	0.74	0.88	0.53	NA	NA
Tl	NA	-0.58	0.94	0.40	NA	0.77	0.98	0.06	NA	NA
Te	NA	-0.71	0.90	0.56	NA	0.94	0.94	0.14	NA	NA
Ga	NA	0.04	0.70	0.99	NA	0.35	0.49	0.90	NA	NA
Cs	NA	-0.25	0.87	0.95	NA	0.62	0.71	0.72	NA	NA
Ge	NA	-0.48	0.85	0.23	NA	0.63	0.94	-0.04	NA	NA
Hf	NA	0.58	-0.14	0.30	NA	-0.43	-0.17	0.58	NA	NA
Nb	NA	0.89	-0.14	0.39	NA	-0.62	-0.37	0.76	NA	NA
Rb	NA	-0.19	0.68	0.96	NA	0.57	0.52	0.75	NA	NA
Sn	NA	-0.66	0.89	0.29	NA	0.82	0.97	-0.08	NA	NA
Ta	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	NA	1.00	-0.44	-0.03	NA	-0.87	-0.57	0.45	NA	NA
Y	NA	-0.44	1.00	0.69	NA	0.75	0.95	0.38	NA	NA
Ce	NA	-0.03	0.69	1.00	NA	0.40	0.48	0.88	NA	NA
In	NA	NA	NA	NA	1.00	NA	NA	NA	NA	NA
Re	NA	-0.87	0.75	0.40	NA	1.00	0.81	-0.08	NA	NA
Be	NA	-0.57	0.95	0.48	NA	0.81	1.00	0.14	NA	NA
Li	NA	0.45	0.38	0.88	NA	-0.08	0.14	1.00	NA	NA
Pd	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00

Statistical correlations of all 53 elements analyzed- 63 micron size

Site 4

	Mo	Cu	Pb	Zn	Ag	Mg	Cr	Ni	Al	Se	Co	Mn	Fe	As
Mo	1.00	-0.56	0.32	-0.32	0.61	-0.58	0.01	-0.34	0.21	0.54	-0.54	-0.53	0.01	-0.67
Cu	-0.56	1.00	0.03	0.82	-0.90	0.96	0.33	0.89	0.03	-0.52	0.95	0.93	0.09	0.85
Pb	0.32	0.03	1.00	-0.13	0.34	-0.22	-0.61	-0.03	-0.52	-0.37	-0.19	-0.09	-0.79	-0.37
Zn	-0.32	0.82	-0.13	1.00	-0.81	0.88	0.67	0.98	0.48	-0.03	0.87	0.71	0.34	0.62
Ag	0.61	-0.90	0.34	-0.81	1.00	-0.95	-0.53	-0.82	-0.26	0.31	-0.96	-0.92	-0.35	-0.91
Mg	-0.58	0.96	-0.22	0.88	-0.95	1.00	0.54	0.92	0.21	-0.36	0.97	0.90	0.31	0.87
Cr	0.01	0.33	-0.61	0.67	-0.53	0.54	1.00	0.56	0.88	0.57	0.50	0.36	0.89	0.41
Ni	-0.34	0.89	-0.03	0.98	-0.82	0.92	0.56	1.00	0.32	-0.20	0.90	0.76	0.23	0.66
Al	0.21	0.03	-0.52	0.48	-0.26	0.21	0.88	0.32	1.00	0.82	0.20	0.05	0.74	0.10
Se	0.54	-0.52	-0.37	-0.03	0.31	-0.36	0.57	-0.20	0.82	1.00	-0.38	-0.48	0.57	-0.43
Co	-0.54	0.95	-0.19	0.87	-0.96	0.97	0.50	0.90	0.20	-0.38	1.00	0.95	0.29	0.91
Mn	-0.53	0.93	-0.09	0.71	-0.92	0.90	0.36	0.76	0.05	-0.48	0.95	1.00	0.21	0.92
Fe	0.01	0.09	-0.79	0.34	-0.35	0.31	0.89	0.23	0.74	0.57	0.29	0.21	1.00	0.35
As	-0.67	0.85	-0.37	0.62	-0.91	0.87	0.41	0.66	0.10	-0.43	0.91	0.92	0.35	1.00
U	-0.30	0.56	-0.64	0.72	-0.76	0.72	0.91	0.63	0.73	0.29	0.71	0.63	0.83	0.72
S	0.88	-0.59	0.39	-0.35	0.72	-0.62	0.00	-0.39	0.19	0.59	-0.64	-0.61	0.03	-0.74
Hg	0.75	-0.38	0.65	-0.19	0.60	-0.48	-0.12	-0.21	0.09	0.41	-0.51	-0.48	-0.22	-0.68
La	-0.66	0.85	-0.17	0.74	-0.85	0.87	0.46	0.73	0.23	-0.28	0.85	0.87	0.28	0.86
Au	0.22	0.12	0.92	-0.13	0.19	-0.15	-0.57	-0.04	-0.47	-0.37	-0.12	0.05	-0.71	-0.22
Th	-0.42	0.72	-0.58	0.82	-0.87	0.85	0.82	0.77	0.60	0.08	0.86	0.75	0.69	0.83
Sr	0.11	0.46	0.86	0.27	-0.05	0.23	-0.30	0.39	-0.40	-0.48	0.23	0.28	-0.54	0.04
Cd	-0.29	0.81	0.16	0.72	-0.71	0.76	0.44	0.73	0.20	-0.21	0.73	0.79	0.22	0.60
Sb	0.27	0.03	0.96	-0.24	0.33	-0.23	-0.71	-0.11	-0.67	-0.50	-0.21	-0.07	-0.82	-0.32
Bi	-0.27	0.35	-0.63	0.23	-0.47	0.47	0.48	0.25	0.10	-0.11	0.48	0.49	0.71	0.64
V	0.60	-0.71	0.56	-0.79	0.86	-0.85	-0.75	-0.73	-0.54	-0.02	-0.82	-0.73	-0.60	-0.83
Ca	0.31	0.27	0.88	0.09	0.09	0.03	-0.31	0.18	-0.34	-0.33	0.09	0.22	-0.48	-0.05
P	0.47	0.24	0.16	0.48	-0.18	0.21	0.57	0.41	0.66	0.50	0.26	0.24	0.35	0.11
Ba	-0.36	0.89	0.10	0.89	-0.79	0.90	0.48	0.92	0.19	-0.30	0.86	0.81	0.18	0.64
Ti	-0.15	0.13	-0.67	0.08	-0.26	0.28	0.45	0.10	0.10	0.01	0.25	0.22	0.72	0.41
B	0.04	0.43	0.83	0.19	-0.10	0.20	-0.45	0.33	-0.53	-0.61	0.20	0.26	-0.68	-0.01
Na	0.65	-0.40	0.83	-0.28	0.67	-0.57	-0.46	-0.26	-0.19	0.15	-0.55	-0.53	-0.61	-0.76
K	-0.54	0.96	0.14	0.78	-0.83	0.91	0.21	0.86	-0.12	-0.62	0.91	0.89	-0.02	0.76
W	0.50	-0.08	0.95	-0.13	0.46	-0.28	-0.46	-0.04	-0.37	-0.16	-0.29	-0.24	-0.64	-0.49
Sc	-0.37	0.66	-0.58	0.82	-0.84	0.82	0.89	0.75	0.68	0.19	0.81	0.71	0.74	0.75
Tl	-0.45	0.23	-0.78	0.23	-0.42	0.43	0.59	0.20	0.27	0.07	0.37	0.34	0.79	0.55
Te	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ga	0.07	-0.43	-0.69	-0.36	0.22	-0.24	0.27	-0.40	0.13	0.33	-0.27	-0.27	0.65	-0.05
Cs	-0.51	0.23	-0.72	0.25	-0.39	0.43	0.53	0.21	0.26	0.04	0.36	0.30	0.66	0.52
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.33	-0.02	-0.34	0.44	-0.18	0.11	0.77	0.27	0.95	0.82	0.15	0.04	0.62	0.03
Nb	0.35	-0.52	-0.66	-0.26	0.29	-0.31	0.47	-0.34	0.43	0.65	-0.34	-0.41	0.75	-0.22
Rb	-0.49	0.78	-0.45	0.88	-0.86	0.92	0.74	0.87	0.44	-0.08	0.85	0.70	0.53	0.73
Sn	0.59	-0.73	0.55	-0.80	0.92	-0.85	-0.71	-0.74	-0.55	-0.01	-0.84	-0.75	-0.53	-0.82
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.10	0.28	-0.49	0.62	-0.49	0.42	0.90	0.48	0.92	0.62	0.46	0.37	0.77	0.39
Y	-0.30	0.62	-0.51	0.83	-0.78	0.75	0.89	0.73	0.77	0.30	0.75	0.64	0.69	0.68
Ce	-0.69	0.84	-0.22	0.64	-0.89	0.86	0.42	0.65	0.13	-0.36	0.82	0.88	0.30	0.86
In	0.23	0.09	-0.23	0.51	-0.27	0.19	0.67	0.36	0.82	0.64	0.27	0.19	0.49	0.09
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.10	0.50	-0.49	0.70	-0.66	0.61	0.88	0.61	0.82	0.41	0.64	0.56	0.74	0.62
Li	-0.56	0.79	-0.46	0.90	-0.91	0.92	0.74	0.86	0.50	-0.03	0.86	0.73	0.52	0.76
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	0.53	-0.17	0.92	-0.21	0.54	-0.37	-0.47	-0.13	-0.38	-0.11	-0.38	-0.31	-0.59	-0.55

Site 4

	U	**S**	**Hg**	**La**	**Au**	**Th**	**Sr**	**Cd**	**Sb**	**Bi**	**V**	**Ca**	**P**	**Ba**	**Ti**
Mo	-0.30	0.88	0.75	-0.66	0.22	-0.42	0.11	-0.29	0.27	-0.27	0.60	0.31	0.47	-0.38	-0.15
Cu	0.56	-0.59	-0.38	0.85	0.12	0.72	0.46	0.81	0.03	0.35	-0.71	0.27	0.24	0.89	0.13
Pb	-0.64	0.39	0.65	-0.17	0.92	-0.58	0.86	0.16	0.96	-0.63	0.56	0.88	0.16	0.10	-0.67
Zn	0.72	-0.35	-0.19	0.74	-0.13	0.82	0.27	0.72	-0.24	0.23	-0.79	0.09	0.48	0.89	0.08
Ag	-0.76	0.72	0.60	-0.85	0.19	-0.87	-0.05	-0.71	0.33	-0.47	0.86	0.09	-0.18	-0.79	-0.26
Mg	0.72	-0.62	-0.48	0.87	-0.15	0.85	0.23	0.76	-0.23	0.47	-0.85	0.03	0.21	0.90	0.28
Cr	0.91	0.00	-0.12	0.46	-0.57	0.82	-0.30	0.44	-0.71	0.48	-0.75	-0.31	0.57	0.48	0.45
Ni	0.63	-0.39	-0.21	0.73	-0.04	0.77	0.39	0.73	-0.11	0.25	-0.73	0.18	0.41	0.92	0.10
Al	0.73	0.19	0.09	0.23	-0.47	0.60	-0.40	0.20	-0.67	0.10	-0.54	-0.34	0.66	0.19	0.10
Se	0.29	0.59	0.41	-0.28	-0.37	0.08	-0.48	-0.21	-0.50	-0.11	-0.02	-0.33	0.50	-0.30	0.01
Co	0.71	-0.64	-0.51	0.85	-0.12	0.86	0.23	0.73	-0.21	0.48	-0.82	0.09	0.26	0.86	0.25
Mn	0.63	-0.61	-0.48	0.87	0.05	0.75	0.28	0.79	-0.07	0.49	-0.73	0.22	0.24	0.81	0.22
Fe	0.83	0.03	-0.22	0.28	-0.71	0.69	-0.54	0.22	-0.82	0.71	-0.60	-0.48	0.35	0.18	0.72
As	0.72	-0.74	-0.68	0.86	-0.22	0.83	0.04	0.60	-0.32	0.64	-0.83	-0.05	0.11	0.64	0.41
U	1.00	-0.30	-0.36	0.71	-0.49	0.95	-0.26	0.58	-0.69	0.60	-0.91	-0.28	0.49	0.57	0.47
S	-0.30	1.00	0.92	-0.57	0.29	-0.48	0.20	-0.17	0.31	-0.32	0.57	0.39	0.47	-0.34	-0.17
Hg	-0.36	0.92	1.00	-0.42	0.58	-0.50	0.50	0.04	0.55	-0.54	0.55	0.63	0.53	-0.13	-0.45
La	0.71	-0.57	-0.42	1.00	-0.06	0.77	0.18	0.79	-0.24	0.32	-0.88	0.10	0.27	0.81	0.10
Au	-0.49	0.29	0.58	-0.06	1.00	-0.48	0.80	0.31	0.93	-0.57	0.48	0.86	0.23	0.10	-0.67
Th	0.95	-0.48	-0.50	0.77	-0.48	1.00	-0.15	0.57	-0.62	0.62	-0.95	-0.25	0.39	0.66	0.47
Sr	-0.26	0.20	0.50	0.18	0.80	-0.15	1.00	0.50	0.84	-0.28	0.17	0.92	0.31	0.48	-0.37
Cd	0.58	-0.17	0.04	0.79	0.31	0.57	0.50	1.00	0.12	0.23	-0.58	0.46	0.50	0.89	0.01
Sb	-0.69	0.31	0.55	-0.24	0.93	-0.62	0.84	0.12	1.00	-0.52	0.63	0.84	0.03	0.01	-0.56
Bi	0.60	-0.32	-0.54	0.32	-0.57	0.62	-0.28	0.23	-0.52	1.00	-0.50	-0.30	-0.06	0.24	0.95
V	-0.91	0.57	0.55	-0.88	0.48	-0.95	0.17	-0.58	0.63	-0.50	1.00	0.28	-0.27	-0.68	-0.34
Ca	-0.28	0.39	0.63	0.10	0.86	-0.25	0.92	0.46	0.84	-0.30	0.28	1.00	0.46	0.32	-0.42
P	0.49	0.47	0.53	0.27	0.23	0.39	0.31	0.50	0.03	-0.06	-0.27	0.46	1.00	0.36	-0.16
Ba	0.57	-0.34	-0.13	0.81	0.10	0.66	0.48	0.89	0.01	0.24	-0.68	0.32	0.36	1.00	0.06
Ti	0.47	-0.17	-0.45	0.10	-0.67	0.47	-0.37	0.01	-0.56	0.95	-0.34	-0.42	-0.16	0.06	1.00
B	-0.39	0.02	0.34	0.05	0.84	-0.25	0.89	0.42	0.87	-0.36	0.30	0.76	0.08	0.40	-0.45
Na	-0.67	0.72	0.88	-0.52	0.70	-0.70	0.55	-0.16	0.73	-0.79	0.72	0.63	0.27	-0.22	-0.71
K	0.42	-0.57	-0.34	0.76	0.18	0.60	0.53	0.79	0.15	0.33	-0.58	0.34	0.12	0.90	0.12
W	-0.58	0.60	0.81	-0.26	0.81	-0.57	0.83	0.11	0.88	-0.60	0.57	0.85	0.28	0.06	-0.57
Sc	0.97	-0.40	-0.42	0.78	-0.48	0.97	-0.19	0.63	-0.65	0.55	-0.95	-0.25	0.43	0.69	0.41
Tl	0.66	-0.35	-0.57	0.43	-0.77	0.62	-0.49	0.17	-0.75	0.86	-0.64	-0.53	-0.16	0.23	0.86
Te	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ga	0.18	0.10	-0.27	-0.27	-0.74	0.07	-0.68	-0.40	-0.62	0.67	-0.02	-0.59	-0.29	-0.41	0.81
Cs	0.60	-0.40	-0.59	0.51	-0.78	0.59	-0.47	0.11	-0.75	0.69	-0.69	-0.53	-0.19	0.25	0.69
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.63	0.30	0.23	0.17	-0.27	0.49	-0.28	0.21	-0.50	-0.01	-0.41	-0.14	0.78	0.15	-0.05
Nb	0.26	0.37	0.00	-0.38	-0.71	0.10	-0.66	-0.38	-0.64	0.52	0.01	-0.56	0.01	-0.41	0.70
Rb	0.80	-0.52	-0.48	0.76	-0.45	0.89	-0.01	0.60	-0.50	0.51	-0.89	-0.24	0.19	0.80	0.41
Sn	-0.89	0.64	0.58	-0.84	0.40	-0.93	0.20	-0.59	0.59	-0.41	0.96	0.31	-0.27	-0.67	-0.24
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.86	0.04	-0.04	0.45	-0.39	0.77	-0.27	0.40	-0.61	0.30	-0.68	-0.17	0.75	0.37	0.20
Y	0.96	-0.30	-0.29	0.77	-0.39	0.94	-0.15	0.63	-0.61	0.39	-0.93	-0.19	0.56	0.66	0.25
Ce	0.69	-0.62	-0.47	0.92	-0.02	0.71	0.13	0.83	-0.21	0.42	-0.79	0.03	0.13	0.78	0.19
In	0.56	0.17	0.15	0.26	-0.19	0.48	-0.21	0.30	-0.41	-0.04	-0.42	-0.04	0.71	0.27	-0.14
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.94	-0.14	-0.17	0.64	-0.35	0.89	-0.16	0.53	-0.57	0.42	-0.82	-0.12	0.71	0.49	0.28
Li	0.85	-0.56	-0.48	0.82	-0.38	0.91	-0.05	0.67	-0.52	0.43	-0.93	-0.24	0.24	0.81	0.29
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	-0.61	0.67	0.85	-0.33	0.79	-0.62	0.79	0.07	0.86	-0.56	0.63	0.84	0.25	-0.01	-0.51

Site 4

	B	Na	K	W	Sc	Tl	Te	Ga	Cs	Ge	Hf	Nb	Rb	Sn	Ta	Zr
Mo	0.04	0.65	-0.54	0.50	-0.37	-0.45	NA	0.07	-0.51	NA	0.33	0.35	-0.49	0.59	NA	0.10
Cu	0.43	-0.40	0.96	-0.08	0.66	0.23	NA	-0.43	0.23	NA	-0.02	-0.52	0.78	-0.73	NA	0.28
Pb	0.83	0.83	0.14	0.95	-0.58	-0.78	NA	-0.69	-0.72	NA	-0.34	-0.66	-0.45	0.55	NA	-0.49
Zn	0.19	-0.28	0.78	-0.13	0.82	0.23	NA	-0.36	0.25	NA	0.44	-0.26	0.88	-0.80	NA	0.62
Ag	-0.10	0.67	-0.83	0.46	-0.84	-0.42	NA	0.22	-0.39	NA	-0.18	0.29	-0.86	0.92	NA	-0.49
Mg	0.20	-0.57	0.91	-0.28	0.82	0.43	NA	-0.24	0.43	NA	0.11	-0.31	0.92	-0.85	NA	0.42
Cr	-0.45	-0.46	0.21	-0.46	0.89	0.59	NA	0.27	0.53	NA	0.77	0.47	0.74	-0.71	NA	0.90
Ni	0.33	-0.26	0.86	-0.04	0.75	0.20	NA	-0.40	0.21	NA	0.27	-0.34	0.87	-0.74	NA	0.48
Al	-0.53	-0.19	-0.12	-0.37	0.68	0.27	NA	0.13	0.26	NA	0.95	0.43	0.44	-0.55	NA	0.92
Se	-0.61	0.15	-0.62	-0.16	0.19	0.07	NA	0.33	0.04	NA	0.82	0.65	-0.08	-0.01	NA	0.62
Co	0.20	-0.55	0.91	-0.29	0.81	0.37	NA	-0.27	0.36	NA	0.15	-0.34	0.85	-0.84	NA	0.46
Mn	0.26	-0.53	0.89	-0.24	0.71	0.34	NA	-0.27	0.30	NA	0.04	-0.41	0.70	-0.75	NA	0.37
Fe	-0.68	-0.61	-0.02	-0.64	0.74	0.79	NA	0.65	0.66	NA	0.62	0.75	0.53	-0.53	NA	0.77
As	-0.01	-0.76	0.76	-0.49	0.75	0.55	NA	-0.05	0.52	NA	0.03	-0.22	0.73	-0.82	NA	0.39
U	-0.39	-0.67	0.42	-0.58	0.97	0.66	NA	0.18	0.60	NA	0.63	0.26	0.80	-0.89	NA	0.86
S	0.02	0.72	-0.57	0.60	-0.40	-0.35	NA	0.10	-0.40	NA	0.30	0.37	-0.52	0.64	NA	0.04
Hg	0.34	0.88	-0.34	0.81	-0.42	-0.57	NA	-0.27	-0.59	NA	0.23	0.00	-0.48	0.58	NA	-0.04
La	0.05	-0.52	0.76	-0.26	0.78	0.43	NA	-0.27	0.51	NA	0.17	-0.38	0.76	-0.84	NA	0.45
Au	0.84	0.70	0.18	0.81	-0.48	-0.77	NA	-0.74	-0.78	NA	-0.27	-0.71	-0.45	0.40	NA	-0.39
Th	-0.25	-0.70	0.60	-0.57	0.97	0.62	NA	0.07	0.59	NA	0.49	0.10	0.89	-0.93	NA	0.77
Sr	0.89	0.55	0.53	0.83	-0.19	-0.49	NA	-0.68	-0.47	NA	-0.28	-0.66	-0.01	0.20	NA	-0.27
Cd	0.42	-0.16	0.79	0.11	0.63	0.17	NA	-0.40	0.11	NA	0.21	-0.38	0.60	-0.59	NA	0.40
Sb	0.87	0.73	0.15	0.88	-0.65	-0.75	NA	-0.62	-0.75	NA	-0.50	-0.64	-0.50	0.59	NA	-0.61
Bi	-0.36	-0.79	0.33	-0.60	0.55	0.86	NA	0.67	0.69	NA	-0.01	0.52	0.51	-0.41	NA	0.30
V	0.30	0.72	-0.58	0.57	-0.95	-0.64	NA	-0.02	-0.69	NA	-0.41	0.01	-0.89	0.96	NA	-0.68
Ca	0.76	0.63	0.34	0.85	-0.25	-0.53	NA	-0.59	-0.53	NA	-0.14	-0.56	-0.24	0.31	NA	-0.17
P	0.08	0.27	0.12	0.28	0.43	-0.16	NA	-0.29	-0.19	NA	0.78	0.01	0.19	-0.27	NA	0.75
Ba	0.40	-0.22	0.90	0.06	0.69	0.23	NA	-0.41	0.25	NA	0.15	-0.41	0.80	-0.67	NA	0.37
Ti	-0.45	-0.71	0.12	-0.57	0.41	0.86	NA	0.81	0.69	NA	-0.05	0.70	0.41	-0.24	NA	0.20
B	1.00	0.51	0.54	0.72	-0.29	-0.62	NA	-0.75	-0.65	NA	-0.43	-0.76	-0.07	0.21	NA	-0.43
Na	0.51	1.00	-0.32	0.89	-0.66	-0.84	NA	-0.49	-0.78	NA	0.00	-0.29	-0.62	0.70	NA	-0.32
K	0.54	-0.32	1.00	0.01	0.55	0.18	NA	-0.43	0.16	NA	-0.14	-0.55	0.71	-0.60	NA	0.13
W	0.72	0.89	0.01	1.00	-0.55	-0.71	NA	-0.56	-0.64	NA	-0.22	-0.45	-0.42	0.61	NA	-0.40
Sc	-0.29	-0.66	0.55	-0.55	1.00	0.62	NA	0.08	0.60	NA	0.58	0.13	0.89	-0.94	NA	0.82
Tl	-0.62	-0.84	0.18	-0.71	0.62	1.00	NA	0.73	0.94	NA	0.08	0.58	0.59	-0.51	NA	0.34
Te	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ga	-0.75	-0.49	-0.43	-0.56	0.08	0.73	NA	1.00	0.62	NA	0.02	0.91	-0.02	0.10	NA	0.09
Cs	-0.65	-0.78	0.16	-0.64	0.60	0.94	NA	0.62	1.00	NA	0.06	0.45	0.60	-0.52	NA	0.31
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA	NA	NA
Hf	-0.43	0.00	-0.14	-0.22	0.58	0.08	NA	0.02	0.06	NA	1.00	0.33	0.26	-0.44	NA	0.92
Nb	-0.76	-0.29	-0.55	-0.45	0.13	0.58	NA	0.91	0.45	NA	0.33	1.00	-0.02	0.11	NA	0.31
Rb	-0.07	-0.62	0.71	-0.42	0.89	0.59	NA	-0.02	0.60	NA	0.26	-0.02	1.00	-0.87	NA	0.54
Sn	0.21	0.70	-0.60	0.61	-0.94	-0.51	NA	0.10	-0.52	NA	-0.44	0.11	-0.87	1.00	NA	-0.69
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA
Zr	-0.43	-0.32	0.13	-0.40	0.82	0.34	NA	0.09	0.31	NA	0.92	0.31	0.54	-0.69	NA	1.00
Y	-0.29	-0.53	0.47	-0.47	0.97	0.50	NA	-0.04	0.50	NA	0.69	0.08	0.82	-0.92	NA	0.89
Ce	0.13	-0.61	0.78	-0.34	0.74	0.46	NA	-0.21	0.44	NA	0.05	-0.34	0.73	-0.81	NA	0.34
In	-0.30	0.02	0.03	-0.20	0.57	0.03	NA	-0.09	0.01	NA	0.93	0.16	0.27	-0.46	NA	0.87
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.34	-0.46	0.32	-0.42	0.90	0.43	NA	0.03	0.40	NA	0.78	0.19	0.67	-0.81	NA	0.95
Li	-0.08	-0.62	0.71	-0.47	0.93	0.53	NA	-0.11	0.54	NA	0.36	-0.09	0.97	-0.95	NA	0.61
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	0.67	0.90	-0.06	0.99	-0.60	-0.67	NA	-0.46	-0.63	NA	-0.22	-0.35	-0.49	0.68	NA	-0.42

Site 4

	Y	Ce	In	Re	Be	Li	Pd	Pt
Mo	-0.30	-0.69	0.23	NA	-0.10	-0.56	NA	0.53
Cu	0.62	0.84	0.09	NA	0.50	0.79	NA	-0.17
Pb	-0.51	-0.22	-0.23	NA	-0.49	-0.46	NA	0.92
Zn	0.83	0.64	0.51	NA	0.70	0.90	NA	-0.21
Ag	-0.78	-0.89	-0.27	NA	-0.66	-0.91	NA	0.54
Mg	0.75	0.86	0.19	NA	0.61	0.92	NA	-0.37
Cr	0.89	0.42	0.67	NA	0.88	0.74	NA	-0.47
Ni	0.73	0.65	0.36	NA	0.61	0.86	NA	-0.13
Al	0.77	0.13	0.82	NA	0.82	0.50	NA	-0.38
Se	0.30	-0.36	0.64	NA	0.41	-0.03	NA	-0.11
Co	0.75	0.82	0.27	NA	0.64	0.86	NA	-0.38
Mn	0.64	0.88	0.19	NA	0.56	0.73	NA	-0.31
Fe	0.69	0.30	0.49	NA	0.74	0.52	NA	-0.59
As	0.68	0.86	0.09	NA	0.62	0.76	NA	-0.55
U	0.96	0.69	0.56	NA	0.94	0.85	NA	-0.61
S	-0.30	-0.62	0.17	NA	-0.14	-0.56	NA	0.67
Hg	-0.29	-0.47	0.15	NA	-0.17	-0.48	NA	0.85
La	0.77	0.92	0.26	NA	0.64	0.82	NA	-0.33
Au	-0.39	-0.02	-0.19	NA	-0.35	-0.38	NA	0.79
Th	0.94	0.71	0.48	NA	0.89	0.91	NA	-0.62
Sr	-0.15	0.13	-0.21	NA	-0.16	-0.05	NA	0.79
Cd	0.63	0.83	0.30	NA	0.53	0.67	NA	0.07
Sb	-0.61	-0.21	-0.41	NA	-0.57	-0.52	NA	0.86
Bi	0.39	0.42	-0.04	NA	0.42	0.43	NA	-0.56
V	-0.93	-0.79	-0.42	NA	-0.82	-0.93	NA	0.63
Ca	-0.19	0.03	0.04	NA	-0.12	-0.24	NA	0.84
P	0.56	0.13	0.71	NA	0.71	0.24	NA	0.25
Ba	0.66	0.78	0.27	NA	0.49	0.91	NA	-0.01
Ti	0.25	0.19	-0.14	NA	0.28	0.29	NA	-0.51
B	-0.29	0.13	-0.30	NA	-0.34	-0.08	NA	0.67
Na	-0.53	-0.61	0.02	NA	-0.46	-0.62	NA	0.90
K	0.47	0.78	0.03	NA	0.32	0.71	NA	-0.06
W	-0.47	-0.34	-0.20	NA	-0.42	-0.47	NA	0.99
Sc	0.97	0.74	0.57	NA	0.90	0.93	NA	-0.60
Tl	0.50	0.46	0.03	NA	0.43	0.53	NA	-0.67
Te	NA	NA	NA	NA	NA	NA	NA	NA
Ga	-0.04	-0.21	-0.09	NA	0.03	-0.11	NA	-0.46
Cs	0.50	0.44	0.01	NA	0.40	0.54	NA	-0.63
Ge	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.69	0.05	0.93	NA	0.78	0.36	NA	-0.22
Nb	0.08	-0.34	0.16	NA	0.19	-0.09	NA	-0.35
Rb	0.82	0.73	0.27	NA	0.67	0.97	NA	-0.49
Sn	-0.92	-0.81	-0.46	NA	-0.81	-0.95	NA	0.68
Ta	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.89	0.34	0.87	NA	0.95	0.61	NA	-0.42
Y	1.00	0.69	0.66	NA	0.95	0.89	NA	-0.52
Ce	0.69	1.00	0.12	NA	0.54	0.81	NA	-0.40
In	0.66	0.12	1.00	NA	0.70	0.38	NA	-0.20
Re	NA	NA	NA	1.00	NA	NA	NA	NA
Be	0.95	0.54	0.70	NA	1.00	0.73	NA	-0.47
Li	0.89	0.81	0.38	NA	0.73	1.00	NA	-0.54
Pd	NA	NA	NA	NA	NA	NA	1.00	NA
Pt	-0.52	-0.40	-0.20	NA	-0.47	-0.54	NA	1.00

Statistical correlations of all 53 elements analyzed - 2mm size

Site 1

	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Hg	Fe	As	U	Au	S
Mo	1.00	0.07	0.81	0.58	0.92	0.32	-0.23	-0.20	0.89	0.22	0.68	0.04	0.90	0.66
Cu	0.07	1.00	-0.13	0.65	-0.26	0.93	0.87	0.88	-0.22	0.39	0.37	0.59	-0.17	-0.19
Pb	0.81	-0.13	1.00	0.44	0.89	0.12	-0.45	-0.37	0.95	-0.35	0.22	-0.44	0.73	0.76
Zn	0.58	0.65	0.44	1.00	0.36	0.70	0.21	0.32	0.46	0.10	0.55	0.18	0.25	0.56
Ag	0.92	-0.26	0.89	0.36	1.00	0.02	-0.51	-0.48	0.97	-0.03	0.43	-0.23	0.87	0.71
Ni	0.32	0.93	0.12	0.70	0.02	1.00	0.78	0.73	0.03	0.43	0.42	0.63	0.04	-0.12
Co	-0.23	0.87	-0.45	0.21	-0.51	0.78	1.00	0.92	-0.55	0.54	0.19	0.76	-0.35	-0.63
Mn	-0.20	0.88	-0.37	0.32	-0.48	0.73	0.92	1.00	-0.47	0.39	0.23	0.59	-0.32	-0.41
Hg	0.89	-0.22	0.95	0.46	0.97	0.03	-0.55	-0.47	1.00	-0.21	0.35	-0.37	0.80	0.83
Fe	0.22	0.39	-0.35	0.10	-0.03	0.43	0.54	0.39	-0.21	1.00	0.68	0.91	0.23	-0.42
As	0.68	0.37	0.22	0.55	0.43	0.42	0.19	0.23	0.35	0.68	1.00	0.49	0.67	0.32
U	0.04	0.59	-0.44	0.18	-0.23	0.63	0.76	0.59	-0.37	0.91	0.49	1.00	-0.06	-0.57
Au	0.90	-0.17	0.73	0.25	0.87	0.04	-0.35	-0.32	0.80	0.23	0.67	-0.06	1.00	0.57
S	0.66	-0.19	0.76	0.56	0.71	-0.12	-0.63	-0.41	0.83	-0.42	0.32	-0.57	0.57	1.00
Th	-0.17	0.66	-0.58	0.06	-0.45	0.62	0.87	0.68	-0.58	0.83	0.34	0.95	-0.22	-0.73
Sr	0.59	0.06	0.79	0.71	0.60	0.13	-0.42	-0.21	0.76	-0.51	0.21	-0.53	0.40	0.93
Cd	0.74	-0.10	0.95	0.53	0.81	0.06	-0.49	-0.32	0.91	-0.47	0.22	-0.55	0.63	0.90
Sb	0.92	0.09	0.88	0.72	0.88	0.28	-0.32	-0.19	0.93	-0.07	0.57	-0.20	0.77	0.86
Bi	0.62	0.46	0.21	0.36	0.40	0.62	0.46	0.32	0.26	0.79	0.79	0.69	0.60	-0.08
V	0.89	-0.09	0.89	0.62	0.89	0.10	-0.50	-0.37	0.95	-0.17	0.51	-0.34	0.79	0.92
Ca	0.28	0.02	0.49	0.59	0.30	-0.06	-0.42	-0.13	0.50	-0.61	0.09	-0.62	0.13	0.86
P	0.65	0.01	0.62	0.65	0.59	0.01	-0.42	-0.16	0.70	-0.20	0.56	-0.37	0.59	0.94
La	-0.07	0.84	-0.34	0.29	-0.36	0.85	0.94	0.78	-0.43	0.64	0.26	0.86	-0.23	-0.60
Cr	0.26	0.47	-0.31	0.22	0.00	0.53	0.57	0.41	-0.17	0.99	0.69	0.94	0.20	-0.38
Mg	-0.12	0.85	-0.44	0.31	-0.41	0.82	0.95	0.83	-0.48	0.67	0.28	0.88	-0.31	-0.59
Ba	0.76	0.12	0.89	0.75	0.74	0.27	-0.34	-0.16	0.86	-0.36	0.34	-0.39	0.57	0.90
Ti	-0.14	0.57	-0.52	0.08	-0.37	0.60	0.77	0.53	-0.50	0.81	0.29	0.95	-0.24	-0.71
B	0.29	-0.18	0.48	0.50	0.36	-0.23	-0.61	-0.36	0.53	-0.59	0.08	-0.66	0.17	0.89
Al	0.26	0.31	-0.31	0.13	0.06	0.39	0.45	0.28	-0.13	0.97	0.63	0.88	0.21	-0.37
Na	0.51	-0.12	0.65	0.63	0.56	-0.09	-0.58	-0.37	0.70	-0.48	0.24	-0.55	0.37	0.96
K	0.41	0.12	0.53	0.72	0.38	0.07	-0.35	-0.08	0.55	-0.45	0.27	-0.47	0.24	0.89
W	0.47	0.17	0.12	0.29	0.30	0.18	0.07	0.30	0.26	0.43	0.61	0.29	0.43	0.27
Sc	0.01	0.80	-0.38	0.25	-0.29	0.79	0.93	0.81	-0.39	0.80	0.44	0.92	-0.09	-0.57
Tl	0.38	0.26	-0.17	0.15	0.21	0.38	0.37	0.23	0.02	0.95	0.68	0.84	0.34	-0.26
Se	0.71	-0.13	0.25	0.20	0.65	0.04	-0.19	-0.25	0.49	0.66	0.75	0.37	0.73	0.27
Te	-0.12	0.49	-0.27	0.11	-0.20	0.41	0.63	0.69	-0.23	0.31	0.11	0.43	-0.22	-0.33
Ga	0.24	0.27	-0.33	0.01	0.03	0.32	0.43	0.27	-0.17	0.99	0.68	0.86	0.30	-0.39
Cs	0.31	0.01	-0.24	-0.07	0.17	0.10	0.17	0.02	-0.04	0.92	0.67	0.70	0.41	-0.25
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.21	0.65	-0.40	0.11	-0.50	0.56	0.75	0.78	-0.52	0.45	0.21	0.63	-0.25	-0.49
Nb	0.35	0.02	-0.20	0.00	0.22	0.11	0.14	-0.02	0.01	0.90	0.69	0.70	0.42	-0.20
Rb	0.39	0.42	-0.19	0.42	0.12	0.47	0.37	0.27	-0.01	0.90	0.81	0.81	0.30	-0.09
Sn	0.87	-0.22	0.97	0.33	0.94	0.06	-0.48	-0.45	0.95	-0.19	0.31	-0.34	0.84	0.70
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.20	0.78	-0.45	0.17	-0.49	0.74	0.92	0.81	-0.56	0.62	0.23	0.84	-0.29	-0.65
Y	-0.21	0.83	-0.47	0.18	-0.48	0.77	0.99	0.87	-0.54	0.62	0.20	0.83	-0.33	-0.68
Ce	-0.24	0.76	-0.50	0.09	-0.48	0.72	0.97	0.83	-0.57	0.64	0.16	0.85	-0.34	-0.74
In	0.39	-0.12	-0.13	0.00	0.34	-0.01	-0.02	-0.13	0.15	0.78	0.61	0.54	0.43	-0.05
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.10	0.73	-0.52	0.17	-0.39	0.69	0.89	0.74	-0.51	0.84	0.40	0.95	-0.19	-0.65
Li	0.03	0.60	-0.47	0.17	-0.24	0.62	0.75	0.57	-0.39	0.93	0.48	0.98	-0.07	-0.58
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 1

	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al
Mo	-0.17	0.59	0.74	0.92	0.62	0.89	0.28	0.65	-0.07	0.26	-0.12	0.76	-0.14	0.29	0.26
Cu	0.66	0.06	-0.10	0.09	0.46	-0.09	0.02	0.01	0.84	0.47	0.85	0.12	0.57	-0.18	0.31
Pb	-0.58	0.79	0.95	0.88	0.21	0.89	0.49	0.62	-0.34	-0.31	-0.44	0.89	-0.52	0.48	-0.31
Zn	0.06	0.71	0.53	0.72	0.36	0.62	0.59	0.65	0.29	0.22	0.31	0.75	0.08	0.50	0.13
Ag	-0.45	0.60	0.81	0.88	0.40	0.89	0.30	0.59	-0.36	0.00	-0.41	0.74	-0.37	0.36	0.06
Ni	0.62	0.13	0.06	0.28	0.62	0.10	-0.06	0.01	0.85	0.53	0.82	0.27	0.60	-0.23	0.39
Co	0.87	-0.42	-0.49	-0.32	0.46	-0.50	-0.42	-0.42	0.94	0.57	0.95	-0.34	0.77	-0.61	0.45
Mn	0.68	-0.21	-0.32	-0.19	0.32	-0.37	-0.13	-0.16	0.78	0.41	0.83	-0.16	0.53	-0.36	0.28
Hg	-0.58	0.76	0.91	0.93	0.26	0.95	0.50	0.70	-0.43	-0.17	-0.48	0.86	-0.50	0.53	-0.13
Fe	0.83	-0.51	-0.47	-0.07	0.79	-0.17	-0.61	-0.20	0.64	0.99	0.67	-0.36	0.81	-0.59	0.97
As	0.34	0.21	0.22	0.57	0.79	0.51	0.09	0.56	0.26	0.69	0.28	0.34	0.29	0.08	0.63
U	0.95	-0.53	-0.55	-0.20	0.69	-0.34	-0.62	-0.37	0.86	0.94	0.88	-0.39	0.95	-0.66	0.88
Au	-0.22	0.40	0.63	0.77	0.60	0.79	0.13	0.59	-0.23	0.20	-0.31	0.57	-0.24	0.17	0.21
S	-0.73	0.93	0.90	0.86	-0.08	0.92	0.86	0.94	-0.60	-0.38	-0.59	0.90	-0.71	0.89	-0.37
Th	1.00	-0.64	-0.69	-0.40	0.59	-0.53	-0.68	-0.51	0.92	0.84	0.93	-0.53	0.96	-0.75	0.76
Sr	-0.64	1.00	0.92	0.84	-0.09	0.86	0.90	0.86	-0.39	-0.44	-0.41	0.97	-0.61	0.87	-0.48
Cd	-0.69	0.92	1.00	0.90	0.04	0.92	0.73	0.78	-0.45	-0.42	-0.50	0.96	-0.66	0.69	-0.44
Sb	-0.40	0.84	0.90	1.00	0.39	0.97	0.61	0.84	-0.22	-0.01	-0.25	0.94	-0.37	0.59	-0.02
Bi	0.59	-0.09	0.04	0.39	1.00	0.27	-0.36	0.08	0.58	0.81	0.53	0.13	0.56	-0.41	0.75
V	-0.53	0.86	0.92	0.97	0.27	1.00	0.64	0.86	-0.38	-0.13	-0.43	0.93	-0.48	0.67	-0.13
Ca	-0.68	0.90	0.73	0.61	-0.36	0.64	1.00	0.84	-0.50	-0.55	-0.45	0.77	-0.70	0.96	-0.58
P	-0.51	0.86	0.78	0.84	0.08	0.86	0.84	1.00	-0.43	-0.17	-0.40	0.83	-0.55	0.84	-0.20
La	0.92	-0.39	-0.45	-0.22	0.58	-0.38	-0.50	-0.43	1.00	0.69	0.97	-0.27	0.89	-0.63	0.57
Cr	0.84	-0.44	-0.42	-0.01	0.81	-0.13	-0.55	-0.17	0.69	1.00	0.73	-0.28	0.85	-0.55	0.98
Mg	0.93	-0.41	-0.50	-0.25	0.53	-0.43	-0.45	-0.40	0.97	0.73	1.00	-0.31	0.89	-0.59	0.62
Ba	-0.53	0.97	0.96	0.94	0.13	0.93	0.77	0.83	-0.27	-0.28	-0.31	1.00	-0.50	0.73	-0.32
Ti	0.96	-0.61	-0.66	-0.37	0.56	-0.48	-0.70	-0.55	0.89	0.85	0.89	-0.50	1.00	-0.72	0.79
B	-0.75	0.87	0.69	0.59	-0.41	0.67	0.96	0.84	-0.63	-0.55	-0.59	0.73	-0.72	1.00	-0.54
Al	0.76	-0.48	-0.44	-0.02	0.75	-0.13	-0.58	-0.20	0.57	0.98	0.62	-0.32	0.79	-0.54	1.00
Na	-0.69	0.94	0.81	0.77	-0.19	0.83	0.92	0.90	-0.55	-0.41	-0.53	0.86	-0.64	0.96	-0.41
K	-0.56	0.93	0.74	0.71	-0.17	0.72	0.98	0.90	-0.39	-0.38	-0.35	0.83	-0.57	0.94	-0.42
W	0.13	0.13	0.20	0.39	0.34	0.31	0.13	0.45	0.03	0.39	0.15	0.23	0.01	0.06	0.39
Sc	0.95	-0.45	-0.47	-0.18	0.69	-0.35	-0.53	-0.35	0.95	0.83	0.96	-0.31	0.88	-0.66	0.73
Tl	0.68	-0.39	-0.30	0.10	0.80	-0.01	-0.53	-0.11	0.50	0.95	0.55	-0.21	0.70	-0.50	0.98
Se	0.15	0.02	0.16	0.49	0.67	0.47	-0.16	0.33	-0.04	0.65	0.00	0.17	0.19	-0.04	0.73
Te	0.41	-0.24	-0.23	-0.11	0.32	-0.31	-0.16	-0.20	0.45	0.34	0.55	-0.18	0.33	-0.34	0.35
Ga	0.77	-0.53	-0.46	-0.07	0.77	-0.14	-0.63	-0.19	0.54	0.96	0.57	-0.37	0.75	-0.59	0.96
Cs	0.58	-0.48	-0.37	0.00	0.70	-0.03	-0.57	-0.10	0.29	0.88	0.33	-0.33	0.59	-0.47	0.92
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.72	-0.34	-0.40	-0.31	0.25	-0.40	-0.33	-0.26	0.73	0.43	0.73	-0.28	0.59	-0.47	0.28
Nb	0.55	-0.41	-0.33	0.06	0.70	0.03	-0.52	-0.05	0.28	0.88	0.32	-0.27	0.59	-0.41	0.92
Rb	0.67	-0.17	-0.24	0.19	0.73	0.11	-0.27	0.12	0.52	0.93	0.57	-0.06	0.70	-0.22	0.91
Sn	-0.50	0.66	0.88	0.85	0.32	0.88	0.33	0.56	-0.33	-0.17	-0.44	0.79	-0.44	0.35	-0.16
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.92	-0.46	-0.53	-0.34	0.45	-0.48	-0.51	-0.45	0.95	0.64	0.94	-0.37	0.85	-0.65	0.50
Y	0.92	-0.49	-0.54	-0.34	0.50	-0.52	-0.52	-0.49	0.97	0.65	0.98	-0.39	0.85	-0.68	0.55
Ce	0.93	-0.56	-0.59	-0.39	0.50	-0.56	-0.60	-0.56	0.96	0.67	0.96	-0.45	0.87	-0.75	0.57
In	0.35	-0.31	-0.21	0.15	0.60	0.11	-0.38	0.04	0.08	0.76	0.16	-0.18	0.40	-0.26	0.87
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.99	-0.56	-0.62	-0.30	0.63	-0.46	-0.60	-0.43	0.93	0.86	0.95	-0.45	0.94	-0.69	0.78
Li	0.95	-0.55	-0.59	-0.22	0.69	-0.36	-0.63	-0.38	0.85	0.95	0.88	-0.42	0.95	-0.66	0.91
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 1

	Na	K	W	Sc	Tl	Se	Te	Ga	Cs	Ge	Hf	Nb	Rb	Sn	Ta
Mo	0.51	0.41	0.47	0.01	0.38	0.71	-0.12	0.24	0.31	NA	-0.21	0.35	0.39	0.87	NA
Cu	-0.12	0.12	0.17	0.80	0.26	-0.13	0.49	0.27	0.01	NA	0.65	0.02	0.42	-0.22	NA
Pb	0.65	0.53	0.12	-0.38	-0.17	0.25	-0.27	-0.33	-0.24	NA	-0.40	-0.20	-0.19	0.97	NA
Zn	0.63	0.72	0.29	0.25	0.15	0.20	0.11	0.01	-0.07	NA	0.11	0.00	0.42	0.33	NA
Ag	0.56	0.38	0.30	-0.29	0.21	0.65	-0.20	0.03	0.17	NA	-0.50	0.22	0.12	0.94	NA
Ni	-0.09	0.07	0.18	0.79	0.38	0.04	0.41	0.32	0.10	NA	0.56	0.11	0.47	0.06	NA
Co	-0.58	-0.35	0.07	0.93	0.37	-0.19	0.63	0.43	0.17	NA	0.75	0.14	0.37	-0.48	NA
Mn	-0.37	-0.08	0.30	0.81	0.23	-0.25	0.69	0.27	0.02	NA	0.78	-0.02	0.27	-0.45	NA
Hg	0.70	0.55	0.26	-0.39	0.02	0.49	-0.23	-0.17	-0.04	NA	-0.52	0.01	-0.01	0.95	NA
Fe	-0.48	-0.45	0.43	0.80	0.95	0.66	0.31	0.99	0.92	NA	0.45	0.90	0.90	-0.19	NA
As	0.24	0.27	0.61	0.44	0.68	0.75	0.11	0.68	0.67	NA	0.21	0.69	0.81	0.31	NA
U	-0.55	-0.47	0.29	0.92	0.84	0.37	0.43	0.86	0.70	NA	0.63	0.70	0.81	-0.34	NA
Au	0.37	0.24	0.43	-0.09	0.34	0.73	-0.22	0.30	0.41	NA	-0.25	0.42	0.30	0.84	NA
S	0.96	0.89	0.27	-0.57	-0.26	0.27	-0.33	-0.39	-0.25	NA	-0.49	-0.20	-0.09	0.70	NA
Th	-0.69	-0.56	0.13	0.95	0.68	0.15	0.41	0.77	0.58	NA	0.72	0.55	0.67	-0.50	NA
Sr	0.94	0.93	0.13	-0.45	-0.39	0.02	-0.24	-0.53	-0.48	NA	-0.34	-0.41	-0.17	0.66	NA
Cd	0.81	0.74	0.20	-0.47	-0.30	0.16	-0.23	-0.46	-0.37	NA	-0.40	-0.33	-0.24	0.88	NA
Sb	0.77	0.71	0.39	-0.18	0.10	0.49	-0.11	-0.07	0.00	NA	-0.31	0.06	0.19	0.85	NA
Bi	-0.19	-0.17	0.34	0.69	0.80	0.67	0.32	0.77	0.70	NA	0.25	0.70	0.73	0.32	NA
V	0.83	0.72	0.31	-0.35	-0.01	0.47	-0.31	-0.14	-0.03	NA	-0.40	0.03	0.11	0.88	NA
Ca	0.92	0.98	0.13	-0.53	-0.53	-0.16	-0.16	-0.63	-0.57	NA	-0.33	-0.52	-0.27	0.33	NA
P	0.90	0.90	0.45	-0.35	-0.11	0.33	-0.20	-0.19	-0.10	NA	-0.26	-0.05	0.12	0.56	NA
La	-0.55	-0.39	0.03	0.95	0.50	-0.04	0.45	0.54	0.29	NA	0.73	0.28	0.52	-0.33	NA
Cr	-0.41	-0.38	0.39	0.83	0.95	0.65	0.34	0.96	0.88	NA	0.43	0.88	0.93	-0.17	NA
Mg	-0.53	-0.35	0.15	0.96	0.55	0.00	0.55	0.57	0.33	NA	0.73	0.32	0.57	-0.44	NA
Ba	0.86	0.83	0.23	-0.31	-0.21	0.17	-0.18	-0.37	-0.33	NA	-0.28	-0.27	-0.06	0.79	NA
Ti	-0.64	-0.57	0.01	0.88	0.70	0.19	0.33	0.75	0.59	NA	0.59	0.59	0.70	-0.44	NA
B	0.96	0.94	0.06	-0.66	-0.50	-0.04	-0.34	-0.59	-0.47	NA	-0.47	-0.41	-0.22	0.35	NA
Al	-0.41	-0.42	0.39	0.73	0.98	0.73	0.35	0.96	0.92	NA	0.28	0.92	0.91	-0.16	NA
Na	1.00	0.95	0.13	-0.57	-0.34	0.13	-0.35	-0.47	-0.35	NA	-0.46	-0.28	-0.09	0.54	NA
K	0.95	1.00	0.19	-0.40	-0.37	-0.01	-0.14	-0.47	-0.42	NA	-0.28	-0.37	-0.08	0.38	NA
W	0.13	0.19	1.00	0.27	0.49	0.55	0.26	0.43	0.43	NA	0.36	0.40	0.45	0.18	NA
Sc	-0.57	-0.40	0.27	1.00	0.68	0.17	0.57	0.72	0.50	NA	0.73	0.47	0.65	-0.33	NA
Tl	-0.34	-0.37	0.49	0.68	1.00	0.81	0.35	0.95	0.93	NA	0.24	0.93	0.89	-0.01	NA
Se	0.13	-0.01	0.55	0.17	0.81	1.00	0.01	0.71	0.84	NA	-0.20	0.86	0.73	0.41	NA
Te	-0.35	-0.14	0.26	0.57	0.35	0.01	1.00	0.23	0.11	NA	0.23	0.07	0.15	-0.31	NA
Ga	-0.47	-0.47	0.43	0.72	0.95	0.71	0.23	1.00	0.96	NA	0.38	0.95	0.88	-0.14	NA
Cs	-0.35	-0.42	0.43	0.50	0.93	0.84	0.11	0.96	1.00	NA	0.16	0.99	0.84	-0.04	NA
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA	NA
Hf	-0.46	-0.28	0.36	0.73	0.24	-0.20	0.23	0.38	0.16	NA	1.00	0.11	0.32	-0.38	NA
Nb	-0.28	-0.37	0.40	0.47	0.93	0.86	0.07	0.95	0.99	NA	0.11	1.00	0.87	0.00	NA
Rb	-0.09	-0.08	0.45	0.65	0.89	0.73	0.15	0.88	0.84	NA	0.32	0.87	1.00	-0.07	NA
Sn	0.54	0.38	0.18	-0.33	-0.01	0.41	-0.31	-0.14	-0.04	NA	-0.38	0.00	-0.07	1.00	NA
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00
Zr	-0.60	-0.43	0.14	0.92	0.43	-0.12	0.38	0.53	0.28	NA	0.90	0.25	0.47	-0.43	NA
Y	-0.64	-0.44	0.09	0.96	0.47	-0.10	0.61	0.52	0.27	NA	0.75	0.24	0.44	-0.47	NA
Ce	-0.70	-0.52	0.07	0.95	0.50	-0.09	0.61	0.55	0.31	NA	0.74	0.27	0.43	-0.48	NA
In	-0.15	-0.25	0.46	0.31	0.89	0.92	0.19	0.82	0.93	NA	-0.13	0.94	0.77	0.05	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.63	-0.48	0.19	0.98	0.71	0.18	0.50	0.77	0.57	NA	0.69	0.55	0.70	-0.46	NA
Li	-0.56	-0.48	0.24	0.92	0.84	0.39	0.41	0.87	0.72	NA	0.56	0.72	0.83	-0.38	NA
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 1

	Zr	**Y**	**Ce**	**In**	**Re**	**Be**	**Li**	**Pd**	**Pt**
Mo	-0.20	-0.21	-0.24	0.39	NA	-0.10	0.03	NA	NA
Cu	0.78	0.83	0.76	-0.12	NA	0.73	0.60	NA	NA
Pb	-0.45	-0.47	-0.50	-0.13	NA	-0.52	-0.47	NA	NA
Zn	0.17	0.18	0.09	0.00	NA	0.17	0.17	NA	NA
Ag	-0.49	-0.48	-0.48	0.34	NA	-0.39	-0.24	NA	NA
Ni	0.74	0.77	0.72	-0.01	NA	0.69	0.62	NA	NA
Co	0.92	0.99	0.97	-0.02	NA	0.89	0.75	NA	NA
Mn	0.81	0.87	0.83	-0.13	NA	0.74	0.57	NA	NA
Hg	-0.56	-0.54	-0.57	0.15	NA	-0.51	-0.39	NA	NA
Fe	0.62	0.62	0.64	0.78	NA	0.84	0.93	NA	NA
As	0.23	0.20	0.16	0.61	NA	0.40	0.48	NA	NA
U	0.84	0.83	0.85	0.54	NA	0.95	0.98	NA	NA
Au	-0.29	-0.33	-0.34	0.43	NA	-0.19	-0.07	NA	NA
S	-0.65	-0.68	-0.74	-0.05	NA	-0.65	-0.58	NA	NA
Th	0.92	0.92	0.93	0.35	NA	0.99	0.95	NA	NA
Sr	-0.46	-0.49	-0.56	-0.31	NA	-0.56	-0.55	NA	NA
Cd	-0.53	-0.54	-0.59	-0.21	NA	-0.62	-0.59	NA	NA
Sb	-0.34	-0.34	-0.39	0.15	NA	-0.30	-0.22	NA	NA
Bi	0.45	0.50	0.50	0.60	NA	0.63	0.69	NA	NA
V	-0.48	-0.52	-0.56	0.11	NA	-0.46	-0.36	NA	NA
Ca	-0.51	-0.52	-0.60	-0.38	NA	-0.60	-0.63	NA	NA
P	-0.45	-0.49	-0.56	0.04	NA	-0.43	-0.38	NA	NA
La	0.95	0.97	0.96	0.08	NA	0.93	0.85	NA	NA
Cr	0.64	0.65	0.67	0.76	NA	0.86	0.95	NA	NA
Mg	0.94	0.98	0.96	0.16	NA	0.95	0.88	NA	NA
Ba	-0.37	-0.39	-0.45	-0.18	NA	-0.45	-0.42	NA	NA
Ti	0.85	0.85	0.87	0.40	NA	0.94	0.95	NA	NA
B	-0.65	-0.68	-0.75	-0.26	NA	-0.69	-0.66	NA	NA
Al	0.50	0.55	0.57	0.87	NA	0.78	0.91	NA	NA
Na	-0.60	-0.64	-0.70	-0.15	NA	-0.63	-0.56	NA	NA
K	-0.43	-0.44	-0.52	-0.25	NA	-0.48	-0.48	NA	NA
W	0.14	0.09	0.07	0.46	NA	0.19	0.24	NA	NA
Sc	0.92	0.96	0.95	0.31	NA	0.98	0.92	NA	NA
Tl	0.43	0.47	0.50	0.89	NA	0.71	0.84	NA	NA
Se	-0.12	-0.10	-0.09	0.92	NA	0.18	0.39	NA	NA
Te	0.38	0.61	0.61	0.19	NA	0.50	0.41	NA	NA
Ga	0.53	0.52	0.55	0.82	NA	0.77	0.87	NA	NA
Cs	0.28	0.27	0.31	0.93	NA	0.57	0.72	NA	NA
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.90	0.75	0.74	-0.13	NA	0.69	0.56	NA	NA
Nb	0.25	0.24	0.27	0.94	NA	0.55	0.72	NA	NA
Rb	0.47	0.44	0.43	0.77	NA	0.70	0.83	NA	NA
Sn	-0.43	-0.47	-0.48	0.05	NA	-0.46	-0.38	NA	NA
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	1.00	0.94	0.94	0.02	NA	0.90	0.80	NA	NA
Y	0.94	1.00	0.99	0.08	NA	0.94	0.83	NA	NA
Ce	0.94	0.99	1.00	0.12	NA	0.94	0.84	NA	NA
In	0.02	0.08	0.12	1.00	NA	0.38	0.57	NA	NA
Re	NA	NA	NA	NA	1.00	NA	NA	NA	NA
Be	0.90	0.94	0.94	0.38	NA	1.00	0.97	NA	NA
Li	0.80	0.83	0.84	0.57	NA	0.97	1.00	NA	NA
Pd	NA	NA	NA	NA	NA	NA	NA	1.00	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	1.00

Statistical correlations of all 53 elements analyzed - 2mm size

Site 2

	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Hg	Fe	As	U	Au
Mo	1.00	-0.37	0.99	-0.28	0.90	-0.34	-0.43	-0.51	0.95	-0.41	-0.44	-0.47	-0.25
Cu	-0.37	1.00	-0.36	0.94	-0.25	1.00	0.98	0.98	-0.43	0.64	0.67	0.64	0.84
Pb	0.99	-0.36	1.00	-0.29	0.86	-0.33	-0.40	-0.50	0.94	-0.48	-0.50	-0.53	-0.22
Zn	-0.28	0.94	-0.29	1.00	-0.16	0.96	0.88	0.93	-0.29	0.67	0.65	0.61	0.66
Ag	0.90	-0.25	0.86	-0.16	1.00	-0.23	-0.34	-0.38	0.86	-0.03	-0.11	-0.10	-0.06
Ni	-0.34	1.00	-0.33	0.96	-0.23	1.00	0.97	0.98	-0.41	0.65	0.68	0.64	0.81
Co	-0.43	0.98	-0.40	0.88	-0.34	0.97	1.00	0.98	-0.52	0.57	0.64	0.61	0.86
Mn	-0.51	0.98	-0.50	0.93	-0.38	0.98	0.98	1.00	-0.57	0.68	0.71	0.69	0.80
Hg	0.95	-0.43	0.94	-0.29	0.86	-0.41	-0.52	-0.57	1.00	-0.44	-0.53	-0.54	-0.36
Fe	-0.41	0.64	-0.48	0.67	-0.03	0.65	0.57	0.68	-0.44	1.00	0.96	0.98	0.54
As	-0.44	0.67	-0.50	0.65	-0.11	0.68	0.64	0.71	-0.53	0.96	1.00	0.98	0.56
U	-0.47	0.64	-0.53	0.61	-0.10	0.64	0.61	0.69	-0.54	0.98	0.98	1.00	0.59
Au	-0.25	0.84	-0.22	0.66	-0.06	0.81	0.86	0.80	-0.36	0.54	0.56	0.59	1.00
S	0.64	-0.53	0.60	-0.28	0.56	-0.50	-0.66	-0.61	0.83	-0.38	-0.53	-0.53	-0.63
Th	-0.56	0.90	-0.56	0.82	-0.32	0.90	0.91	0.94	-0.66	0.83	0.88	0.87	0.81
Sr	0.55	-0.23	0.57	-0.08	0.25	-0.21	-0.29	-0.32	0.69	-0.66	-0.74	-0.78	-0.39
Cd	0.99	-0.39	1.00	-0.30	0.84	-0.36	-0.43	-0.53	0.95	-0.51	-0.52	-0.56	-0.28
Sb	0.58	0.40	0.55	0.43	0.74	0.43	0.34	0.28	0.43	0.41	0.43	0.38	0.45
Bi	0.17	0.50	0.13	0.46	0.46	0.51	0.49	0.46	-0.01	0.69	0.71	0.72	0.65
V	0.95	-0.48	0.93	-0.31	0.89	-0.45	-0.56	-0.60	0.98	-0.37	-0.45	-0.46	-0.41
Ca	-0.13	0.06	-0.09	0.14	-0.39	0.05	0.03	0.05	0.07	-0.46	-0.54	-0.54	-0.15
P	0.49	-0.24	0.45	0.08	0.46	-0.20	-0.37	-0.29	0.68	-0.11	-0.29	-0.28	-0.45
La	-0.63	0.62	-0.62	0.42	-0.39	0.59	0.70	0.69	-0.78	0.67	0.75	0.79	0.75
Cr	-0.41	0.79	-0.46	0.81	-0.07	0.79	0.72	0.81	-0.44	0.97	0.95	0.95	0.66
Mg	-0.47	0.98	-0.47	0.92	-0.28	0.98	0.95	0.98	-0.53	0.77	0.81	0.78	0.80
Ba	0.62	0.46	0.62	0.54	0.66	0.49	0.40	0.33	0.53	0.21	0.19	0.15	0.45
Ti	-0.47	0.96	-0.46	0.81	-0.33	0.94	0.97	0.96	-0.58	0.65	0.72	0.70	0.89
B	0.93	-0.49	0.94	-0.39	0.70	-0.47	-0.54	-0.62	0.95	-0.68	-0.72	-0.75	-0.43
Al	-0.44	0.70	-0.50	0.75	-0.11	0.72	0.66	0.75	-0.49	0.98	0.95	0.96	0.58
Na	0.78	-0.45	0.80	-0.33	0.51	-0.43	-0.51	-0.57	0.87	-0.74	-0.79	-0.83	-0.48
K	-0.43	0.99	-0.41	0.91	-0.36	0.98	0.99	0.98	-0.50	0.56	0.62	0.57	0.80
W	-0.31	0.90	-0.32	0.85	-0.08	0.91	0.90	0.90	-0.43	0.80	0.84	0.83	0.85
Sc	-0.36	0.85	-0.40	0.84	-0.06	0.86	0.81	0.86	-0.43	0.93	0.92	0.92	0.76
Tl	-0.48	0.86	-0.50	0.82	-0.19	0.86	0.85	0.90	-0.56	0.90	0.90	0.91	0.80
Se	0.28	-0.09	0.17	0.13	0.59	-0.05	-0.22	-0.11	0.34	0.57	0.43	0.46	-0.13
Te	0.03	0.00	-0.01	-0.10	0.23	-0.02	-0.04	-0.02	0.00	0.28	0.26	0.31	0.15
Ga	-0.46	0.49	-0.52	0.43	-0.08	0.48	0.48	0.55	-0.55	0.92	0.92	0.97	0.54
Cs	-0.59	0.75	-0.61	0.63	-0.30	0.74	0.78	0.81	-0.71	0.85	0.89	0.92	0.78
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.32	0.94	-0.27	0.83	-0.32	0.93	0.97	0.92	-0.44	0.40	0.49	0.45	0.81
Nb	-0.19	0.29	-0.29	0.36	0.22	0.30	0.21	0.32	-0.21	0.91	0.84	0.88	0.29
Rb	-0.54	0.91	-0.55	0.84	-0.30	0.91	0.91	0.94	-0.62	0.85	0.87	0.87	0.82
Sn	0.98	-0.40	0.98	-0.37	0.88	-0.38	-0.43	-0.54	0.89	-0.45	-0.44	-0.47	-0.21
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.38	0.97	-0.36	0.87	-0.30	0.97	0.99	0.96	-0.51	0.59	0.68	0.63	0.82
Y	-0.53	0.87	-0.53	0.73	-0.28	0.85	0.89	0.90	-0.65	0.79	0.84	0.85	0.88
Ce	-0.62	0.62	-0.62	0.43	-0.37	0.59	0.69	0.69	-0.77	0.70	0.78	0.82	0.74
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.45	0.80	-0.48	0.84	-0.22	0.83	0.78	0.84	-0.51	0.86	0.89	0.85	0.60
Li	-0.47	0.83	-0.51	0.85	-0.18	0.84	0.79	0.87	-0.51	0.94	0.92	0.93	0.68
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 2

	S	**Th**	**Sr**	**Cd**	**Sb**	**Bi**	**V**	**Ca**	**P**	**La**	**Cr**	**Mg**	**Ba**	**Ti**
Mo	0.64	-0.56	0.55	0.99	0.58	0.17	0.95	-0.13	0.49	-0.63	-0.41	-0.47	0.62	-0.47
Cu	-0.53	0.90	-0.23	-0.39	0.40	0.50	-0.48	0.06	-0.24	0.62	0.79	0.98	0.46	0.96
Pb	0.60	-0.56	0.57	1.00	0.55	0.13	0.93	-0.09	0.45	-0.62	-0.46	-0.47	0.62	-0.46
Zn	-0.28	0.82	-0.08	-0.30	0.43	0.46	-0.31	0.14	0.08	0.42	0.81	0.92	0.54	0.81
Ag	0.56	-0.32	0.25	0.84	0.74	0.46	0.89	-0.39	0.46	-0.39	-0.07	-0.28	0.66	-0.33
Ni	-0.50	0.90	-0.21	-0.36	0.43	0.51	-0.45	0.05	-0.20	0.59	0.79	0.98	0.49	0.94
Co	-0.66	0.91	-0.29	-0.43	0.34	0.49	-0.56	0.03	-0.37	0.70	0.72	0.95	0.40	0.97
Mn	-0.61	0.94	-0.32	-0.53	0.28	0.46	-0.60	0.05	-0.29	0.69	0.81	0.98	0.33	0.96
Hg	0.83	-0.66	0.69	0.95	0.43	-0.01	0.98	0.07	0.68	-0.78	-0.44	-0.53	0.53	-0.58
Fe	-0.38	0.83	-0.66	-0.51	0.41	0.69	-0.37	-0.46	-0.11	0.67	0.97	0.77	0.21	0.65
As	-0.53	0.88	-0.74	-0.52	0.43	0.71	-0.45	-0.54	-0.29	0.75	0.95	0.81	0.19	0.72
U	-0.53	0.87	-0.78	-0.56	0.38	0.72	-0.46	-0.54	-0.28	0.79	0.95	0.78	0.15	0.70
Au	-0.63	0.81	-0.39	-0.28	0.45	0.65	-0.41	-0.15	-0.45	0.75	0.66	0.80	0.45	0.89
S	1.00	-0.72	0.75	0.65	0.04	-0.36	0.81	0.35	0.88	-0.92	-0.41	-0.58	0.17	-0.73
Th	-0.72	1.00	-0.62	-0.60	0.34	0.63	-0.64	-0.26	-0.42	0.86	0.90	0.96	0.25	0.94
Sr	0.75	-0.62	1.00	0.62	-0.06	-0.55	0.58	0.75	0.65	-0.86	-0.56	-0.39	0.26	-0.43
Cd	0.65	-0.60	0.62	1.00	0.52	0.08	0.94	-0.05	0.49	-0.67	-0.48	-0.50	0.60	-0.50
Sb	0.04	0.34	-0.06	0.52	1.00	0.84	0.47	-0.51	0.16	0.14	0.46	0.38	0.90	0.33
Bi	-0.36	0.63	-0.55	0.08	0.84	1.00	0.08	-0.73	-0.15	0.59	0.70	0.54	0.66	0.52
V	0.81	-0.64	0.58	0.94	0.47	0.08	1.00	-0.07	0.70	-0.74	-0.39	-0.55	0.53	0.63
Ca	0.35	-0.26	0.75	-0.05	-0.51	-0.73	-0.07	1.00	0.35	-0.47	-0.33	-0.07	-0.14	-0.10
P	0.88	-0.42	0.65	0.49	0.16	-0.15	0.70	0.35	1.00	-0.73	-0.10	-0.29	0.36	-0.51
La	-0.92	0.86	-0.86	-0.67	0.14	0.59	-0.74	-0.47	-0.73	1.00	0.68	0.70	-0.04	0.79
Cr	-0.41	0.90	-0.56	-0.48	0.46	0.70	-0.39	-0.33	-0.10	0.68	1.00	0.88	0.33	0.76
Mg	-0.58	0.96	-0.39	-0.50	0.38	0.54	-0.55	-0.07	-0.29	0.70	0.88	1.00	0.36	0.96
Ba	0.17	0.25	0.26	0.60	0.90	0.66	0.53	-0.14	0.36	-0.04	0.33	0.36	1.00	0.30
Ti	-0.73	0.94	-0.43	-0.50	0.33	0.52	-0.63	-0.10	-0.51	0.79	0.76	0.96	0.30	1.00
B	0.75	-0.76	0.78	0.96	0.28	-0.20	0.91	0.20	0.55	-0.83	-0.65	0.62	0.43	-0.62
Al	-0.43	0.88	-0.64	-0.52	0.41	0.70	-0.40	-0.40	-0.09	0.70	0.98	0.82	0.26	0.69
Na	0.81	-0.78	0.93	0.83	0.08	-0.43	0.79	0.47	0.63	-0.92	-0.68	-0.60	0.30	-0.61
K	-0.59	0.88	-0.21	-0.43	0.31	0.41	-0.55	0.12	-0.30	0.62	0.71	0.95	0.39	0.95
W	-0.60	0.95	-0.51	-0.36	0.57	0.78	-0.40	-0.32	-0.27	0.77	0.89	0.93	0.51	0.90
Sc	-0.47	0.94	-0.54	-0.43	0.52	0.75	-0.39	-0.33	-0.16	0.72	0.99	0.92	0.42	0.83
Tl	-0.61	0.98	-0.61	-0.54	0.41	0.71	-0.52	-0.30	-0.28	0.82	0.95	0.93	0.33	0.87
Se	0.44	0.06	-0.18	0.18	0.48	0.48	0.46	-0.46	0.56	-0.10	0.46	0.03	0.31	-0.19
Te	-0.11	0.11	-0.33	-0.04	0.13	0.25	-0.03	-0.38	-0.35	0.22	0.18	0.08	-0.09	0.13
Ga	-0.58	0.79	-0.89	-0.55	0.33	0.74	-0.45	-0.67	-0.35	0.83	0.86	0.64	0.06	0.58
Cs	-0.78	0.96	-0.80	-0.65	0.28	0.68	-0.66	-0.44	-0.52	0.95	0.87	0.84	0.12	0.85
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.63	0.81	-0.17	-0.30	0.35	0.43	-0.49	0.09	-0.35	0.61	0.58	0.87	0.46	0.91
Nb	-0.15	0.56	-0.67	-0.30	0.43	0.71	-0.09	-0.64	0.05	0.49	0.81	0.45	0.17	0.30
Rb	-0.67	1.00	-0.58	-0.59	0.35	0.64	-0.60	-0.22	-0.35	0.83	0.92	0.96	0.29	0.93
Sn	0.51	-0.54	0.43	0.97	0.57	0.21	0.90	-0.24	0.33	-0.52	-0.45	-0.50	0.58	-0.46
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.68	0.92	-0.34	-0.39	0.40	0.54	-0.54	-0.07	-0.39	0.71	0.73	0.95	0.43	0.96
Y	-0.78	0.98	-0.66	-0.58	0.34	0.67	-0.64	-0.32	-0.52	0.92	0.86	0.92	0.24	0.94
Ce	-0.91	0.87	-0.88	-0.67	0.16	0.62	-0.72	-0.51	-0.71	1.00	0.70	0.71	-0.03	0.78
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.48	0.91	-0.51	-0.50	0.41	0.62	-0.45	-0.26	-0.09	0.66	0.92	0.88	0.34	0.76
Li	-0.49	0.94	-0.55	-0.53	0.41	0.67	-0.46	-0.27	-0.13	0.72	0.98	0.91	0.32	0.80
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 2

	B	Al	Na	K	W	Sc	Tl	Se	Te	Ga	Cs	Ge	Hf	Nb	Rb
Mo	0.93	-0.44	0.78	-0.43	-0.31	-0.36	-0.48	0.28	0.03	-0.46	-0.59	NA	-0.32	-0.19	-0.54
Cu	-0.49	0.70	-0.45	0.99	0.90	0.85	0.86	-0.09	0.00	0.49	0.75	NA	0.94	0.29	0.91
Pb	0.94	-0.50	0.80	-0.41	-0.32	-0.40	-0.50	0.17	-0.01	-0.52	-0.61	NA	-0.27	-0.29	-0.55
Zn	-0.39	0.75	-0.33	0.91	0.85	0.84	0.82	0.13	-0.10	0.43	0.63	NA	0.83	0.36	0.84
Ag	0.70	-0.11	0.51	-0.36	-0.08	-0.06	-0.19	0.59	0.23	-0.08	-0.30	NA	-0.32	0.22	-0.30
Ni	-0.47	0.72	-0.43	0.98	0.91	0.86	0.86	-0.05	-0.02	0.48	0.74	NA	0.93	0.30	0.91
Co	-0.54	0.66	-0.51	0.99	0.90	0.81	0.85	-0.22	-0.04	0.48	0.78	NA	0.97	0.21	0.91
Mn	-0.62	0.75	-0.57	0.98	0.90	0.86	0.90	-0.11	-0.02	0.55	0.81	NA	0.92	0.32	0.94
Hg	0.95	-0.49	0.87	-0.50	-0.43	-0.43	-0.56	0.34	0.00	-0.55	-0.71	NA	-0.44	-0.21	-0.62
Fe	-0.68	0.98	-0.74	0.56	0.80	0.93	0.90	0.57	0.28	0.92	0.85	NA	0.40	0.91	0.85
As	-0.72	0.95	-0.79	0.62	0.84	0.92	0.90	0.43	0.26	0.92	0.89	NA	0.49	0.84	0.87
U	-0.75	0.96	-0.83	0.57	0.83	0.92	0.91	0.46	0.31	0.97	0.92	NA	0.45	0.88	0.87
Au	-0.43	0.58	-0.48	0.80	0.85	0.76	0.80	-0.13	0.15	0.54	0.78	NA	0.81	0.29	0.82
S	0.75	-0.43	0.81	-0.59	-0.60	-0.47	-0.61	0.44	-0.11	-0.58	-0.78	NA	-0.63	-0.15	-0.67
Th	-0.76	0.88	-0.78	0.88	0.95	0.94	0.98	0.06	0.11	0.79	0.96	NA	0.81	0.56	1.00
Sr	0.78	-0.64	0.93	-0.21	-0.51	-0.54	-0.61	-0.18	-0.33	-0.89	-0.80	NA	-0.17	-0.67	-0.58
Cd	0.96	-0.52	0.83	-0.43	-0.36	-0.43	-0.54	0.18	-0.04	-0.55	-0.65	NA	-0.30	-0.30	-0.59
Sb	0.28	0.41	0.08	0.31	0.57	0.52	0.41	0.48	0.13	0.33	0.28	NA	0.35	0.43	0.35
Bi	-0.20	0.70	-0.43	0.41	0.78	0.75	0.71	0.48	0.25	0.74	0.68	NA	0.43	0.71	0.64
V	0.91	-0.40	0.79	-0.55	-0.40	-0.39	-0.52	0.46	-0.03	-0.45	-0.66	NA	-0.49	-0.09	-0.60
Ca	0.20	-0.40	0.47	0.12	-0.32	-0.33	-0.30	-0.46	-0.38	-0.67	-0.44	NA	0.09	-0.64	-0.22
P	0.55	-0.09	0.63	-0.30	-0.27	-0.16	-0.28	0.56	-0.35	-0.35	-0.52	NA	-0.35	0.05	-0.35
La	-0.83	0.70	-0.92	0.62	0.77	0.72	0.82	-0.10	0.22	0.83	0.95	NA	0.61	0.49	0.83
Cr	-0.65	0.98	-0.68	0.71	0.89	0.99	0.95	0.46	0.18	0.86	0.87	NA	0.58	0.81	0.92
Mg	-0.62	0.82	-0.60	0.95	0.93	0.92	0.93	0.03	0.08	0.64	0.84	NA	0.87	0.45	0.96
Ba	0.43	0.26	0.30	0.39	0.51	0.42	0.33	0.31	-0.09	0.06	0.12	NA	0.46	0.17	0.29
Ti	-0.62	0.69	-0.61	0.95	0.90	0.83	0.87	-0.19	0.13	0.58	0.85	NA	0.91	0.30	0.93
B	1.00	-0.70	0.95	-0.51	-0.55	-0.62	-0.71	0.05	-0.12	-0.75	-0.83	NA	-0.40	-0.50	-0.74
Al	-0.70	1.00	-0.74	0.64	0.87	0.96	0.94	0.50	0.12	0.90	0.88	NA	0.52	0.86	0.90
Na	0.95	-0.74	1.00	-0.45	-0.63	-0.66	-0.75	-0.05	-0.25	-0.88	-0.90	NA	-0.37	-0.62	-0.75
K	-0.51	0.64	-0.45	1.00	0.87	0.79	0.82	-0.21	-0.09	0.42	0.72	NA	0.97	0.18	0.88
W	-0.55	0.87	-0.63	0.87	1.00	0.95	0.97	0.17	0.04	0.75	0.90	NA	0.83	0.57	0.96
Sc	-0.62	0.96	-0.66	0.79	0.95	1.00	0.98	0.37	0.13	0.83	0.90	NA	0.68	0.74	0.95
Tl	-0.71	0.94	-0.75	0.82	0.97	0.98	1.00	0.23	0.11	0.85	0.95	NA	0.74	0.68	0.99
Se	0.05	0.50	-0.05	-0.21	0.17	0.37	0.23	1.00	0.17	0.46	0.12	NA	-0.34	0.81	0.10
Te	-0.12	0.12	-0.25	-0.09	0.04	0.13	0.11	0.17	1.00	0.33	0.20	NA	-0.17	0.32	0.08
Ga	-0.75	0.90	-0.88	0.42	0.75	0.83	0.85	0.46	0.33	1.00	0.91	NA	0.32	0.89	0.79
Cs	-0.83	0.88	-0.90	0.72	0.90	0.90	0.95	0.12	0.20	0.91	1.00	NA	0.66	0.66	0.95
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA
Hf	-0.40	0.52	-0.37	0.97	0.83	0.68	0.74	-0.34	-0.17	0.32	0.66	NA	1.00	0.04	0.81
Nb	-0.50	0.86	-0.62	0.18	0.57	0.74	0.68	0.81	0.32	0.89	0.66	NA	0.04	1.00	0.58
Rb	-0.74	0.90	-0.75	0.88	0.96	0.95	0.99	0.10	0.08	0.79	0.95	NA	0.81	0.58	1.00
Sn	0.89	-0.48	0.70	-0.45	-0.30	-0.39	-0.48	0.19	0.07	-0.42	-0.54	NA	-0.31	-0.22	-0.54
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.52	0.68	-0.53	0.98	0.92	0.81	0.85	-0.18	-0.03	0.51	0.79	NA	0.97	0.25	0.91
Y	-0.74	0.83	-0.79	0.84	0.94	0.91	0.96	0.00	0.19	0.80	0.97	NA	0.80	0.53	0.97
Ce	-0.83	0.73	-0.93	0.61	0.79	0.74	0.83	-0.05	0.22	0.86	0.96	NA	0.59	0.54	0.84
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.65	0.94	-0.65	0.79	0.91	0.93	0.92	0.31	-0.16	0.76	0.84	NA	0.70	0.66	0.92
Li	-0.69	0.98	-0.71	0.78	0.93	0.98	0.98	0.36	0.08	0.83	0.90	NA	0.67	0.74	0.96
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 2

	Sn	**Ta**	**Zr**	**Y**	**Ce**	**In**	**Re**	**Be**	**Li**	**Pd**	**Pt**
Mo	0.98	NA	-0.38	-0.53	-0.62	NA	NA	-0.45	-0.47	NA	NA
Cu	-0.40	NA	0.97	0.87	0.62	NA	NA	0.80	0.83	NA	NA
Pb	0.98	NA	-0.36	-0.53	-0.62	NA	NA	-0.48	-0.51	NA	NA
Zn	-0.37	NA	0.87	0.73	0.43	NA	NA	0.84	0.85	NA	NA
Ag	0.88	NA	-0.30	-0.28	-0.37	NA	NA	-0.22	-0.18	NA	NA
Ni	-0.38	NA	0.97	0.85	0.59	NA	NA	0.83	0.84	NA	NA
Co	-0.43	NA	0.99	0.89	0.69	NA	NA	0.78	0.79	NA	NA
Mn	-0.54	NA	0.96	0.90	0.69	NA	NA	0.84	0.87	NA	NA
Hg	0.89	NA	-0.51	-0.65	-0.77	NA	NA	-0.51	-0.51	NA	NA
Fe	-0.45	NA	0.59	0.79	0.70	NA	NA	0.86	0.94	NA	NA
As	-0.44	NA	0.68	0.84	0.78	NA	NA	0.89	0.92	NA	NA
U	-0.47	NA	0.63	0.85	0.82	NA	NA	0.85	0.93	NA	NA
Au	-0.21	NA	0.82	0.88	0.74	NA	NA	0.60	0.68	NA	NA
S	0.51	NA	-0.68	-0.78	-0.91	NA	NA	-0.48	-0.49	NA	NA
Th	-0.54	NA	0.92	0.98	0.87	NA	NA	0.91	0.94	NA	NA
Sr	0.43	NA	-0.34	-0.66	-0.88	NA	NA	-0.51	-0.55	NA	NA
Cd	0.97	NA	-0.39	-0.58	-0.67	NA	NA	-0.50	-0.53	NA	NA
Sb	0.57	NA	0.40	0.34	0.16	NA	NA	0.41	0.41	NA	NA
Bi	0.21	NA	0.54	0.67	0.62	NA	NA	0.62	0.67	NA	NA
V	0.90	NA	-0.54	-0.64	-0.72	NA	NA	-0.45	-0.46	NA	NA
Ca	-0.24	NA	-0.07	-0.32	-0.51	NA	NA	-0.26	-0.27	NA	NA
P	0.33	NA	-0.39	-0.52	-0.71	NA	NA	-0.09	-0.13	NA	NA
La	-0.52	NA	0.71	0.92	1.00	NA	NA	0.66	0.72	NA	NA
Cr	-0.45	NA	0.73	0.86	0.70	NA	NA	0.92	0.98	NA	NA
Mg	-0.50	NA	0.95	0.92	0.71	NA	NA	0.88	0.91	NA	NA
Ba	0.58	NA	0.43	0.24	-0.03	NA	NA	0.34	0.32	NA	NA
Ti	-0.46	NA	0.96	0.94	0.78	NA	NA	0.76	0.80	NA	NA
B	0.89	NA	-0.52	-0.74	-0.83	NA	NA	0.55	0.69	NA	NA
Al	-0.48	NA	0.68	0.83	0.73	NA	NA	0.94	0.98	NA	NA
Na	0.70	NA	-0.53	-0.79	-0.93	NA	NA	-0.65	-0.71	NA	NA
K	-0.45	NA	0.98	0.84	0.61	NA	NA	0.79	0.78	NA	NA
W	-0.30	NA	0.92	0.94	0.79	NA	NA	0.91	0.93	NA	NA
Sc	-0.39	NA	0.81	0.91	0.74	NA	NA	0.93	0.98	NA	NA
Tl	-0.48	NA	0.85	0.96	0.83	NA	NA	0.92	0.98	NA	NA
Se	0.19	NA	-0.18	0.00	-0.05	NA	NA	0.31	0.36	NA	NA
Te	0.07	NA	-0.03	0.19	0.22	NA	NA	-0.16	0.08	NA	NA
Ga	-0.42	NA	0.51	0.80	0.86	NA	NA	0.76	0.83	NA	NA
Cs	-0.54	NA	0.79	0.97	0.96	NA	NA	0.84	0.90	NA	NA
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.31	NA	0.97	0.80	0.59	NA	NA	0.70	0.67	NA	NA
Nb	-0.22	NA	0.25	0.53	0.54	NA	NA	0.66	0.74	NA	NA
Rb	-0.54	NA	0.91	0.97	0.84	NA	NA	0.92	0.96	NA	NA
Sn	1.00	NA	-0.38	-0.49	-0.52	NA	NA	-0.48	-0.50	NA	NA
Ta	NA	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.38	NA	1.00	0.89	0.70	NA	NA	0.81	0.80	NA	NA
Y	-0.49	NA	0.89	1.00	0.92	NA	NA	0.83	0.89	NA	NA
Ce	-0.52	NA	0.70	0.92	1.00	NA	NA	0.69	0.74	NA	NA
In	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA
Be	-0.48	NA	0.81	0.83	0.69	NA	NA	1.00	0.96	NA	NA
Li	-0.50	NA	0.80	0.89	0.74	NA	NA	0.96	1.00	NA	NA
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00

Statistical correlations of all 53 elements analyzed - 2mm size

Site 3

	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Hg	Fe	As	U	Au	S
Mo	1.00	0.95	0.94	0.84	0.97	0.92	0.89	0.94	0.98	0.89	0.86	0.95	0.83	0.89
Cu	0.95	1.00	0.98	0.92	0.99	0.96	0.91	1.00	0.97	0.80	0.90	0.95	0.65	0.96
Pb	0.94	0.98	1.00	0.84	0.98	0.89	0.84	0.99	0.98	0.76	0.84	0.90	0.66	0.92
Zn	0.84	0.92	0.84	1.00	0.89	0.97	0.92	0.91	0.82	0.72	0.93	0.94	0.48	0.96
Ag	0.97	0.99	0.98	0.89	1.00	0.94	0.88	0.99	0.99	0.80	0.90	0.94	0.73	0.95
Ni	0.92	0.96	0.89	0.97	0.94	1.00	0.98	0.94	0.89	0.85	0.98	0.99	0.59	0.93
Co	0.89	0.91	0.84	0.92	0.88	0.98	1.00	0.89	0.83	0.91	0.96	0.98	0.55	0.85
Mn	0.94	1.00	0.99	0.91	0.99	0.94	0.89	1.00	0.96	0.77	0.88	0.93	0.62	0.96
Hg	0.98	0.97	0.98	0.82	0.99	0.89	0.83	0.96	1.00	0.81	0.84	0.90	0.80	0.91
Fe	0.89	0.80	0.76	0.72	0.80	0.85	0.91	0.77	0.81	1.00	0.81	0.90	0.72	0.67
As	0.86	0.90	0.84	0.93	0.90	0.98	0.96	0.88	0.84	0.81	1.00	0.94	0.57	0.89
U	0.95	0.95	0.90	0.94	0.94	0.99	0.98	0.93	0.90	0.90	0.94	1.00	0.65	0.91
Au	0.83	0.65	0.66	0.48	0.73	0.59	0.55	0.62	0.80	0.72	0.57	0.65	1.00	0.59
S	0.89	0.96	0.92	0.96	0.95	0.93	0.85	0.96	0.91	0.67	0.89	0.91	0.59	1.00
Th	0.01	-0.20	-0.24	-0.26	-0.20	-0.09	0.08	-0.25	-0.14	0.41	-0.10	0.01	0.17	-0.38
Sr	0.65	0.82	0.83	0.79	0.80	0.71	0.59	0.84	0.75	0.31	0.68	0.65	0.32	0.89
Cd	0.94	1.00	0.98	0.92	0.99	0.95	0.89	1.00	0.96	0.76	0.90	0.94	0.62	0.97
Sb	0.95	1.00	0.99	0.90	0.99	0.93	0.88	1.00	0.97	0.76	0.88	0.93	0.65	0.96
Bi	0.92	0.95	0.96	0.82	0.97	0.91	0.87	0.95	0.95	0.78	0.91	0.89	0.68	0.88
V	-0.62	-0.45	-0.37	-0.45	-0.46	-0.59	-0.69	-0.40	-0.47	-0.88	-0.57	-0.66	-0.61	-0.33
Ca	0.31	0.52	0.53	0.60	0.49	0.43	0.28	0.56	0.42	-0.07	0.39	0.35	0.00	0.68
P	0.72	0.87	0.89	0.79	0.85	0.74	0.64	0.90	0.80	0.41	0.68	0.71	0.36	0.90
La	0.23	0.04	-0.01	-0.02	0.04	0.17	0.33	-0.01	0.08	0.62	0.16	0.26	0.29	-0.15
Cr	0.77	0.64	0.58	0.59	0.65	0.74	0.83	0.60	0.65	0.97	0.72	0.80	0.65	0.50
Mg	0.84	0.80	0.71	0.84	0.78	0.92	0.96	0.76	0.74	0.94	0.90	0.94	0.58	0.74
Ba	0.76	0.85	0.75	0.99	0.81	0.93	0.88	0.83	0.73	0.65	0.90	0.90	0.40	0.92
Ti	0.93	0.92	0.88	0.85	0.90	0.94	0.97	0.91	0.88	0.95	0.88	0.97	0.62	0.82
B	0.88	0.96	0.96	0.89	0.96	0.88	0.79	0.97	0.93	0.62	0.83	0.86	0.57	0.97
Al	0.24	0.07	0.01	0.02	0.06	0.21	0.37	0.02	0.09	0.64	0.20	0.29	0.28	-0.12
Na	0.81	0.88	0.79	0.99	0.86	0.95	0.89	0.86	0.79	0.69	0.93	0.92	0.50	0.95
K	0.73	0.86	0.78	0.98	0.82	0.91	0.84	0.85	0.74	0.57	0.90	0.86	0.37	0.94
W	-0.85	-0.83	-0.84	-0.72	-0.89	-0.77	-0.66	-0.82	-0.90	-0.59	-0.79	-0.74	-0.81	-0.84
Sc	0.92	0.81	0.77	0.69	0.82	0.83	0.88	0.77	0.84	0.99	0.79	0.89	0.79	0.67
Tl	0.97	0.99	0.99	0.88	0.99	0.93	0.89	0.99	0.98	0.82	0.88	0.94	0.70	0.94
Se	0.97	0.97	0.95	0.87	0.96	0.93	0.91	0.96	0.95	0.89	0.85	0.96	0.70	0.90
Te	0.85	0.96	0.93	0.95	0.94	0.93	0.86	0.96	0.88	0.64	0.90	0.89	0.50	0.98
Ga	0.10	-0.09	-0.14	-0.13	-0.08	0.06	0.23	-0.14	-0.04	0.52	0.07	0.14	0.21	-0.27
Cs	0.64	0.50	0.42	0.46	0.49	0.62	0.73	0.45	0.51	0.91	0.60	0.69	0.57	0.34
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.39	-0.56	-0.52	-0.67	-0.48	-0.52	-0.47	-0.59	-0.40	-0.22	-0.39	-0.53	0.05	-0.66
Nb	-0.61	-0.76	-0.73	-0.84	-0.72	-0.71	-0.60	-0.78	-0.65	-0.33	-0.62	-0.68	-0.25	-0.89
Rb	0.03	-0.04	-0.15	0.08	-0.08	0.20	0.36	-0.10	-0.12	0.45	0.28	0.21	-0.04	-0.15
Sn	0.94	0.99	1.00	0.86	0.99	0.90	0.84	0.99	0.97	0.75	0.85	0.90	0.65	0.94
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.68	-0.83	-0.78	-0.93	-0.80	-0.82	-0.72	-0.84	-0.72	-0.42	-0.79	-0.77	-0.33	-0.94
Y	0.98	0.92	0.90	0.80	0.93	0.91	0.92	0.90	0.94	0.96	0.86	0.95	0.77	0.81
Ce	0.23	0.04	0.00	-0.02	0.04	0.17	0.34	0.00	0.08	0.62	0.17	0.26	0.30	-0.15
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.99	0.94	0.92	0.83	0.95	0.93	0.92	0.92	0.96	0.94	0.88	0.96	0.80	0.86
Li	-0.11	-0.30	-0.32	-0.37	-0.29	-0.18	0.00	-0.34	-0.24	0.31	-0.15	-0.10	0.06	-0.49
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 3

	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B
Mo	0.01	0.65	0.94	0.95	0.92	-0.62	0.31	0.72	0.23	0.77	0.84	0.76	0.93	0.88
Cu	-0.20	0.82	1.00	1.00	0.95	-0.45	0.52	0.87	0.04	0.64	0.80	0.85	0.92	0.96
Pb	-0.24	0.83	0.98	0.99	0.96	-0.37	0.53	0.89	-0.01	0.58	0.71	0.75	0.88	0.96
Zn	-0.26	0.79	0.92	0.90	0.82	-0.45	0.60	0.79	-0.02	0.59	0.84	0.99	0.85	0.89
Ag	-0.20	0.80	0.99	0.99	0.97	-0.46	0.49	0.85	0.04	0.65	0.78	0.81	0.90	0.96
Ni	-0.09	0.71	0.95	0.93	0.91	-0.59	0.43	0.74	0.17	0.74	0.92	0.93	0.94	0.88
Co	0.08	0.59	0.89	0.88	0.87	-0.69	0.28	0.64	0.33	0.83	0.96	0.88	0.97	0.79
Mn	-0.25	0.84	1.00	1.00	0.95	-0.40	0.56	0.90	-0.01	0.60	0.76	0.83	0.91	0.97
Hg	-0.14	0.75	0.96	0.97	0.95	-0.47	0.42	0.80	0.08	0.65	0.74	0.73	0.88	0.93
Fe	0.41	0.31	0.76	0.76	0.78	-0.88	-0.07	0.41	0.62	0.97	0.94	0.65	0.95	0.62
As	-0.10	0.68	0.90	0.88	0.91	-0.57	0.39	0.68	0.16	0.72	0.90	0.90	0.88	0.83
U	0.01	0.65	0.94	0.93	0.89	-0.66	0.35	0.71	0.26	0.80	0.94	0.90	0.97	0.86
Au	0.17	0.32	0.62	0.65	0.68	-0.61	0.00	0.36	0.29	0.65	0.58	0.40	0.62	0.57
S	-0.38	0.89	0.97	0.96	0.88	-0.33	0.68	0.90	-0.15	0.50	0.74	0.92	0.82	0.97
Th	1.00	-0.73	-0.27	-0.26	-0.18	-0.73	-0.91	-0.63	0.96	0.59	0.29	-0.27	0.16	-0.45
Sr	-0.73	1.00	0.85	0.85	0.77	0.13	0.90	0.98	-0.54	0.09	0.38	0.74	0.55	0.94
Cd	-0.27	0.85	1.00	1.00	0.95	-0.39	0.58	0.90	-0.03	0.59	0.77	0.85	0.90	0.98
Sb	-0.26	0.85	1.00	1.00	0.95	-0.39	0.57	0.90	-0.03	0.59	0.75	0.83	0.89	0.98
Bi	-0.18	0.77	0.95	0.95	1.00	-0.43	0.43	0.80	0.07	0.64	0.74	0.74	0.87	0.91
V	-0.73	0.13	-0.39	-0.39	-0.43	1.00	0.44	0.04	-0.86	-0.96	-0.85	-0.43	-0.72	-0.21
Ca	-0.91	0.90	0.58	0.57	0.43	0.44	1.00	0.85	-0.80	-0.28	0.07	0.60	0.21	0.72
P	-0.63	0.98	0.90	0.90	0.80	0.04	0.85	1.00	-0.43	0.18	0.43	0.73	0.64	0.96
La	0.96	-0.54	-0.03	-0.03	0.07	-0.86	-0.80	-0.43	1.00	0.78	0.52	-0.04	0.40	-0.23
Cr	0.59	0.09	0.59	0.59	0.64	-0.96	-0.28	0.18	0.78	1.00	0.92	0.54	0.86	0.42
Mg	0.29	0.38	0.77	0.75	0.74	-0.85	0.07	0.43	0.52	0.92	1.00	0.82	0.93	0.63
Ba	-0.27	0.74	0.85	0.83	0.74	-0.43	0.60	0.73	-0.04	0.54	0.82	1.00	0.79	0.82
Ti	0.16	0.55	0.90	0.89	0.87	-0.72	0.21	0.64	0.40	0.86	0.93	0.79	1.00	0.79
B	-0.45	0.94	0.98	0.98	0.91	-0.21	0.72	0.96	-0.23	0.42	0.63	0.82	0.79	1.00
Al	0.95	-0.51	0.00	0.00	0.08	-0.87	-0.77	-0.41	1.00	0.79	0.56	0.01	0.43	-0.21
Na	-0.27	0.76	0.89	0.87	0.79	-0.46	0.58	0.74	-0.03	0.57	0.83	0.99	0.81	0.86
K	-0.42	0.83	0.87	0.85	0.77	-0.29	0.71	0.81	-0.18	0.43	0.74	0.98	0.74	0.87
W	0.34	-0.76	-0.84	-0.85	-0.89	0.28	-0.48	-0.73	0.15	-0.44	-0.56	-0.65	-0.64	-0.86
Sc	0.40	0.32	0.76	0.77	0.79	-0.87	-0.07	0.41	0.60	0.95	0.91	0.62	0.93	0.63
Tl	-0.15	0.78	0.99	0.99	0.96	-0.48	0.47	0.85	0.08	0.67	0.79	0.79	0.93	0.95
Se	-0.01	0.68	0.95	0.96	0.90	-0.59	0.37	0.77	0.22	0.75	0.85	0.79	0.97	0.89
Te	-0.43	0.92	0.97	0.96	0.90	-0.27	0.71	0.93	-0.19	0.46	0.71	0.91	0.81	0.98
Ga	0.98	-0.63	-0.15	-0.15	-0.04	-0.80	-0.86	-0.54	0.99	0.70	0.43	-0.14	0.28	-0.35
Cs	0.73	-0.09	0.44	0.43	0.48	-0.99	-0.43	0.01	0.87	0.98	0.86	0.42	0.77	0.25
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.45	-0.67	-0.58	-0.57	-0.32	-0.03	-0.74	-0.71	0.33	-0.06	-0.36	-0.69	-0.48	-0.63
Nb	0.62	-0.90	-0.79	-0.79	-0.60	-0.01	-0.89	-0.90	0.46	-0.13	-0.46	-0.84	-0.57	-0.86
Rb	0.74	-0.47	-0.09	-0.12	0.00	-0.71	-0.62	-0.45	0.81	0.63	0.52	0.13	0.28	-0.28
Sn	-0.26	0.84	0.99	0.99	0.96	-0.36	0.55	0.90	-0.03	0.57	0.71	0.77	0.88	0.97
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.60	-0.93	-0.86	-0.84	-0.73	0.09	-0.85	-0.89	0.40	-0.24	-0.57	-0.92	-0.63	-0.91
Y	0.17	0.54	0.90	0.90	0.91	-0.73	0.16	0.63	0.40	0.87	0.89	0.71	0.97	0.80
Ce	0.96	-0.53	-0.02	-0.02	0.07	-0.86	-0.80	-0.43	1.00	0.78	0.52	-0.04	0.40	-0.23
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.10	0.59	0.92	0.93	0.92	-0.70	0.23	0.66	0.33	0.84	0.89	0.75	0.96	0.83
Li	0.97	-0.77	-0.36	-0.36	-0.22	-0.62	-0.95	-0.69	0.93	0.51	0.19	-0.38	0.06	-0.54
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 3

	Al	**Na**	**K**	**W**	**Sc**	**Tl**	**Se**	**Te**	**Ga**	**Cs**	**Ge**	**Hf**	**Nb**	**Rb**
Mo	0.24	0.81	0.73	-0.85	0.92	0.97	0.97	0.85	0.10	0.64	NA	-0.39	-0.61	0.03
Cu	0.07	0.88	0.86	-0.83	0.81	0.99	0.97	0.96	-0.09	0.50	NA	-0.56	-0.76	-0.04
Pb	0.01	0.79	0.78	-0.84	0.77	0.99	0.95	0.93	-0.14	0.42	NA	-0.52	-0.73	-0.15
Zn	0.02	0.99	0.98	-0.72	0.69	0.88	0.87	0.95	-0.13	0.46	NA	-0.67	-0.84	0.08
Ag	0.06	0.86	0.82	-0.89	0.82	0.99	0.96	0.94	-0.08	0.49	NA	-0.48	-0.72	-0.08
Ni	0.21	0.95	0.91	-0.77	0.83	0.93	0.93	0.93	0.06	0.62	NA	-0.52	-0.71	0.20
Co	0.37	0.89	0.84	-0.66	0.88	0.89	0.91	0.86	0.23	0.73	NA	-0.47	-0.60	0.36
Mn	0.02	0.86	0.85	-0.82	0.77	0.99	0.96	0.96	-0.14	0.45	NA	-0.59	-0.78	-0.10
Hg	0.09	0.79	0.74	-0.90	0.84	0.98	0.95	0.88	-0.04	0.51	NA	-0.40	-0.65	-0.12
Fe	0.64	0.69	0.57	-0.59	0.99	0.82	0.89	0.64	0.52	0.91	NA	-0.22	-0.33	0.45
As	0.20	0.93	0.90	-0.79	0.79	0.88	0.85	0.90	0.07	0.60	NA	-0.39	-0.62	0.28
U	0.29	0.92	0.86	-0.74	0.89	0.94	0.96	0.89	0.14	0.69	NA	-0.53	-0.68	0.21
Au	0.28	0.50	0.37	-0.81	0.79	0.70	0.70	0.50	0.21	0.57	NA	0.05	-0.25	-0.04
S	-0.12	0.95	0.94	-0.84	0.67	0.94	0.90	0.98	-0.27	0.34	NA	-0.66	-0.89	-0.15
Th	0.95	-0.27	-0.42	0.34	0.40	-0.15	-0.01	-0.43	0.98	0.73	NA	0.45	0.62	0.74
Sr	-0.51	0.76	0.83	-0.76	0.32	0.78	0.68	0.92	-0.63	-0.09	NA	-0.67	-0.90	-0.47
Cd	0.00	0.89	0.87	-0.84	0.76	0.99	0.95	0.97	-0.15	0.44	NA	-0.58	-0.79	-0.09
Sb	0.00	0.87	0.85	-0.85	0.77	0.99	0.96	0.96	-0.15	0.43	NA	-0.57	-0.79	-0.12
Bi	0.08	0.79	0.77	-0.89	0.79	0.96	0.90	0.90	-0.04	0.48	NA	-0.32	-0.60	0.00
V	-0.87	-0.46	-0.29	0.28	-0.87	-0.48	-0.59	-0.27	-0.80	-0.99	NA	-0.03	-0.01	-0.71
Ca	-0.77	0.58	0.71	-0.48	-0.07	0.47	0.37	0.71	-0.86	-0.43	NA	-0.74	-0.89	-0.62
P	-0.41	0.74	0.81	-0.73	0.41	0.85	0.77	0.93	-0.54	0.01	NA	-0.71	-0.90	-0.45
La	1.00	-0.03	-0.18	0.15	0.60	0.08	0.22	-0.19	0.99	0.87	NA	0.33	0.46	0.81
Cr	0.79	0.57	0.43	-0.44	0.95	0.67	0.75	0.46	0.70	0.98	NA	-0.06	-0.13	0.63
Mg	0.56	0.83	0.74	-0.56	0.91	0.79	0.85	0.71	0.43	0.86	NA	-0.36	-0.46	0.52
Ba	0.01	0.99	0.98	-0.65	0.62	0.79	0.79	0.91	-0.14	0.42	NA	-0.69	-0.84	0.13
Ti	0.43	0.81	0.74	-0.64	0.93	0.93	0.97	0.81	0.28	0.77	NA	-0.48	-0.57	0.28
B	-0.21	0.86	0.87	-0.86	0.63	0.95	0.89	0.98	-0.35	0.25	NA	-0.63	-0.86	-0.28
Al	1.00	0.01	-0.14	0.14	0.61	0.10	0.24	-0.15	0.99	0.89	NA	0.30	0.42	0.84
Na	0.01	1.00	0.98	-0.73	0.67	0.84	0.83	0.93	-0.13	0.45	NA	-0.64	-0.83	0.10
K	-0.14	0.98	1.00	-0.70	0.54	0.80	0.77	0.95	-0.28	0.30	NA	-0.69	-0.88	0.02
W	0.14	-0.73	-0.70	1.00	-0.64	-0.84	-0.74	-0.82	0.23	-0.27	NA	0.18	0.58	0.23
Sc	0.61	0.67	0.54	-0.64	1.00	0.83	0.89	0.63	0.49	0.89	NA	-0.18	-0.32	0.37
Tl	0.10	0.84	0.80	-0.84	0.83	1.00	0.98	0.93	-0.05	0.52	NA	-0.51	-0.72	-0.06
Se	0.24	0.83	0.77	-0.74	0.89	0.98	1.00	0.88	0.08	0.63	NA	-0.55	-0.69	0.04
Te	-0.15	0.93	0.95	-0.82	0.63	0.93	0.88	1.00	-0.30	0.30	NA	-0.66	-0.87	-0.13
Ga	0.99	-0.13	-0.28	0.23	0.49	-0.05	0.08	-0.30	1.00	0.81	NA	0.44	0.57	0.84
Cs	0.89	0.45	0.30	-0.27	0.89	0.52	0.63	0.30	0.81	1.00	NA	0.01	0.00	0.72
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA
Hf	0.30	-0.64	-0.69	0.18	-0.18	-0.51	-0.55	-0.66	0.44	0.01	NA	1.00	0.89	0.28
Nb	0.42	-0.83	-0.88	0.58	-0.32	-0.72	-0.69	-0.87	0.57	0.00	NA	0.89	1.00	0.39
Rb	0.84	0.10	0.02	0.23	0.37	-0.06	0.04	-0.13	0.84	0.72	NA	0.28	0.39	1.00
Sn	-0.01	0.81	0.80	-0.85	0.76	0.99	0.95	0.94	-0.16	0.41	NA	-0.53	-0.75	-0.16
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.35	-0.92	-0.97	0.71	-0.41	-0.78	-0.72	-0.95	0.49	-0.09	NA	0.76	0.95	0.23
Y	0.42	0.76	0.68	-0.75	0.97	0.94	0.97	0.79	0.28	0.77	NA	-0.33	-0.50	0.21
Ce	1.00	-0.03	-0.18	0.14	0.60	0.09	0.22	-0.18	0.99	0.88	NA	0.34	0.46	0.81
In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	0.35	0.81	0.72	-0.80	0.95	0.96	0.97	0.83	0.21	0.72	NA	-0.36	-0.56	0.15
Li	0.92	-0.37	-0.50	0.39	0.29	-0.25	-0.13	-0.50	0.97	0.64	NA	0.58	0.75	0.78
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Site 3

	Sn	Ta	Zr	Y	Ce	In	Re	Be	Li	Pd	Pt
Mo	0.94	NA	-0.68	0.98	0.23	NA	NA	0.99	-0.11	NA	NA
Cu	0.99	NA	-0.83	0.92	0.04	NA	NA	0.94	-0.30	NA	NA
Pb	1.00	NA	-0.78	0.90	0.00	NA	NA	0.92	-0.32	NA	NA
Zn	0.86	NA	-0.93	0.80	-0.02	NA	NA	0.83	-0.37	NA	NA
Ag	0.99	NA	-0.80	0.93	0.04	NA	NA	0.95	-0.29	NA	NA
Ni	0.90	NA	-0.82	0.91	0.17	NA	NA	0.93	-0.18	NA	NA
Co	0.84	NA	-0.72	0.92	0.34	NA	NA	0.92	0.00	NA	NA
Mn	0.99	NA	-0.84	0.90	0.00	NA	NA	0.92	-0.34	NA	NA
Hg	0.97	NA	-0.72	0.94	0.08	NA	NA	0.96	-0.24	NA	NA
Fe	0.75	NA	-0.42	0.96	0.62	NA	NA	0.94	0.31	NA	NA
As	0.85	NA	-0.79	0.86	0.17	NA	NA	0.88	-0.15	NA	NA
U	0.90	NA	-0.77	0.95	0.26	NA	NA	0.96	-0.10	NA	NA
Au	0.65	NA	-0.33	0.77	0.30	NA	NA	0.80	0.06	NA	NA
S	0.94	NA	-0.94	0.81	-0.15	NA	NA	0.86	-0.49	NA	NA
Th	-0.26	NA	0.60	0.17	0.96	NA	NA	0.10	0.97	NA	NA
Sr	0.84	NA	-0.93	0.54	-0.53	NA	NA	0.59	-0.77	NA	NA
Cd	0.99	NA	-0.86	0.90	-0.02	NA	NA	0.92	-0.36	NA	NA
Sb	0.99	NA	-0.84	0.90	-0.02	NA	NA	0.93	-0.36	NA	NA
Bi	0.96	NA	-0.73	0.91	0.07	NA	NA	0.92	-0.22	NA	NA
V	-0.36	NA	0.09	-0.73	-0.86	NA	NA	-0.70	-0.62	NA	NA
Ca	0.55	NA	-0.85	0.16	-0.80	NA	NA	0.23	-0.95	NA	NA
P	0.90	NA	-0.89	0.63	-0.43	NA	NA	0.66	-0.69	NA	NA
La	-0.03	NA	0.40	0.40	1.00	NA	NA	0.33	0.93	NA	NA
Cr	0.57	NA	-0.24	0.87	0.78	NA	NA	0.84	0.51	NA	NA
Mg	0.71	NA	-0.57	0.89	0.52	NA	NA	0.89	0.19	NA	NA
Ba	0.77	NA	-0.92	0.71	-0.04	NA	NA	0.75	-0.38	NA	NA
Ti	0.88	NA	-0.63	0.97	0.40	NA	NA	0.96	0.06	NA	NA
B	0.97	NA	-0.91	0.80	-0.23	NA	NA	0.83	-0.54	NA	NA
Al	-0.01	NA	0.35	0.42	1.00	NA	NA	0.35	0.92	NA	NA
Na	0.81	NA	-0.92	0.76	-0.03	NA	NA	0.81	-0.37	NA	NA
K	0.80	NA	-0.97	0.68	-0.18	NA	NA	0.72	-0.50	NA	NA
W	-0.85	NA	0.71	-0.75	0.14	NA	NA	-0.80	0.39	NA	NA
Sc	0.76	NA	-0.41	0.97	0.60	NA	NA	0.95	0.29	NA	NA
Tl	0.99	NA	-0.78	0.94	0.09	NA	NA	0.96	-0.25	NA	NA
Se	0.95	NA	-0.72	0.97	0.22	NA	NA	0.97	-0.13	NA	NA
Te	0.94	NA	-0.95	0.79	-0.18	NA	NA	0.83	-0.50	NA	NA
Ga	-0.16	NA	0.49	0.28	0.99	NA	NA	0.21	0.97	NA	NA
Cs	0.41	NA	-0.09	0.77	0.88	NA	NA	0.72	0.64	NA	NA
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.53	NA	0.76	-0.33	0.34	NA	NA	-0.36	0.58	NA	NA
Nb	-0.75	NA	0.95	-0.50	0.46	NA	NA	-0.56	0.75	NA	NA
Rb	-0.16	NA	0.23	0.21	0.81	NA	NA	0.15	0.78	NA	NA
Sn	1.00	NA	-0.80	0.90	-0.03	NA	NA	0.92	-0.34	NA	NA
Ta	NA	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.80	NA	1.00	-0.58	0.39	NA	NA	-0.64	0.69	NA	NA
Y	0.90	NA	-0.58	1.00	0.41	NA	NA	0.99	0.08	NA	NA
Ce	-0.03	NA	0.39	0.41	1.00	NA	NA	0.34	0.93	NA	NA
In	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA	NA
Re	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA
Be	0.92	NA	-0.64	0.99	0.34	NA	NA	1.00	0.00	NA	NA
Li	-0.34	NA	0.69	0.08	0.93	NA	NA	0.00	1.00	NA	NA
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA
Pt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00

Statistical correlations of all 53 elements analyzed - 2mm size

Site 4

	Mo	**Cu**	**Pb**	**Zn**	**Ag**	**Ni**	**Co**	**Mn**	**Hg**	**Fe**	**As**	**U**	**Au**
Mo	1.00	-0.57	0.87	-0.26	0.76	-0.39	-0.81	-0.79	0.92	-0.18	-0.69	-0.62	0.16
Cu	-0.57	1.00	-0.35	0.56	-0.88	0.75	0.80	0.86	-0.45	-0.24	0.22	0.33	-0.58
Pb	0.87	-0.35	1.00	-0.30	0.64	-0.36	-0.79	-0.67	0.93	-0.62	-0.81	-0.86	-0.23
Zn	-0.26	0.56	-0.30	1.00	-0.71	0.96	0.63	0.42	-0.27	0.30	0.17	0.58	-0.40
Ag	0.76	-0.88	0.64	-0.71	1.00	-0.83	-0.91	-0.90	0.66	-0.08	-0.41	-0.61	0.45
Ni	-0.39	0.75	-0.36	0.96	-0.83	1.00	0.75	0.58	-0.37	0.17	0.18	0.56	-0.46
Co	-0.81	0.80	-0.79	0.63	-0.91	0.75	1.00	0.90	-0.85	0.32	0.67	0.80	-0.28
Mn	-0.79	0.86	-0.67	0.42	-0.90	0.58	0.90	1.00	-0.72	0.07	0.53	0.60	-0.33
Hg	0.92	-0.45	0.93	-0.27	0.66	-0.37	-0.85	-0.72	1.00	-0.45	-0.87	-0.80	0.02
Fe	-0.18	-0.24	-0.62	0.30	-0.08	0.17	0.32	0.07	-0.45	1.00	0.61	0.81	0.59
As	-0.69	0.22	-0.81	0.17	-0.41	0.18	0.67	0.53	-0.87	0.61	1.00	0.80	0.05
U	-0.62	0.33	-0.86	0.58	-0.61	0.56	0.80	0.60	-0.80	0.81	0.80	1.00	0.14
Au	0.16	-0.58	-0.23	-0.40	0.45	-0.46	-0.28	-0.33	0.02	0.59	0.05	0.14	1.00
S	0.89	-0.54	0.78	-0.13	0.62	-0.28	-0.81	-0.74	0.94	-0.19	-0.82	-0.62	0.21
Th	-0.65	0.42	-0.86	0.69	-0.72	0.68	0.85	0.63	-0.79	0.74	0.73	0.98	0.05
Sr	0.56	0.09	0.71	0.03	0.11	0.05	-0.45	-0.25	0.79	-0.65	-0.88	-0.70	-0.24
Cd	0.81	-0.48	0.80	-0.29	0.58	-0.43	-0.79	-0.56	0.91	-0.33	-0.77	-0.68	0.09
Sb	0.86	-0.34	0.97	-0.44	0.68	-0.47	-0.77	-0.62	0.88	-0.61	-0.72	-0.85	-0.16
Bi	0.02	-0.51	-0.42	-0.07	0.29	-0.20	0.03	-0.22	-0.30	0.90	0.51	0.56	0.74
V	0.95	-0.59	0.93	-0.45	0.83	-0.54	-0.90	-0.82	0.93	-0.40	-0.77	-0.80	0.11
Ca	0.47	0.07	0.66	-0.06	0.09	-0.04	-0.45	-0.18	0.73	-0.69	-0.86	-0.71	-0.25
P	0.62	-0.18	0.44	0.45	0.09	0.27	-0.29	-0.31	0.60	0.13	-0.48	-0.09	-0.05
La	-0.71	0.53	-0.65	0.58	-0.76	0.58	0.73	0.69	-0.67	0.28	0.69	0.66	-0.43
Cr	-0.22	0.02	-0.57	0.65	-0.33	0.52	0.50	0.20	-0.46	0.90	0.58	0.87	0.21
Mg	-0.83	0.73	-0.83	0.63	-0.90	0.74	0.99	0.87	-0.88	0.39	0.69	0.84	-0.22
Ba	0.34	0.31	0.40	0.55	-0.21	0.50	-0.07	0.00	0.51	-0.24	-0.51	-0.18	-0.36
Ti	0.53	-0.51	0.44	-0.48	0.70	-0.52	-0.43	-0.52	0.27	0.01	-0.08	-0.25	0.18
B	0.82	-0.20	0.91	0.03	0.44	-0.04	-0.63	-0.60	0.90	-0.51	-0.87	-0.71	-0.23
Al	-0.04	-0.04	-0.37	0.70	-0.25	0.53	0.36	0.06	-0.27	0.81	0.44	0.74	0.09
Na	0.91	-0.45	0.98	-0.30	0.68	-0.39	-0.85	-0.74	0.97	-0.54	-0.84	-0.85	-0.12
K	0.03	0.70	0.24	0.51	-0.50	0.61	0.23	0.37	0.25	-0.48	-0.46	-0.16	-0.52
W	0.75	-0.24	0.87	-0.13	0.42	-0.19	-0.72	-0.56	0.94	-0.61	-0.91	-0.82	-0.18
Sc	-0.41	0.31	-0.64	0.75	-0.57	0.66	0.70	0.49	-0.59	0.77	0.66	0.93	-0.03
Tl	-0.21	-0.13	-0.56	0.44	-0.13	0.29	0.34	0.05	-0.42	0.91	0.59	0.77	0.43
Se	0.50	-0.60	0.14	0.24	0.41	-0.03	-0.30	-0.54	0.26	0.65	0.05	0.24	0.33
Te	0.18	-0.07	-0.07	0.71	-0.17	0.50	0.17	-0.04	0.02	0.57	0.18	0.49	-0.11
Ga	0.02	-0.61	-0.41	-0.18	0.36	-0.31	-0.08	-0.28	-0.25	0.87	0.45	0.48	0.82
Cs	-0.20	-0.40	-0.53	0.15	0.06	-0.02	0.13	-0.10	-0.39	0.86	0.64	0.63	0.45
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	-0.03	0.03	-0.30	0.80	-0.35	0.62	0.36	0.12	-0.19	0.67	0.24	0.67	-0.02
Nb	0.29	-0.72	-0.16	-0.16	0.51	-0.33	-0.29	-0.50	0.04	0.80	0.20	0.30	0.83
Rb	0.00	-0.06	-0.29	0.65	-0.17	0.47	0.30	0.00	-0.23	0.75	0.45	0.68	0.03
Sn	0.87	-0.73	0.81	-0.60	0.95	-0.70	-0.91	-0.88	0.80	-0.26	-0.60	-0.72	0.27
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.25	0.21	-0.50	0.84	-0.52	0.71	0.57	0.33	-0.40	0.72	0.41	0.81	-0.02
Y	-0.57	0.42	-0.73	0.76	-0.71	0.71	0.80	0.61	-0.70	0.68	0.71	0.94	-0.13
Ce	-0.71	0.68	-0.70	0.44	-0.77	0.51	0.84	0.88	-0.73	0.32	0.72	0.74	-0.26
In	0.18	-0.07	-0.07	0.71	-0.17	0.50	0.17	-0.04	0.02	0.57	0.18	0.49	-0.11
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.22	0.21	-0.43	0.81	-0.49	0.69	0.57	0.31	-0.42	0.65	0.48	0.78	-0.18
Li	-0.60	0.51	-0.73	0.79	-0.76	0.77	0.86	0.66	-0.73	0.61	0.68	0.93	-0.19
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	0.58	-0.06	0.70	-0.07	0.23	-0.08	-0.57	-0.36	0.83	-0.60	-0.89	-0.74	-0.11

Site 4

	S	**Th**	**Sr**	**Cd**	**Sb**	**Bi**	**V**	**Ca**	**P**	**La**	**Cr**	**Mg**	**Ba**	**Ti**
Mo	0.89	-0.65	0.56	0.81	0.86	0.02	0.95	0.47	0.62	-0.71	-0.22	-0.83	0.34	0.53
Cu	-0.54	0.42	0.09	-0.48	-0.34	-0.51	-0.59	0.07	-0.18	0.53	0.02	0.73	0.31	-0.51
Pb	0.78	-0.86	0.71	0.80	0.97	-0.42	0.93	0.66	0.44	-0.65	-0.57	-0.83	0.40	0.44
Zn	-0.13	0.69	0.03	-0.29	-0.44	-0.07	-0.45	-0.06	0.45	0.58	0.65	0.63	0.55	-0.48
Ag	0.62	-0.72	0.11	0.58	0.68	0.29	0.83	0.09	0.09	-0.76	-0.33	-0.90	-0.21	0.70
Ni	-0.28	0.68	0.05	-0.43	-0.47	-0.20	-0.54	-0.04	0.27	0.58	0.52	0.74	0.50	-0.52
Co	-0.81	0.85	-0.45	-0.79	-0.77	0.03	-0.90	-0.45	-0.29	0.73	0.50	0.99	-0.07	-0.43
Mn	-0.74	0.63	-0.25	-0.56	-0.62	-0.22	-0.82	-0.18	-0.31	0.69	0.20	0.87	0.00	-0.52
Hg	0.94	-0.79	0.79	0.91	0.88	-0.30	0.93	0.73	0.60	-0.67	-0.46	-0.88	0.51	0.27
Fe	-0.19	0.74	-0.65	-0.33	-0.61	0.90	-0.40	-0.69	0.13	0.28	0.90	0.39	-0.24	0.01
As	-0.82	0.73	-0.88	-0.77	-0.72	0.51	-0.77	-0.86	-0.48	0.69	0.58	0.69	-0.51	-0.08
U	-0.62	0.98	-0.70	-0.68	-0.85	0.56	-0.80	-0.71	-0.09	0.66	0.87	0.84	-0.18	-0.25
Au	0.21	0.05	-0.24	0.09	-0.16	0.74	0.11	-0.25	-0.05	-0.43	0.21	-0.22	-0.36	0.18
S	1.00	-0.60	0.73	0.90	0.70	-0.10	0.84	0.67	0.75	-0.63	-0.22	-0.80	0.51	0.16
Th	-0.60	1.00	-0.60	-0.70	-0.88	0.44	-0.84	-0.62	-0.04	0.71	0.86	0.89	-0.08	-0.38
Sr	0.73	-0.60	1.00	0.71	0.63	-0.69	0.57	0.97	0.57	-0.40	-0.54	-0.49	0.70	-0.24
Cd	0.90	-0.70	0.71	1.00	0.75	-0.25	0.81	0.74	0.65	-0.54	-0.39	-0.81	0.44	0.17
Sb	0.70	-0.88	0.63	0.75	1.00	-0.35	0.93	0.59	0.31	-0.70	-0.63	-0.83	0.26	0.55
Bi	-0.10	0.44	-0.69	-0.25	-0.35	1.00	-0.12	-0.73	-0.05	-0.06	0.67	0.09	-0.47	0.38
V	0.84	-0.84	0.57	0.81	0.93	-0.12	1.00	0.52	0.41	-0.83	-0.48	-0.92	0.22	0.60
Ca	0.67	-0.62	0.97	0.74	0.59	-0.73	0.52	1.00	0.51	-0.37	-0.62	-0.48	0.57	-0.27
P	0.75	-0.04	0.57	0.65	0.31	-0.05	0.41	0.51	1.00	-0.08	0.29	-0.27	0.67	-0.14
La	-0.63	0.71	-0.40	-0.54	-0.70	-0.06	-0.83	-0.37	-0.08	1.00	0.50	0.74	0.09	-0.62
Cr	-0.22	0.86	-0.54	-0.39	-0.63	0.67	-0.48	-0.62	0.29	0.50	1.00	0.55	0.03	-0.12
Mg	-0.80	0.89	-0.49	-0.81	-0.83	0.09	-0.92	-0.48	-0.27	0.74	0.55	1.00	-0.11	-0.45
Ba	0.51	-0.08	0.70	0.44	0.26	-0.47	0.22	0.57	0.67	0.09	0.03	-0.11	1.00	-0.40
Ti	0.16	-0.38	-0.24	0.17	0.55	0.38	0.60	-0.27	-0.14	-0.62	-0.12	-0.45	-0.40	1.00
B	0.83	-0.65	0.79	0.74	0.82	-0.41	0.83	0.70	0.61	-0.60	-0.38	-0.67	0.61	0.27
Al	-0.04	0.74	-0.38	-0.22	-0.46	0.57	-0.31	-0.48	0.48	0.47	0.97	0.41	0.19	-0.09
Na	0.87	-0.84	0.73	0.85	0.94	-0.35	0.95	0.68	0.53	-0.68	-0.52	-0.88	0.40	0.39
K	0.17	-0.05	0.68	0.19	0.17	-0.71	0.00	0.61	0.33	0.09	-0.21	0.17	0.82	-0.45
W	0.87	-0.76	0.93	0.85	0.78	-0.56	0.78	0.89	0.61	-0.50	-0.54	-0.75	0.62	-0.02
Sc	-0.42	0.92	-0.54	-0.48	-0.69	0.47	-0.64	-0.59	0.19	0.69	0.94	0.73	0.11	-0.24
Tl	-0.20	0.72	-0.61	-0.38	-0.59	0.80	-0.40	-0.71	0.10	0.36	0.89	0.39	-0.04	-0.04
Se	0.45	0.18	-0.18	0.27	0.06	0.65	0.29	-0.28	0.60	-0.06	0.66	-0.25	0.16	0.31
Te	0.21	0.51	-0.08	0.08	-0.20	0.32	-0.09	-0.17	0.73	0.42	0.80	0.20	0.41	-0.12
Ga	-0.04	0.36	-0.65	-0.17	-0.36	0.98	-0.09	-0.66	-0.05	-0.09	0.60	0.00	-0.49	0.30
Cs	-0.19	0.56	-0.68	-0.30	-0.56	0.79	-0.36	-0.71	0.03	0.42	0.77	0.20	-0.25	-0.06
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.06	0.70	-0.19	-0.10	-0.43	0.38	-0.28	-0.24	0.62	0.43	0.88	0.42	0.28	-0.20
Nb	0.25	0.20	-0.41	0.07	-0.14	0.92	0.16	-0.47	0.18	-0.26	0.55	-0.22	-0.28	0.35
Rb	-0.06	0.66	-0.42	-0.23	-0.37	0.56	-0.25	-0.54	0.40	0.45	0.92	0.34	0.23	0.02
Sn	0.71	-0.80	0.32	0.68	0.85	0.10	0.95	0.27	0.20	-0.85	-0.43	-0.92	-0.01	0.73
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.16	0.85	-0.31	-0.29	-0.61	0.39	-0.50	-0.35	0.46	0.56	0.92	0.62	0.21	-0.31
Y	-0.53	0.96	-0.53	-0.58	-0.79	0.34	-0.78	-0.55	0.11	0.81	0.87	0.84	0.05	-0.39
Ce	-0.74	0.72	-0.47	-0.56	-0.65	0.04	-0.81	-0.44	-0.26	0.82	0.45	0.81	0.04	-0.41
In	0.21	0.51	-0.08	0.08	-0.20	0.32	-0.09	-0.17	0.73	0.42	0.80	0.20	0.41	-0.12
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.23	0.81	-0.37	-0.34	-0.51	0.35	-0.46	-0.41	0.41	0.60	0.89	0.61	0.12	-0.17
Li	-0.59	0.96	-0.53	-0.65	-0.78	0.28	-0.79	-0.56	0.04	0.78	0.83	0.89	0.05	-0.36
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	0.79	-0.65	0.98	0.76	0.61	-0.62	0.60	0.95	0.55	-0.43	-0.55	-0.60	0.66	-0.26

Site 4

	B	Al	Na	K	W	Sc	Tl	Se	Te	Ga	Cs	Ge	Hf	Nb
Mo	0.82	-0.04	0.91	0.03	0.75	-0.41	-0.21	0.50	0.18	0.02	-0.20	NA	-0.03	0.29
Cu	-0.20	-0.04	-0.45	0.70	-0.24	0.31	-0.13	-0.60	-0.07	-0.61	-0.40	NA	0.03	-0.72
Pb	0.91	-0.37	0.98	0.24	0.87	-0.64	-0.56	0.14	-0.07	-0.41	-0.53	NA	-0.30	-0.16
Zn	0.03	0.70	-0.30	0.51	-0.13	0.75	0.44	0.24	0.71	-0.18	0.15	NA	0.80	-0.16
Ag	0.44	-0.25	0.68	-0.50	0.42	-0.57	-0.13	0.41	-0.17	0.36	0.06	NA	-0.35	0.51
Ni	-0.04	0.53	-0.39	0.61	-0.19	0.66	0.29	-0.03	0.50	-0.31	-0.02	NA	0.62	-0.33
Co	-0.63	0.36	-0.85	0.23	-0.72	0.70	0.34	-0.30	0.17	-0.08	0.13	NA	0.36	-0.29
Mn	-0.60	0.06	-0.74	0.37	-0.56	0.49	0.05	-0.54	-0.04	-0.28	-0.10	NA	0.12	-0.50
Hg	0.90	-0.27	0.97	0.25	0.94	-0.59	-0.42	0.26	0.02	-0.25	-0.39	NA	-0.19	0.04
Fe	-0.51	0.81	-0.54	-0.48	-0.61	0.77	0.91	0.65	0.57	0.87	0.86	NA	0.67	0.80
As	-0.87	0.44	-0.84	-0.46	-0.91	0.66	0.59	0.05	0.18	0.45	0.64	NA	0.24	0.20
U	-0.71	0.74	-0.85	-0.16	-0.82	0.93	0.77	0.24	0.49	0.48	0.63	NA	0.67	0.30
Au	-0.23	0.09	-0.12	-0.52	-0.18	-0.03	0.43	0.33	-0.11	0.82	0.45	NA	-0.02	0.83
S	0.83	-0.04	0.87	0.17	0.87	-0.42	-0.20	0.45	0.21	-0.04	-0.19	NA	0.06	0.25
Th	-0.65	0.74	-0.84	-0.05	-0.76	0.92	0.72	0.18	0.51	0.36	0.56	NA	0.70	0.20
Sr	0.79	-0.38	0.73	0.68	0.93	-0.54	-0.61	-0.18	-0.08	-0.65	-0.68	NA	-0.19	-0.41
Cd	0.74	-0.22	0.85	0.19	0.85	-0.48	-0.38	0.27	0.08	-0.17	-0.30	NA	-0.10	0.07
Sb	0.82	-0.46	0.94	0.17	0.78	-0.69	-0.59	0.06	-0.20	-0.36	-0.56	NA	-0.43	-0.14
Bi	-0.41	0.57	-0.35	-0.71	-0.56	0.47	0.80	0.65	0.32	0.98	0.79	NA	0.38	0.92
V	0.83	-0.31	0.95	0.00	0.78	-0.64	-0.40	0.29	-0.09	-0.09	-0.36	NA	-0.28	0.16
Ca	0.70	-0.48	0.68	0.61	0.89	-0.59	-0.71	-0.28	-0.17	-0.66	-0.71	NA	-0.24	-0.47
P	0.61	0.48	0.53	0.33	0.61	0.19	0.10	0.60	0.73	-0.05	0.03	NA	0.62	0.18
La	-0.60	0.47	-0.68	0.09	-0.50	0.69	0.36	-0.06	0.42	-0.09	0.42	NA	0.43	-0.26
Cr	-0.38	0.97	-0.52	-0.21	-0.54	0.94	0.89	0.66	0.80	0.60	0.77	NA	0.88	0.55
Mg	-0.67	0.41	-0.88	0.17	-0.75	0.73	0.39	-0.25	0.20	0.00	0.20	NA	0.42	-0.22
Ba	0.61	0.19	0.40	0.82	0.62	0.11	-0.04	0.16	0.41	-0.49	-0.25	NA	0.28	-0.28
Ti	0.27	-0.09	0.39	-0.45	-0.02	-0.24	-0.04	0.31	-0.12	0.30	-0.06	NA	-0.20	0.35
B	1.00	-0.17	0.91	0.46	0.88	-0.46	-0.39	0.22	0.10	-0.43	-0.53	NA	-0.04	-0.15
Al	-0.17	1.00	-0.31	-0.13	-0.34	0.89	0.83	0.77	0.92	0.50	0.72	NA	0.94	0.52
Na	0.91	-0.31	1.00	0.19	0.91	-0.63	-0.51	0.23	-0.01	-0.32	-0.45	NA	-0.23	-0.05
K	0.46	-0.13	0.19	1.00	0.44	-0.01	-0.31	-0.35	0.03	-0.76	-0.63	NA	0.03	-0.66
W	0.88	-0.34	0.91	0.44	1.00	-0.62	-0.56	0.06	-0.02	-0.49	-0.52	NA	-0.20	-0.22
Sc	-0.46	0.89	-0.63	-0.01	-0.62	1.00	0.79	0.44	0.75	0.37	0.63	NA	0.83	0.28
Tl	-0.39	0.83	-0.51	-0.31	-0.56	0.79	1.00	0.67	0.60	0.74	0.85	NA	0.67	0.70
Se	0.22	0.77	0.23	-0.35	0.06	0.44	0.67	1.00	0.78	0.63	0.67	NA	0.67	0.77
Te	0.10	0.92	-0.01	0.03	-0.02	0.75	0.60	0.78	1.00	0.26	0.54	NA	0.93	0.35
Ga	-0.43	0.50	-0.32	-0.76	-0.49	0.37	0.74	0.63	0.26	1.00	0.81	NA	0.32	0.95
Cs	-0.53	0.72	-0.45	-0.63	-0.52	0.63	0.85	0.67	0.54	0.81	1.00	NA	0.53	0.75
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA	NA
Hf	-0.04	0.94	-0.23	0.03	-0.20	0.83	0.67	0.67	0.93	0.32	0.53	NA	1.00	0.35
Nb	-0.15	0.52	-0.05	-0.66	-0.22	0.28	0.70	0.77	0.35	0.95	0.75	NA	0.35	1.00
Rb	-0.12	0.97	-0.25	-0.13	-0.34	0.86	0.84	0.79	0.89	0.47	0.72	NA	0.85	0.50
Sn	0.67	-0.31	0.83	-0.23	0.58	-0.63	-0.26	0.34	-0.18	0.13	-0.19	NA	-0.36	0.33
Ta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	-0.24	0.92	-0.45	0.06	-0.39	0.92	0.72	0.53	0.85	0.32	0.54	NA	0.97	0.29
Y	-0.56	0.81	-0.73	0.01	-0.65	0.97	0.69	0.27	0.67	0.26	0.57	NA	0.78	0.13
Ce	-0.66	0.33	-0.77	0.20	-0.66	0.70	0.36	-0.20	0.21	-0.03	0.26	NA	0.26	-0.23
In	0.10	0.92	-0.01	0.03	-0.02	0.75	0.60	0.78	1.00	0.26	0.54	NA	0.93	0.35
Re	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be	-0.23	0.91	-0.40	-0.02	-0.41	0.90	0.64	0.52	0.87	0.25	0.51	NA	0.94	0.21
Li	-0.54	0.76	-0.75	0.08	-0.68	0.95	0.64	0.18	0.60	0.18	0.47	NA	0.74	0.04
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pt	0.76	-0.40	0.75	0.57	0.95	-0.59	-0.56	-0.12	-0.11	-0.53	-0.57	NA	-0.23	-0.30

Site 4

	Rb	Sn	Ta	Zr	Y	Ce	In	Re	Be	Li	Pd	Pt
Mo	0.00	0.87	NA	-0.25	-0.57	-0.71	0.18	NA	-0.22	-0.60	NA	0.58
Cu	-0.06	-0.73	NA	0.21	0.42	0.68	-0.07	NA	0.21	0.51	NA	-0.06
Pb	-0.29	0.81	NA	-0.50	-0.73	-0.70	-0.07	NA	-0.43	-0.73	NA	0.70
Zn	0.65	-0.60	NA	0.84	0.76	0.44	0.71	NA	0.81	0.79	NA	-0.07
Ag	-0.17	0.95	NA	-0.52	-0.71	-0.77	-0.17	NA	-0.49	-0.76	NA	0.23
Ni	0.47	-0.70	NA	0.71	0.71	0.51	0.50	NA	0.69	0.77	NA	-0.08
Co	0.30	-0.91	NA	0.57	0.80	0.84	0.17	NA	0.57	0.86	NA	-0.57
Mn	0.00	-0.88	NA	0.33	0.61	0.88	-0.04	NA	0.31	0.66	NA	-0.36
Hg	-0.23	0.80	NA	-0.40	-0.70	-0.73	0.02	NA	-0.42	-0.73	NA	0.83
Fe	0.75	-0.26	NA	0.72	0.68	0.32	0.57	NA	0.65	0.61	NA	-0.60
As	0.45	-0.60	NA	0.41	0.71	0.72	0.18	NA	0.48	0.68	NA	-0.89
U	0.68	-0.72	NA	0.81	0.94	0.74	0.49	NA	0.78	0.93	NA	-0.74
Au	0.03	0.27	NA	-0.02	-0.13	-0.26	-0.11	NA	-0.18	-0.19	NA	-0.11
S	-0.06	0.71	NA	-0.16	-0.53	-0.74	0.21	NA	-0.23	-0.59	NA	0.79
Th	0.66	-0.80	NA	0.85	0.96	0.72	0.51	NA	0.81	0.96	NA	-0.65
Sr	-0.42	0.32	NA	-0.31	-0.53	-0.47	-0.08	NA	-0.37	-0.53	NA	0.98
Cd	-0.23	0.68	NA	-0.29	-0.58	-0.56	0.08	NA	-0.34	-0.65	NA	0.76
Sb	-0.37	0.85	NA	-0.61	-0.79	-0.65	-0.20	NA	-0.51	-0.78	NA	0.61
Bi	0.56	0.10	NA	0.39	0.34	0.04	0.32	NA	0.35	0.28	NA	-0.62
V	-0.25	0.95	NA	-0.50	-0.78	-0.81	-0.09	NA	-0.46	-0.79	NA	0.60
Ca	-0.54	0.27	NA	-0.35	-0.55	-0.44	-0.17	NA	-0.41	-0.56	NA	0.95
P	0.40	0.20	NA	0.46	0.11	-0.26	0.73	NA	0.41	0.04	NA	0.55
La	0.45	-0.85	NA	0.56	0.81	0.82	0.42	NA	0.60	0.78	NA	-0.43
Cr	0.92	-0.43	NA	0.92	0.87	0.45	0.80	NA	0.89	0.83	NA	-0.55
Mg	0.34	-0.92	NA	0.62	0.84	0.81	0.20	NA	0.61	0.89	NA	-0.60
Ba	0.23	-0.01	NA	0.21	0.05	0.04	0.41	NA	0.12	0.05	NA	0.66
Ti	0.02	0.73	NA	-0.31	-0.39	-0.41	-0.12	NA	-0.17	-0.36	NA	-0.26
B	-0.12	0.67	NA	-0.24	-0.56	-0.66	0.10	NA	-0.23	-0.54	NA	0.76
Al	0.97	-0.31	NA	0.92	0.81	0.33	0.92	NA	0.91	0.76	NA	-0.40
Na	-0.25	0.83	NA	-0.45	-0.73	-0.77	-0.01	NA	-0.40	-0.75	NA	0.75
K	-0.13	-0.23	NA	0.06	0.01	0.20	0.03	NA	-0.02	0.08	NA	0.57
W	-0.34	0.58	NA	-0.39	-0.65	-0.66	-0.02	NA	-0.41	-0.68	NA	0.95
Sc	0.86	-0.63	NA	0.92	0.97	0.70	0.75	NA	0.90	0.95	NA	-0.59
Tl	0.84	-0.26	NA	0.72	0.69	0.36	0.60	NA	0.64	0.64	NA	-0.56
Se	0.79	0.34	NA	0.53	0.27	-0.20	0.78	NA	0.52	0.18	NA	-0.12
Te	0.89	-0.18	NA	0.85	0.67	0.21	1.00	NA	0.87	0.60	NA	-0.11
Ga	0.47	0.13	NA	0.32	0.26	-0.03	0.26	NA	0.25	0.18	NA	-0.53
Cs	0.72	-0.19	NA	0.54	0.57	0.26	0.54	NA	0.51	0.47	NA	-0.57
Ge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hf	0.85	-0.36	NA	0.97	0.78	0.26	0.93	NA	0.94	0.74	NA	-0.23
Nb	0.50	0.33	NA	0.29	0.13	-0.23	0.35	NA	0.21	0.04	NA	-0.30
Rb	1.00	-0.22	NA	0.83	0.75	0.35	0.89	NA	0.84	0.71	NA	-0.43
Sn	-0.22	1.00	NA	-0.55	-0.78	-0.80	-0.18	NA	-0.51	-0.80	NA	0.39
Ta	NA	NA	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zr	0.83	-0.55	NA	1.00	0.90	0.46	0.85	NA	0.95	0.87	NA	-0.36
Y	0.75	-0.78	NA	0.90	1.00	0.76	0.67	NA	0.89	0.98	NA	-0.59
Ce	0.35	-0.80	NA	0.46	0.76	1.00	0.21	NA	0.45	0.77	NA	-0.54
In	0.89	-0.18	NA	0.85	0.67	0.21	1.00	NA	0.87	0.60	NA	-0.11
Re	NA	NA	NA	NA	NA	NA	NA	1.00	NA	NA	NA	NA
Be	0.84	-0.51	NA	0.95	0.89	0.45	0.87	NA	1.00	0.87	NA	-0.45
Li	0.71	-0.80	NA	0.87	0.98	0.77	0.60	NA	0.87	1.00	NA	-0.61
Pd	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA
Pt	-0.43	0.39	NA	-0.36	-0.59	-0.54	-0.11	NA	-0.45	-0.61	NA	1.00