Biogeochemical expression of the 'Tomahawk' Au-in-calcrete anomaly, Tunkillia, Gawler Craton, South Australia

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Contents

ABSTRACT

The Tunkillia gold prospect hosts the world's largest (spatially) Au-in-calcrete anomaly, although its association with underlying mineralisation has been enigmatic. The Tunkillia gold prospect provides a difficult setting for mineral exploration. The area is dominated by dunefields which makes surficial exploration very complicated. Biogeochemical sampling is effective in almost all areas, is efficient and the costs involved are very low compared to other sampling mediums. Within the Tunkillia area are zones of higher Au-in-calcrete content, such as the 'Tomahawk' Au-in-calcrete anomaly zone. At 'Tomahawk', exploration drilling has failed to identify significant, underlying mineralisation within the anomaly. Biogeochemical Samples were collected along seven transects in the Tunkillia gold prospect. Samples were also taken directly over the top of the ‘Tomahawk’ anomaly. These results were found to be largely independent of the contemporary landscape setting. There is a palaeodrainage system flowing through the area broadly running from the south to the west of the target area. Therefore there may be a palaeolandscape control on the results as there are clusters in the northwest to southeast of the transect area. However, there is only a weak response from the ‘Tomahawk’ anomaly which corresponds to the confluence of the two palaeodrainage valleys. This suggests that the ‘Tomahawk’ anomaly is a transported (palaeodrainage) Au-in-calcrete anomaly and the plants are extracting a deeper response. Four High priority target areas have been defined in this study as areas of interest for mineral exploration to continue. This study has identified two plants (*C. Pauper* and *E. Concinna*) that appear to be effective for determining possible mineralisation in the underlying substrate. This research has supported the use of biogeochemistry as an effective sampling medium for mineral exploration.

1. INTRODUCTION

Biogeochemistry has been long recognised as an effective exploration technique in areas that are dominated by regolith in Europe and North America (Brooks 1972). Although these methods have not been widely adopted for exploration there is growing interest in locating mineral deposits within challenging exploration settings, therefore requiring the refinement of existing exploration techniques (Mayo & Hill 2005). Australia has had a limited adoption of plant biogeochemistry due to the use of other successful sampling techniques (such as, calcrete or soil sampling) and also due to a limited understanding of Australian vegetation (Lowrey & Hill 2006).

Several studies have been undertaken to determine effective biogeochemical sampling approaches in Australia. A study sampling river red gums in the Curnamona Craton showed that the most successful sampling media would be the leaves followed by the twigs (Hulme & Hill 2003). Studies conducted in the Tanami Desert, which is a regolith-dominated terrain, have suggested that biogeochemistry is a promising method for the detection of mineralisation (Reid *et al.* 2005). In the semi-arid area of the Yilgarn Craton, vegetation was tested as an exploration medium in areas of transported overburden and the data supported the hypothesis that vegetation plays an important role in bringing metals to the surface in semi-arid areas with low water-tables (Anand *et al.* 2007). Reid *et al* (2009) conducted biogeochemical testing over the Au mineralisation at the Titania prospect in the Tanami Desert to determine what species best expressed the chemical signature of the mineralisation. It was found that the difference between chemical signatures from the plant species related to the difference in root depth and the plant's ability to access different parts of the regolith profile (Reid *et al.* 2009).

Biogeochemical sampling involving plants has many advantages in mineral exploration. It is effective in almost all areas as plants are abundant across the landscape in most areas. Plants are also efficient to sample and the process of sampling is relatively undemanding. The cost of sampling is extremely low compared to other exploration techniques making it an attractive method for exploration companies. This process also minimises disturbance to the environment (Hill 2009).

Several studies have investigated the biogeochemistry in areas with extensive aeolian dunefields such as in the Central Gawler Craton in the Northern Eyre Peninsula and at the Tunkillia gold prospect. Lintern (2004) carried out biogeochemical sampling in the Barns Au prospect in the Gawler Craton in the Northern Eyre Peninsula. However, the results were not conclusive as the area was highly disturbed by drilling and agriculture (Lintern 2004). Mayo and Hill (2005) used biogeochemistry techniques to test the chemical characteristics of mallee vegetation near Wudinna in the Gawler Craton, South Australia. Plant samples were taken across phases of dune deposits and found that the vegetation gave an accurate description of the underlying substrates chemical characteristics.

Tunkillia was initially discovered in late 1994 and was one of the first Gold discoveries in the Gawler Craton. In 1994, Helix Resources Ltd found that calcrete sampling in

Tunkillia identified anomalous gold zones associated with a large hydrothermal systems near the Yarlbrinda Shear Zone (Ferris & Wilson 2004). The mineralisation is believed to be focused in brittle to brittle-ductile faults and shear zones (Fraser *et al.* 2007). Acacia Resources and AngloGold Limited carried out exploration in 1998-2002. In 2004 Minotaur Exploration joined the exploration and carried out drilling at 'Area 223' and several other areas using geophysics and geochemistry to test the targets (Helix 2009).

The Tunkillia gold prospect hosts the largest (spatially) Au-in-calcrete anomaly discovered to date in the Gawler Craton (Ferris & Wilson 2004), although its association with underlying mineralisation has been enigmatic. Within the Tunkillia anomaly are zones of higher Au-in-calcrete content, such as the 'Tomahawk' Au-in-calcrete anomaly zone. At 'Tomahawk', exploration drilling has failed to identify significant, underlying mineralisation. Previous success at using biogeochemical exploration techniques to highlight buried mineralisation within the broader Tunkillia anomaly at 'Area 223' and 'Area 191', which anomalies extends approximately 20 km^2 at the >10 ppb level (Ferris & Wilson 2004), provides encouragement for testing these techniques in the area of the 'Tomahawk' anomaly.

This project aims to provide a biogeochemical characterisation of the 'Tomahawk' area and provide a basis to consider associations between plant biogeochemistry, with calcrete geochemistry and underlying bedrock examined in other studies. This study sampled two dominant plants in the study area. The plant species were chosen based on their known penetrative root systems and their widespread and abundant distribution in the Tunkillia gold prospect. The study aims to characterise the plant biogeochemistry enclosing the Au-in-calcrete ‘anomaly’ in an attempt to determine chemical characteristics in the underlying substrate.

2. SETTING

2.1 Location and land use

The Tunkillia gold prospect is 700km northwest of Adelaide and approximately 70 km south-southeast of Tarcoola. The prospect is accessed via unsealed roads and station tracks extending westward from the Stuart Highway. The study area is covered with sand dunes and Aeolian plains (Lowrey & Hill 2006). The Tunkillia Au Project is a joint venture with Minotaur and Helix Resources (Minotaur 2008).

2.2 Climate

The Tunkillia gold prospect has a semi-arid climate. Although it does not have a weather monitoring station, information from Tarcoola should be reasonably representative of climate conditions for Tunkillia. The mean annual rainfall for Tarcoola is 173.8 mm. The average rainfall during winter and spring fluctuates between 14 and 17.1mm per month. Average summer and autumn rainfall per month fluctuates between 9.8 and 14.1 mm, however there has been some high rainfall throughout February. The maximum daily temperature for summer and winter are 35° C and 18.2° C respectively. The minimum daily temperature for summer and winter are 17.9° C and 4.2° C respectively. However, there is not a lot of current data available regarding the climate in Tarcoola (Meteorology 2009).

2.3 Local Geology

The Tunkillia gold prospect is part of the Gawler Craton and is within the northern part of the Yarlbrinda Shear Zone (Ferris & Wilson 2004). Geological outcrops are sparse due to the aeolian dunefields that cover the area. The area includes Achaean and Paleoproterozoic granites that have been intruded by the Hiltaba Suite granite (Lowrey 2007). The surrounding lithologies in the area are largely granitoids that are medium-coarse grained and are from the paleoproterozoic (1690-1670 Ma), Tunkillia Suite (Lowrey 2007) that have been intensely sheared and brecciated due to the Yarlbrinda shear zone (Helix 2009).

Gold is predominantly confined in steeply dipping quartz veins and is associated with sulphides concordant with the main shear direction (Ferris & Wilson 2004). Gold mineralisation is associated with zones of alteration such as sericite, which is the dominant alteration at Tunkillia. (Ferris & Wilson 2004). The mineralisation has been confined to two main areas of interest these are, ‘Area 191’ and ‘Area 223’. There are also significant zones of low-grade oxide Au-mineralisation within the weathered zone however, the upper saprolite is ‘depleted’ (Ferris & Wilson 2004).

2.4 Landscape and regolith

The study area is dominated by aeolian dunefields that are mostly densely vegetated. In most areas the bedrock is covered by approximately 20-30 m of Au-depleted weathered bedrock and aeolian sands (Lowrey & Hill 2006). The dunes trend approximately west-east and tend to be approximately 10m high and 250m apart (from crest) (Lowrey & Hill 2006). The dunes can be categorised into three phases (Phase I, II, and III) of development. There are large erosional plains that are being transgressed by linear dunes migrating east to north-east (Lowrey & Hill 2006).

Phase I dunes contain siliceous and calcareous dune ridges. Phase I dunes are the most mature (age) of the three phases. Phase II dunes contain red/brown clays and encompass minor rhizomorphic regolith carbonates (Mayo & Hill 2005). Phase III dunes contain light grey sands and may be subdivided into other dune types as they have been reworked (Mayo & Hill 2005). Phase III dunes are the youngest of the three phases.

The swales that are intermediately present between dunes have low relief and comprise red-brown quartzose sand. Some of the swales also include kaolinitic clays. Lowrey (2007) compiled profile logs using rock chips from previous RAB drilling. These profiles showed that the base of the profile begins with saprock overlain by kaolinised saprolite. The saprolite is overlain by a plasmic zone and the by hardpan regolith carbonate.

2.5 Vegetation

The vegetation in the Tunkillia gold prospect is mainly low open woodlands and chenopod shrublands. The Tunkillia gold prospect is dominated by dunefields with varying phases, depositional plains and erosional hills and rises (Thomas 2004). The vegetation of Tunkillia is subject to extreme weather conditions, including long periods of drought and large amounts of winter rainfall. The vegetation tends to be associated with the landform settings and the developmental phase of the dune.

Phase I dunes tend to be dominated by woodlands or shrublands. This includes mulga (*Acacia aneura*) and horse mulga (*Acacia ramulosa*) (Lowrey 2007).

Phase II dunes are mainly dominated by woodland such as red mallee (*Eucalyptus socialis*) and surrounded by an understorey of spinifex (*Triodia sp.*) (Lowrey 2007).

Phase III dune vegetation is dependent on nearby landforms. Generally the plant species is to some extent covered with sand and is enclosed by early stages of colonisations by smaller shrubs (Lowrey 2007).

The intermediate swales tend to be colonised by Victoria Desert mallee (*Eucalyptus concinna*), pearl bluebush (*Maireana sedifolia*) and daisy Bluebush (*Cratystylis conocephala*). The swales that contain regolith carbonate tend to be colonised by black oak (*Casuarina pauper*) and pearl bluebush (*Maireana sedifolia*) (Lowrey 2007).

3. METHODS

3.1 Sampling procedure

Plant species were chosen based on their widespread and abundant nature in the sample area. The plants distribution in Australia is located at figure 1, 2 and 3. A total of 165 plant samples were taken from two species, black oak (*Casuarina pauper*) and Great Victorian Desert mallee (*Eucalyptus concinna*). Table 1 shows the summary of samples taken in the study area. Each sample involved plant leaves being taken from several points around the tree. 165 trees were sampled over and in the region of the

‘Tomahawk’ anomaly. The sampling was conducted over seven NE-SW trending transects with the longest transect being 1 km long and each being approximately 200 m apart. Figure 4 shows the transects with GPS co-ordinates. Figures 5, 6 and 7 shows the same transects separated into different plant species.

Vegetation samples were collected in accordance with the procedures outlined by Hill & Hill (2003). However the samples were collected by hand using powder-free latex gloves rather than using Teflon © coated pruning clippers. Care was taken to minimise contamination due to jewellery, other plants, sunscreen and drill hole dust. The samples were stored in labelled brown paper bags until prepared for analysis (Hill & Hill 2003).

3.2 Sample Preparation

Vegetation samples were stored in brown paper bags and dried in ovens at 60°C at the University of Adelaide. Once dry, samples were sorted to remove any twigs or damaged leaves. The samples were then milled using a stainless steel rotating blade coffee grinder until their consistency was a fine powder. Once completed the samples were packaged in small Kraft© envelopes and sealed. The coffee grinder was cleaned using ethanol, and the samples received little further handling to minimise contamination. Once this process was complete for each sample the envelopes were freighted to ACME Laboratories in Canada. ACME Laboratories used ICP-MS on the samples to measure the abundance of certain elements (Acme 2009).

The samples were analysed by ICP-MS for 53 elements (detection limit. These are: Silver Ag (2 ppb), Arsenic As (0.1 ppm), Gold Au (0.2 ppb), Aluminium Al (0.01 %), Boron B (1 ppm), Barium Ba (0.1 ppm), Beryllium Be (0.1 ppm), Bismuth Bi (0.02 ppm), Calcium Ca (0.01 %), Cerium Ce (0.01 ppm), Caesium Cs (0.005 ppm), Chromium Cr (0.1 ppm), Copper Cu (0.01 ppm), Cobalt Co (0.01 ppm), Cadmium Cd (0.01 ppm), Iron Fe (0.001 %), Gallium Ga (0.1 ppm), Germanium Ge (0.01 ppm), Hafnium Hf (0.001 ppm), Mercury Hg (1 ppb), Potassium K (0.01 %), Lanthanum La (0.01 ppm), Lithium Li (0.01 ppm), Indium In (0.02 ppm), Magnesium Mg (0.001 %), Molybdenum Mo (0.01 ppm), Manganese Mn (1 ppm), Sodium Na (0.001 %), Niobium Nb (0.01 ppm), Nickel Ni (0.1 ppm), Phosphorous P (0.001 %), Lead Pb (0.01 ppm), Palladium Pd (2 ppb), Platinum Pt (1 ppb), Rubidium Rb (0.1 ppm), Rhenium Re (1 ppb), Sulphur S (0.01 %), Antimony Sb (0.02 ppm), Scandium Sc (0.1 ppm), Selenium Se (0.1 ppm), Tin Sn (0.02 ppm), Strontium Sr (0.5 ppm), Tantalum Ta (0.001 ppm), Tellurium Te (0.02 ppm), Titanium Ti (1 ppm), Thorium Th (0.01 ppm), Thallium Tl (0.02 ppm), Uranium U (0.01 ppm), Vanadium V (2 ppm), Tungsten W (0.1 ppm), Yttrium Y (0.001 ppm), Zinc Zn (0.1 ppm) and Zirconium Zr (0.01 ppm). One in ten samples were split and duplicated for QA/QC purposes. The results of these assays are presented as appendix 12.1.

4. RESULTS

The ICP-MS assay results for *E. Concinna* and *C. pauper* are included in appendix 12.1. These results include all 53 element analyses. Results are described here for 13 elements (Au, Ag, Pb, Zn, Sb, Ce, As, Cu, U, Ca, Al, Fe and Hg). These elements were chosen based on their known ability to act as path finders for mineralisation. Split probability plots showing biogeochemical trends are included in figures 8 to 20, only the selected elements are included in these plots. A statistical summary table is located at 10.2 for *C. pauper*, 10.3 *for E. concinna* and 10.4 for the combined statistical summary. The selected elements were also plotted in distribution plots indicating target areas of interest included in figures 21 to 33

4.1 Split Probability Plots

The split probability plots located at figures 8 to 20 demonstrate the difference between each of the species and to express elements from the underlying substrate. Probability plots show the values of a variable against a theoretical distribution. The Y axis represents the concentrations expected for a normal distribution. If the data are normally distributed the values would all fall on a straight line however, if not, the values deviate from the line. The X axis represents the N-score (standard deviations). For Gold, there are elevated assay results for *E. concinna* which remain stable in comparison to *C. pauper*. Silver shows a steady and low assay level however, *C.pauper* shows some high results. Lead shows a steady increase in assay levels in *C. pauper* however, a lower and stable assay level for *E. concinna*. Zinc levels are higher in the *E. concinna* however; the *C. pauper* assay results continue to rise giving a higher assay level in the *C. pauper* overall. The antinomy results show a generally stable level with some high results within the *C. pauper*. Cerium has relatively stable results in the *C. pauper* results, however; the assay results are generally higher in the *E. concinna*. Arsenic has similar assay results for both *E. concinna* and *C. pauper* however; there are some high values within the *C. pauper*. Copper shows a steadily increasing result however, the higher results are present in the *E. concinna*. Uranium results are much higher in the *E. concinna* compared to the *C. pauper*. The *C. pauper* has low uranium assay results. Calcium is high in both the *E. concinna* and *C.pauper*, however, steadily higher in *C. pauper*. Aluminium has low assay results for both *C. pauper* and *E.*

concinna; however, there are high values within the *C. pauper* results. Iron is reasonably constant within the *E. concinna* results, however, there are sharp increases in the results for *C. pauper*, with *C. pauper* attaining higher levels overall. The mercury levels are high in both *E. concinna* and *C. pauper* but greater in *E. concinna*.

4.2 Distribution Plots

The distribution plots located at figures 21 to 33 demonstrate areas of high concentrations within the sampled area. Gold has a cluster of high values in the far northeast corner of the first transect. The gold results show generally elevated levels throughout the transect. Silver has elevated concentrations in the NW top half of the transect area. There are also high concentrations in the far northeast corner of the first transect. Lead has high concentrations throughout the transects with groupings along the forth and fifth transects in the southeast half of the target area. Zinc has elevated results along the forth transect, however, there are highs values sporadically throughout the target area. The Antinomy results show elevated clusters in the far northeast corner of the first transect and also in the centre of the second and third transects. Arsenic has a high value in the far northeast corner of the first transect. There are also high values sporadically throughout the target area. Cerium has elevated results in the fourth transect and also in the far northeast corner of the first transect. Copper has high concentrations throughout the eastern end of the third and fourth transects. There are also higher values in the far northeast corner of the first transect. Aluminium has sporadic anomalies in the northwest half of the target area. There is also a high value in the far northeast and southeast corner of the transect area. Uranium has high values in the first four transects of the target area. There is a cluster of high values in the southwest side of the first three transects. Uranium also has a high value in the far northeast corner of the first transect. Iron has sporadically high values throughout the transect area. There is a cluster of high values in the northeast corner of the first transect. Calcium has sporadic high values throughout; however, Calcium is relatively consistent throughout the target area. There is a high value in the northeast corner of the first transect and in the SW end of the fourth transect. Mercury has high values throughout the second transect, however, there are high values throughout the target area. Mercury also has a high concentration in the northeast corner of the first transect.

4.3 Contamination

Although every effort was taken to minimise contamination of the samples there is a suggestion by the results that some of the samples may have been exposed to detrital inputs. These are expressed within sub-populations within the Gold, Iron, Cerium and Calcium results. These sub-populations suggest that some of the samples have elevated levels due to a little bit of alumino-silicate, Fe-oxide or carbonate dust on the leave, however; overall the dust results are very low. The Aluminium results suggest some clay contamination, however; this is still only around twice the detection limit, and is most likely insignificant. If contamination was significant the results for Titanium and Zirconium would have been anomalously elevated. The contamination of these samples appears very low validating the care taken during the sample collection and preparation.

5. DISCUSSION: MODEL FOR BIOGEOCHEMICAL EXPRESSION OF MINERALISATION

There are a range of variables associated with the environment and biogeochemical processes that contribute to the biogeochemical signature in the plant samples. These variables include:

- Species Characteristics and differences;
- Element Availability;
- Contemporary and palaeolandscape controls; and,
- Bedrock/mineralisation expression

5.1 Species Characteristics and Differences

Biogeochemical characteristics vary between plant species. Both of the species used in this study have different distributions, characteristics and express elements differently. This potentially means that the plant species will express mineralisation differently. Each species has been presented in split probability plots to allow for each of the elements to be examined in detail.

Casuarina pauper is common across the drier parts of South Australia and generally occurs in woodland areas on calcareous soils (Friebe & Matheson 2006). *C. pauper* typically colonises aeolian swales and erosional plains and as such dominated the sampling area. It therefore has the potential to show a more accurate representation on the underlying mineralisation as it is widely sampled over the entire area. The elements Silver, Lead, Zinc, Arsenic, Calcium, Aluminium, Iron and Mercury showed elevated concentrations within the *C. pauper* samples. These elements do appear to associate together possibly expressing buried mineralisation. Mercury, Iron, Aluminium, Gold, Cerium, Zinc and Lead have an irregular distribution throughout the target area. This suggests that the *C. pauper* rooting system is able to penetrate through the aeolian cover into underlying mineralisation. This may also represent the possibility of penetrating a dispersion halo surrounding the mineralisation in the underlying substrate.

Eucalyptus concinna is widespread and common throughout the Great Victorian Desert of South Australia, It generally occurs on swales and on the sides of sand dunes. *E. Concinna* was far less abundant in the sampling area compared to the *C. Pauper* as the target area was an erosional plain. Although, the *E. Concinna* does demonstrate information regarding the underlying mineralisation, the *C. pauper* has been more successful in its demonstration of the underlying substrate due to its abundance. Assays for Cerium, Gold, Copper, Uranium, Calcium and Mercury showed high anomalies within the *E. Concinna*. These elements do appear to accumulate together suggesting possible areas of mineralisation with the underlying substrate. Cerium, Gold and Uranium demonstrate an irregular distribution throughout the target area. This suggests that the *E. concinna* rooting system is able to penetrate through the aeolian cover into underlying mineralisation. This may also represent the possibility of penetrating a dispersion halo surrounding the mineralisation in the underlying substrate.

The results do suggest that the uptake of element is also proportional to the concentration of that element in the underlying substrate (Lowrey 2007) and that abundant elements can demonstrate the underlying mineralisation with a greater degree of ease.

5.2 Element Availability

5.2.1 Gold

Gold is absorbed by plants quite easily in soluble forms as gold is quite mobile. When gold enters the root system of plants is can easily be transported to the tops of the plants allowing for effective sampling of leaves (Kabata-Pendias 2001). To date anomalous gold contents in plants are reported for plants overlying mineralised areas.

5.2.2 Silver

Silver concentrations differ between plant species. The silver concentration located in plants appears to be related to the amount of metal in the soils. This again allows for this element to be detected during biogeochemical sampling. Silver can be concentrated to toxic levels in plants when growing in Au-mineralised areas (Kabata-Pendias 2001).

5.2.3 Lead

Lead is a major chemical pollutant however its concentration in plants is greatly effected by man made industries and pollution. Lead in plants is influenced by several environmental factors such as pollution, seasonal variation and geochemical anomalies. Although Lead is the metal of least bioavailability it can be sourced by the plant in two ways, through soil or air which allows for people to test plants to determine the pollution level in the soil and surrounding areas (Kabata-Pendias 2001).

5.2.4 Zinc

Soluble forms of zinc are readily available to plants and the uptake is closely related to the amount of zinc present in the in the soils. The Rate of zinc absorption differs greatly among plant species. Some authors suggest zinc as being highly mobile with others believe it to have intermediate mobility (Kabata-Pendias 2001). Roots often contain more zinc than the top of the plant.

5.2.5 Antimony

Antimony is considered a nonessential metal and is known to be easily taken up by plants if present in soluble form. There are no reports of plant toxicity caused by antimony however, levels would be expected to increase in plants growing on contaminated soil due to industrial emissions (Kabata-Pendias 2001).

5.2.6 Cerium

The abundance of cerium in plants is dependent on its occurrence in the soil. Woodland plants seem to have the highest ability to absorb cerium. This suggests that woodland plants would be ideal to sample when looking for this element. Cerium is reported to be toxic to cell metabolism but there is not much data on its inhibitory effects on plants (Kabata-Pendias 2001).

5.2.7 Arsenic

Arsenic is a constituent in most plants. Therefore it is not unusual to detect arsenic in plant sampling. However, plant absorption does vary between plant species. Some plants can tolerate higher levels of arsenic whilst others have a low immunity to large levels (Kabata-Pendias 2001). Usually plants growing in areas such as mine waste sites have a high tolerance and will absorb a large amount of arsenic.

5.2.8 Copper

There is increasing evidence of active absorption of copper by plants. It is likely that metal enters root cells in dissociated forms. The rate of copper uptake from plants differs with plant species. The movement of copper plays a predominant role in the plants utilisation of the copper, the process however is not yet fully understood. Within roots, copper is associated mainly with cell walls and is immobile (Kabata-Pendias 2001).

5.2.9 Uranium

Uranium is detected at its highest on plants located on mineralised ground. The assessment of the transfer of uranium from soils to plants is important in environmental research however, little information is available (Kabata-Pendias 2001). However, this element appears to be readily absorbed by plants indicating biogeochemistry would be an appropriate sampling medium to detect high levels of uranium in the soil.

5.2.10 Aluminium

Aluminium is a common constituent of all plants. However the content on plants varies greatly. Plant species differ in their ability to uptake aluminium. Aluminium excess in plants is known to induce calcium deficiency (Kabata-Pendias 2001).

5.2.11 Iron

Iron uptake by plants is metabolically controlled, although it may also be absorbed as Fe^{3+} or $Fe^{2+.}$ Iron is not readily transported in plant tissues, and therefore its deficiency appears first in younger plant parts. Iron uptake is effected by plant and environmental factors (Kabata-Pendias 2001).

5.2.12 Mercury

Plants seem to take up mercury easily making it an effective plant for biogeochemical sampling. Mercury is easily absorbed by the root system and is also translocated within the plant. Plants are also known to absorb mercury vapour. (Kabata-Pendias 2001). Mercury in plants can also be affected by fertilisers due to their ability to uptake through the root system.

5.3 Contemporary and Palaeolandscape Controls

Due to the varying landscape in the Tunkillia gold prospect there is the potential for variations in biogeochemical characteristics. This also places limitations onto the possibility of mineral exploration in the target area. The two species analysed in this study both habitat different landscapes.

E. Concinna dominates swales and the sides of sand dunes. These swales are widespread throughout the Tunkillia Gold prospect however, not as common within the target area. These swales typically have a thinner aeolian cover than the surrounding dunes. This suggests greater ease for plants to penetrate the cover and infiltrate the underlying substrate. This allows for a successful expression of any underlying mineralisation.

C.pauper dominates erosional plains. This was the dominate landscape in the target area. Erosional plains contain little aeolian cover allowing for the plant roots to penetrate the underlying mineralisation. Erosional plains are older land surfaces and allow for the accumulation of elements. From an exploration point of view this is an attractive feature of sampling the *C. Pauper.*

The sampling in this study was conducted during an extensive period of drought in the Tunkillia gold prospect. As a result of this drought it stands to reason that the plant roots would be at their deepest sourcing water from deeper in the substrate. It has been suggested that higher assay values are obtained during the dry season as rainfall can influence the mobility of elements in plants (Cole *et al.* 1968, Eupene & Williams 1980, Hulme & Hill 2004). This suggests that the sampling was done during an ideally dry season allowing for a more accurate representation of the underlying substrate. The Au-in calcrete ‘anomaly’ was investigated using airborne Electromagnetic data (Lane &

Worrell 2002). Using aerial photos and field work allowed for the detection of a palaeodrainage network throughout the Tunkillia gold prospect. This palaeodrainage network could have allowed for misleading information regarding the location of mineralisation in the area as it suggests that the ‘Tomahawk’ anomaly is a transported anomaly. As the results suggest no mineralisation under the ‘Tomahawk’ anomaly this also supports the concept of plant roots and their ability to penetrate the underlying substrate to give an accurate representation of underlying mineralisation.

The contemporary landscape is dominated by dunes and swales. However, the results do not appear to vary by way of the landscape. This means that the results are largely independent of the contemporary landscape setting. This suggests that they relate to something much deeper. There is a palaeodrainage system flowing through the area broadly running from the south to the west of the target area. This shows as silcrete lag with sub-rounded quartz pebbles and also the dark toned ephemeral swampy depressions. Therefore there may be a palaeolandscape control on the results as there are clusters in the northwest to southeast, however, the palaeodrainage may also coincide with bedrock structures. However, there is only a weak response from the ‘Tomahawk’ anomaly which corresponds to the confluence shown in figure 34 of the two palaeodrainage valleys and on elevated Au-in-calcrete response. This suggests that the ‘Tomahawk’ anomaly is a transported (palaeodrainage) Au-in-calcrete anomaly and the plants are extracting a deeper response and this explains why they do not show elevated responses over the ‘Tomahawk’ anomaly.

5.4 Bedrock/Mineralisation expression

The geophysical map shown at figure 35 (PIRSA 2004) shows area 223, 191 and ‘Tomahawk’. This map also shows the Yarlbrinda Shear Zone and the internal structures and contacts trend North-west south-east. These structures and lithologies ‘grain’ the nearest known mineralisation at area 223 which is also trending north-west south-east. However, detailed geology and structure is unknown beyond this due to the aeolian cover. The North-west south-east trends result in clusters of elevated results which support the idea of bedrock/mineralisation control.

6. DISCUSSION: IMPLICATIONS FOR MINERAL EXPLORATION

6.1 Study area targets

When looking at the Au assay results it is immediately clear that there are target areas that can be defined. These results have been allocated into three study area targets.

i) High priority- this is defined by the organised arrangement of high Au following structures and lithological ‘grain’. These target areas also need to be supported by multi-elements.

ii) Priority- this is defined by discrete high gold values and variable multi-element support

iii) Low priority- this is defined by an anomalous high at one location and not supported by surrounding sampling targets or by multi-elements.

The gold assay results have been studied and 10 target areas have been assigned. Four of these being defined as targets A, B, C and D which are High Priority Targets. Three of these defined as targets E, F and G which are Priority Targets and the remaining three are defined as targets H, I and J. These last three targets are Low priority Targets.

These targets have been defined in figures 36 to 48. These targets have been defined using the gold assay results and the targets are supported by multi-element target definition. Within the high priority targets, Target A is supported by Silver, Antimony, Arsenic, Cerium, Copper, Aluminium, Uranium, Iron and calcium. Target B is supported by Silver, Lead, Zinc, Antimony, Calcium and Iron. Target C is supported by Zinc, Antimony and Copper. Target D is supported by Lead, Zinc, Antimony, Cerium, Copper, Uranium and mercury. Within the Priority targets, Target E is supported by Arsenic and cerium. Target F is supported by Lead, antimony, Cerium, Mercury and uranium. Target G is supported by cerium. Within the low priority targets, Target H is supported by lead and cerium. Target I is supported by no multi-elements and Target J is supported by lead.

It seems ideal to look at the gold assay results to start with and define the target areas however; this will only be effective by using multi element support such as silver and antimony.

6.2 Regional Exploration Implications

The Tunkillia area has an Au-in calcrete ‘anomaly’ that is quite spatially large. As a result many smaller significant zones of mineralisation have been defined. However, it is possible that many areas are still yet to be defined, as the area has not yet been thoroughly explored. Alternative exploration techniques are required in order to better detect the Au-mineralisation within this area. This exploration is quite difficult due to the amount of aeolian cover dominating the Tunkillia gold prospect.

There are also concerns with element mobility, as the palaeodrainage network during heavy rain is allowing the elements to travel through the area given an inaccurate indication of the underlying substrate during soil sampling.

Plant biogeochemistry appears to be a successful medium for determining the underlying substrate however it does have its limitations. There needs to be appropriate plant types present in order to get an accurate representation of the underlying mineralisation. The limitations of the two plants chosen in this study are also noted. *C. Pauper* was far more dominant in the area than the *E. Concinna*. This creates and issue if the *E .concinna* was to be used as the sole sampling medium. The plant colony also changes with the landscape making it virtually impossible for one plant to be capable of representing the entire study area. It is also important that the plants used have significant root length in order to be capable of expressing the underlying substrate. Vegetation in this case is only limited by their own frequency rather than their ability to express underlying mineralisation.

The two plants used in this study area are also limited in their distribution country wide. They colonise in the southern to south western parts of Australia making them an unlikely medium to be used else in the country shown is figures 1, 2 and 3.

This study would be ideally followed on by testing regional calcrete and perhaps ranking the calcrete targets based on the palaeodrainage.

7. CONCLUSION

7.1 Landscape

The results from this study have provided major implications for mineral exploration in areas dominated by aeolian cover. Dunes and swales dominate the contemporary landscape however; the results do not appear to vary by way of the landscape. This means that the results are largely independent of the contemporary landscape setting. The northwest- southeast trends result in clusters of elevated results, which support the idea of bedrock/mineralisation control. Therefore there may be a palaeolandscape control on the results as there are clusters in the northwest to southeast; however, the palaeodrainage may also coincide with bedrock structures. There is only a weak response from the 'Tomahawk' anomaly, which corresponds to the confluence of the two-palaeodrainage valleys and on elevated Au-in-calcrete response. This suggests due to the aeolian cover, that soil sampling may not be an appropriate sampling medium to assess the underlying substrate without the support of biogeochemistry.

7.2 Plant Biogeochemistry

This study has proven that biogeochemistry is an effective sampling medium for mineral exploration. This study has identified two plants (*C. Pauper* and *E. Concinna*) that appear to be effective for determining possible mineralisation in the underlying substrate. Although contamination could influence these results so care must be taken during the sampling process. This study has determined that there is the possibility of underlying mineralisation in the defined High Priority target areas. the 'Tomahawk' anomaly did not give high results signifying that the aeolian cover has been misleading in its proposal of underlying mineralisation. However, biogeochemical sampling is limited by the abundance of vegetation in the areas and is controlled by the distance between samples. Biogeochemical sampling will be most effective if also followed up and supported by another sampling medium such as calcrete sampling after defining target areas.

8. ACKNOWLEDGEMENTS

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9. REFERENCES

ACME L. L. A. 2009. Soil, Till and Sediment <http://acmelab.com/services/method-descriptions/soil-till-and-sediment/>.

ANAND R. R., CORNELIUS M. & PHANG C. 2007. Use of vegetation and soil in mineral exploration in areas of transported overburden, Yilgarn Craton, Western Australia: A contribution towards understanding metal transportation processes. *Geochemistry: Exploration, Environement, Analysis* **7**, 267-288.

BROOKS R. R. 1972. *Geobotany and biogeochemistry in Mineral Exploration*. Harper & Row, New York.

COLE M. M., PROVAN D. & TOOMS J. 1968. Geobotany, Biogeochemistry and Geochemistry in the Bulman-Waimuna Springs area, Northern Territory, Australia. *Transactions of the institute of mining and metallurgy section* 77, 81-104.

EUPENE G. S. & WILLIAMS B. T. 1980. Ranger One U deposits, Pine Creek Block, N.T. *Journal of Geochemical Exploration* **12**, 140-143

FERRIS G. & WILSON M. 2004. Tunkillia Project- Proterozoic shear-zone-hosted gold mineralisation within the Yarlbrinda Shear Zone. *MESA* **35**, 6-12.

FRASER G., SKIRROW R. G., SCHMIDT-MUMM A. & HOLM O. 2007. Mesoproterozoic gold in the central Gawler Craton, South Australia: Geology, alteration, fluids and timing. *Economic Geology* **102**, 1511-1539.

FRIEBE M. & MATHESON B. 2006. *Shrubs and Trees of the Great Victorian Desert*. Department for Environment and Heritage, South Australia.

HELIX Resources. 2009. Tunkillia Project-South Australia <http://helix.net.au/tunkillia.21.html>.

HILL S. M. 2009. Vegetation Sampling in the Gawler Craton. *School of Earth and Environmental Sciences, University of Adelaide*.

HILL S. M. & HILL L. J. 2003. Some important plant characteristics and assay overviews for biogeochemical surveys in western New South Wales. *In: Roach (Ed) Advances in Regolith CRC LEME*, 187-192.

HULME K. & HILL S. M. 2003. River Red Gums as a biogeochemical sampling medium in mineral exploration and environmental chemistry programs in the Curnamona Craton and adjacent regions of NSW and SA. *Advances in Regolith CRC LEME,* 205-210.

HULME K. & HILL S. M. 2004. Seasonal Element variations of Eucalyptus Camaldulensis Biogeochemistry and Implications for Mineral Exploration: An example from Teilta Curnamona Province, Western NSWSEASONAL ELEMENT *Regolith 2004, CRC LEME*, 151-156.

KABATA-PENDIAS A. 2001. *Trace Elements in Soils and Plants*. CRC Press LLC, Florida.

LANE R. & WORRELL L. 2002. Interpretation of airborne electromagnetic data: Summary Report on the Tunkillia workshop. *Geoscience Australia* Restricted Report.

LINTERN M. J. 2004. Preliminary studies at Barns Gold Prospect, Gawler Craton, South Australia. *CRC LEME* Open File Report 168.

LOWREY J. 2007. Plant Biogeochemical expression of Au-Mineralisation buried by an aeolian dunefield, Tunkillia, south australia. *CRC LEME, School of Earth and Environmental Sciences*, 1-23.

LOWREY J. & HILL S. 2006. Plant biogeochemistry of Au-mineralistion burried by an aeolian dunefield, Tunkillia, S.A. *CRC LEME, School of Earth and Environmental Sciences*, 217-220.

MAYO A. M. & HILL S. M. 2005. Mineral exploration through and aeolian dunefield near Wudinna, Gawler Craton , South Australia: A framework of plant biogeochemistry and geobotany. *Regolith 2005 -Ten years of CRC LEME*, 223-228.

Bureau of Meteorology. 2009. Climate statistics for Australian locations, Tarcoola <www.bom.gov.au/climate/averages/tables/cm_016044.shtml>.

MINOTAUR 2008. "Tunkillia" from <www.minotaurexploration.com.au>.

PIRSA 2004. "Tunkillia Project" from <www.pir.sa.gov.au>.

REID N., HILL S. M. & LEWIS D. M. 2005. Tanami Geobotany and Biogeochemistry: Towards its characterisation, role in regolith evolution and implications for mineral exploration. *Regolith 2005 -Ten years of CRC LEME*, 256-259.

REID N., HILL S. M. & LEWIS D. M. 2009. Biogeochemical expression of buried gold mineralisation in semi-arid nothern Australia: penetration of transported cover at the Titania Gold Prospect, Tanami Desert, Australia. *Geochemistry: Exploration, Environment, Analysis* 9, 267-273.

THOMAS M. 2004. Biogeochemical Data Ranges from Tunkillia Prospect, Central Gawler Craton, South Australia. *Regolith 2004, CRC LEME*, 362-364.

10. TABLES

11. FIGURES

Figure 8. Split probability plots for gold from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 9. Split probability plots for silver from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 10. Split probability plots for lead from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 11. Split probability plots for zinc from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 12. Split probability plots for antimony from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 13. Split probability plots for cerium from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 14. Split probability plots for arsenic from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 15. Split probability plots for copper from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 16. Split probability plots for uranium from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 17. Split probability plots for calcium from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 18. Split probability plots for aluminium from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 19. Split probability plots for iron from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 20. Split probability plots for mercury from the biogeochemical samples taken in the Tunkillia gold prospect

Figure 21. Distribution plots for gold from biogeochemical samples taken in the Tunkillia gold prospect

Figure 22. Distribution plots for silver from biogeochemical samples taken in the Tunkillia gold prospect

Figure 23. Distribution plots for lead from biogeochemical samples taken in the Tunkillia gold prospect

Figure 24. Distribution plots for zinc from biogeochemical samples taken in the Tunkillia gold prospect

Figure 25. Distribution plots for antimony from biogeochemical samples taken in the Tunkillia gold prospect

Figure 26. Distribution plots for arsenic from biogeochemical samples taken in the Tunkillia gold prospect

Figure 27. Distribution plots for cerium from biogeochemical samples taken in the Tunkillia gold prospect

Figure 28. Distribution plots for copper from biogeochemical samples taken in the Tunkillia gold prospect

Figure 29. Distribution plots for aluminium from biogeochemical samples taken in the Tunkillia gold prospect

Figure 30. Distribution plots for uranium from biogeochemical samples taken in the Tunkillia gold prospect

Figure 31. Distribution plots for iron from biogeochemical samples taken in the Tunkillia gold prospect.

12. APPENDIX

Table 1. Summary of Vegetation samples taken from Tunkillia during April 2009.

Species Name	Number of samples collected
Black Oak (Casuarina Pauper)	137
Great Victorian Desert Mallee (Eucalyptus Concinna)	28

Table 2. Sumamry statistics table for *C. pauper*.

	Ag (2 ppb)	*Al (0.01 %)*	*As (0.1 ppm)*	*Au (0.2 ppb)*	*Ca (0.01 %)*	*Ce (0.01 ppm)*	*Cu (0.01 ppm)*	*Fe (0.001 %)*	*Hg (1 ppb)*	*Pb (0.01 ppm)*	*Sb (0.02 ppm)*	*U (0.01 ppm)*	*Zn (0.1 ppm)*
Mean	0.394160584	0.006350365	0.012408759	0.675182482	1.044087591	0.144160584	2.711386861	0.009430657	15.67883212	0.132481752	0.005912409	0.001605839	13.42262774
Standard Error	0.319395506	0.000556741	0.003654998	0.088912983	0.018723358	0.004169604	0.063351472	0.000218015	0.393694165	0.006582682	0.000969449	0.000776932	0.413948762
Median	0	0.01	0	0.4	1.04	0.14	2.55	0.009	15	0.12	0	0	12.4
Mode	0	0	0	0	0.91	0.12	2.49	0.009	16	0.11	0	0	14.8
Standard Deviation	3.738428547	0.006516485	0.042780657	1.04069978	0.219151287	0.048803965	0.741509968	0.002551803	4.608072052	0.077048314	0.011347113	0.009093758	4.845146035
Sample Variance	13.975848	4.24646E-05	0.001830185	1.083056033	0.048027286	0.002381827	0.549837033	6.5117E-06	21.23432804	0.005936443	0.000128757	8.26964E-05	23.4754401
Kurtosis	126.7072635	-0.661514669	12.09014835	49.77617076	-0.336107319	2.175370455	0.408378793	0.106645666	0.239162125	9.622584282	0.840692819	102.5591664	0.706829682
Skewness	11.10976016	0.536392513	3.571226275	5.929404886	0.090958152	1.137739428	0.686659951	0.531644257	0.578881538	2.696543946	1.563292257	9.617321783	0.989047593
Range	43	0.02	0.2	10.1	1.14	0.29	3.82	0.013	23	0.55	0.04	0.1	24.1
Minimum	1	0.05	0.05	0.1	0.42	0.06	1.36	0.004	7	0.005	0.01	0.005	5.5
Maximum	43	0.02	0.2	10.1	1.56	0.35	5.18	0.017	30	0.55	0.04	0.1	29.6
Sum	54	0.87	1.7	92.5	143.04	19.75	371.46	1.292	2148	18.15	0.81	0.22	1838.9
Count	137	137	137	137	137	137	137	137	137	137	137	137	137
Confidence Level(95.0%)	0.631624015	0.001100989	0.007227981	0.175830824	0.037026578	0.008245645	0.125281384	0.000431138	0.778554126	0.013017653	0.001917145	0.001536431	0.818608823

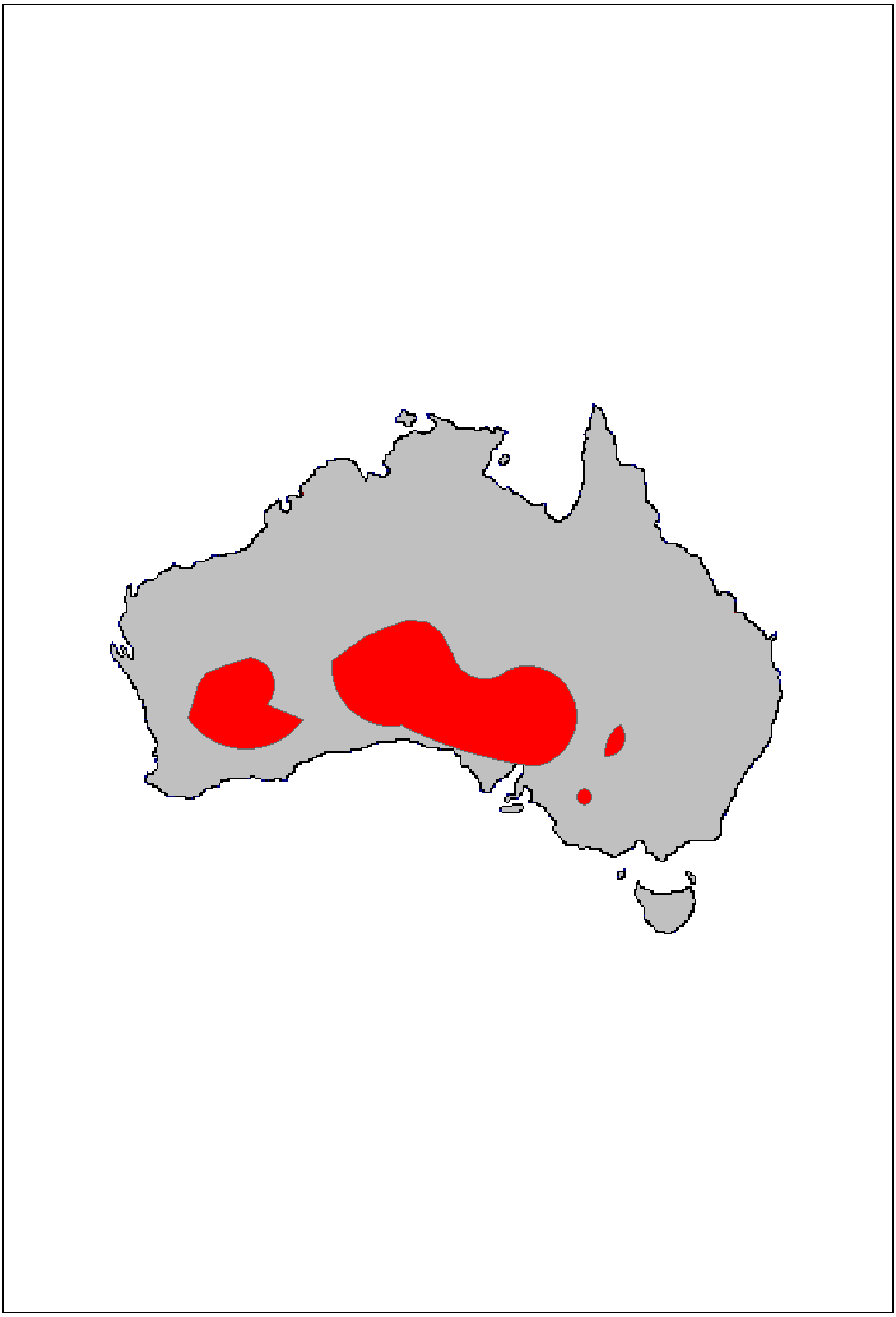
Table 3. Sumamry statistics table for *E. concinna*.

	Ag (2 ppb)	*Al (0.01 %)*	*As (0.1 ppm)*	*Au (0.2 ppb)*	*Ca (0.01 %)*	*Ce (0.01 ppm)*	*Cu (0.01 ppm)*	*Fe (0.001 %)*	*Hg (1 ppb)*	*Pb (0.01 ppm)*	*Sb (0.02 ppm)*	*U (0.01 ppm)*	*Zn (0.1 ppm)*
Mean	0	0.004285714	0.003571429	1.007142857	0.7875	0.156428571	3.883571429	0.003714286	17.75	0.056071429	0.005	0.041071429	13.75714286
Standard Error	0	0.001082395	0.003571429	0.262664842	0.051297001	0.027993831	0.237160905	0.00021735	1.450802551	0.005712219	0.002089277	0.007789208	0.589826191
Median	0	0	0	0.6	0.795	0.12	3.63	0.0035	18	0.045	0	0.03	13.95
Mode	0	0	0	0	0.54	0.04	3.29	0.003	10	0.04	0	0	9.9
Standard Deviation	0	0.005727498	0.018898224	1.389891701	0.271438213	0.14812943	1.25493755	0.001150109	7.676925503	0.030226219	0.011055416	0.041216617	3.121066837
Sample Variance	0	3.28042E-05	0.000357143	1.931798942	0.073678704	0.021942328	1.574868254	1.32275E-06	58.93518519	0.000913624	0.000122222	0.00169881	9.741058201
Kurtosis	#DIV/0!	-0.03782118	28	8.098231222	0.066171754	4.311019953	5.02842007	-0.220203028	-0.377203752	0.058811357	1.676185633	2.535396782	-0.964862934
Skewness	#DIV/0!	0.935801555	5.291502622	2.642652638	0.459954682	2.059287448	1.833098904	0.609975489	0.463256296	0.891773077	1.85967137	1.544609882	-0.2858078
Range	0	0.02	0.1	6.4	1.12	0.61	6.2	0.004	30	0.11	0.03	0.17	11.1
Minimum	1	0	0	0	0.33	0.04	2.17	0.002	6	0.02	0	0	8.3
Maximum	1	0.02	0.1	6.4	1.45	0.65	8.37	0.006	36	0.13	0.03	0.17	19.4
Sum	0	0.12	0.1	28.2	22.05	4.38	108.74	0.104	497	1.57	0.14	1.15	385.2
Count	28	28	28	28	28	28	28	28	28	28	28	28	28
Confidence Level(95.0%)	0	0.002220892	0.007327966	0.538943733	0.10525275	0.057438596	0.486613976	0.000445966	2.976800914	0.011720504	0.004286843	0.015982135	1.210223365

Table 4. Sumamry statistics table for *C. pauper* and *E. concinna*.

	Ag (2 ppb)	*Al (0.01 %)*	*As (0.1 ppm)*	*Au (0.2 ppb)*	*Ca (0.01 %)*	*Ce (0.01 ppm)*	*Cu (0.01 ppm)*	*Fe (0.001 %)*	*Hg (1 ppb)*	*Pb (0.01 ppm)*	*Sb (0.02 ppm)*	*U (0.01 ppm)*	*Zn (0.1 ppm)*
Mean	0.327272727	0.006	0.010909091	0.731515152	1.000545455	0.146242424	2.91030303	0.008460606	16.03030303	0.119515152	0.005757576	0.00830303	13.47939394
Standard Error	0.265281459	0.000499815	0.003101889	0.086403059	0.019273243	0.005830414	0.074264834	0.000249241	0.411352594	0.005980262	0.000877372	0.001857098	0.357491359
Median	0	0.01	0	0.5	0.99	0.14	2.76	0.009	16	0.11	0	0	12.6
Mode	0	0	0	0	0.91	0.12	2.49	0.009	16	0.11	0	0	14.8
Standard Deviation	3.40760204	0.006420242	0.039844487	1.109867387	0.247569292	0.074893025	0.953949061	0.003201556	5.283919741	0.076817856	0.011270051	0.023854852	4.59205965
Sample Variance	11.61175166	4.12195E-05	0.001587583	1.231805617	0.061290554	0.005608965	0.91001881	1.025E-05	27.91980783	0.005900983	0.000127014	0.000569054	21.08701183
Kurtosis	152.6528206	-0.599981172	14.25522804	34.50866902	-0.155743748	15.20084731	6.07231186	-0.289884062	0.793276203	9.39375095	0.892673102	18.86961029	0.814636884
Skewness	12.19407454	0.598953682	3.831343475	4.931727797	-0.129664002	2.962880278	1.653923347	0.076562248	0.75924578	2.529508155	1.59418248	4.050404251	0.926454365
Range	43	0.02	0.2	10.1	1.23	0.61	7.01	0.015	30	0.55	0.04	0.17	24.1
Minimum	1	0.005	0.05	0.1	0.33	0.04	1.36	0.002	6	0.005	0.01	0.005	5.5
Maximum	43	0.02	0.2	10.1	1.56	0.65	8.37	0.017	36	0.55	0.04	0.17	29.6
Sum	54	0.99	1.8	120.7	165.09	24.13	480.2	1.396	2645	19.72	0.95	1.37	2224.1
Count	165	165	165	165	165	165	165	165	165	165	165	165	165
Confidence Level(95.0%)	0.523807403	0.000986902	0.006124787	0.170605824	0.038055684	0.011512354	0.146638479	0.000492135	0.812229904	0.011808234	0.001732402	0.003666904	0.705879035

Figure 1



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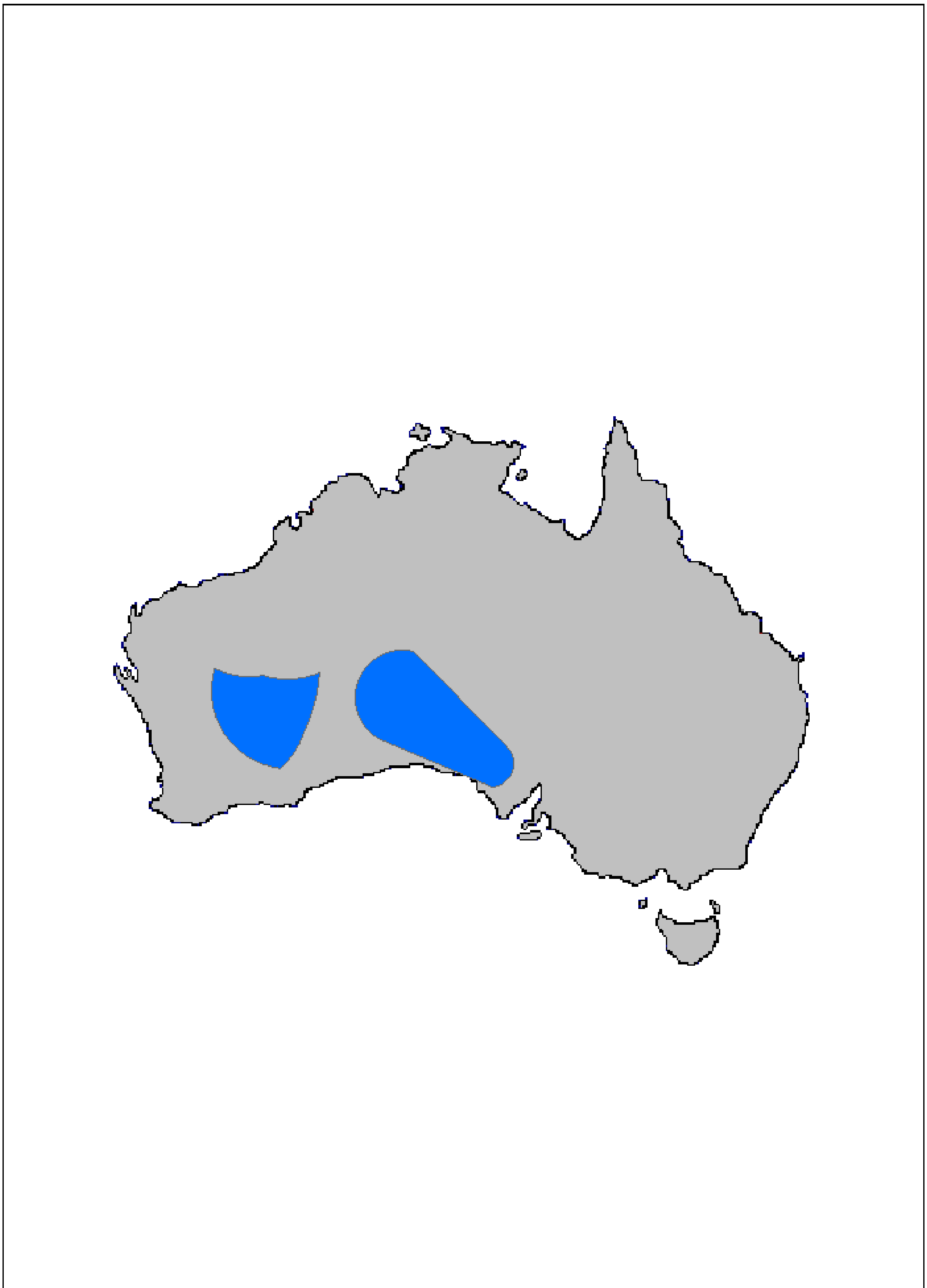

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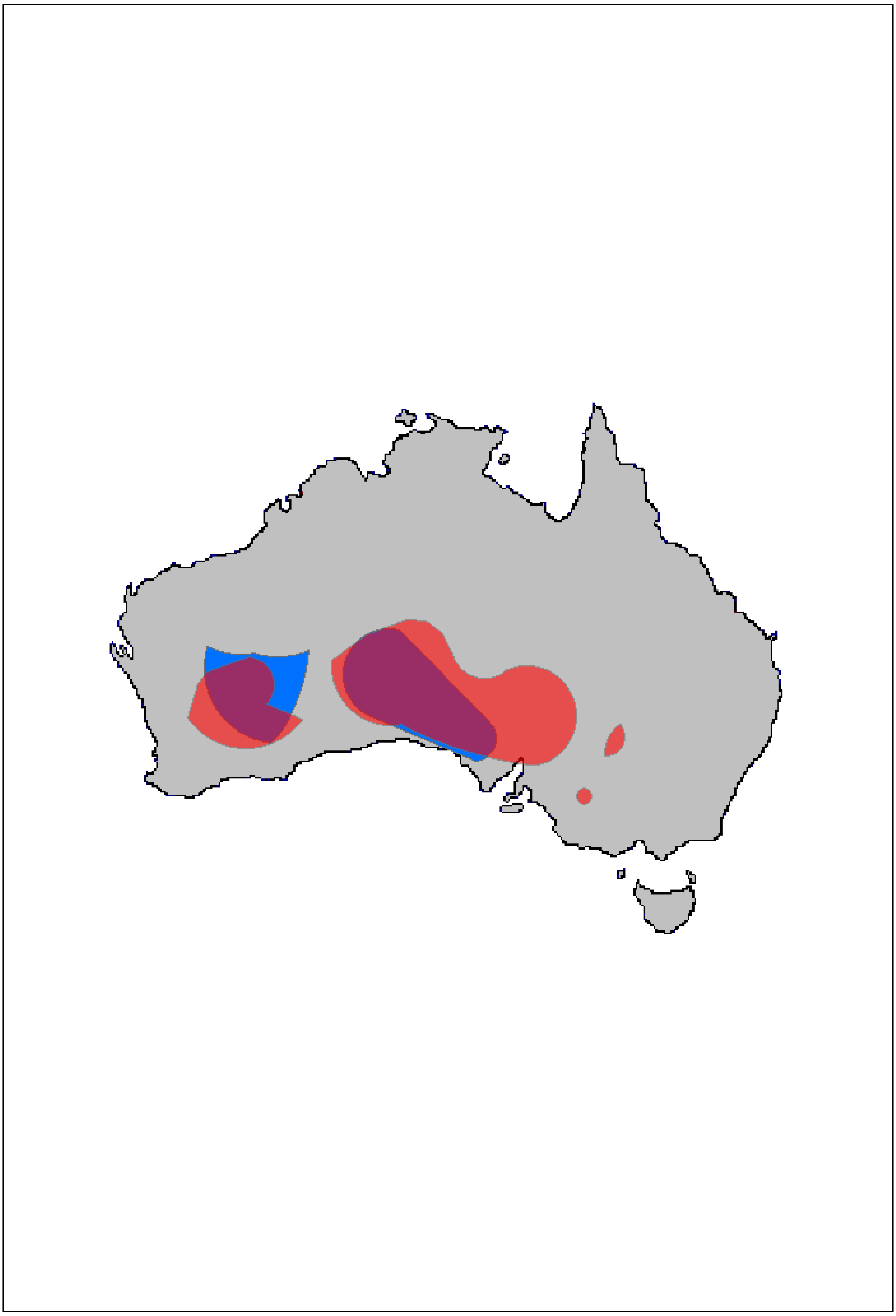

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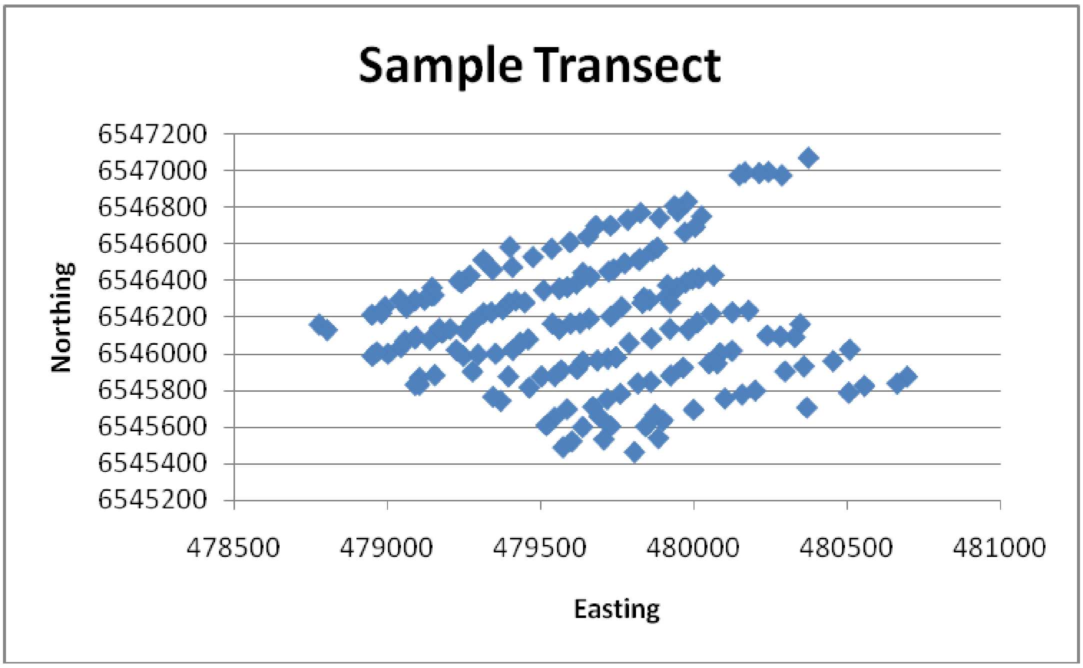
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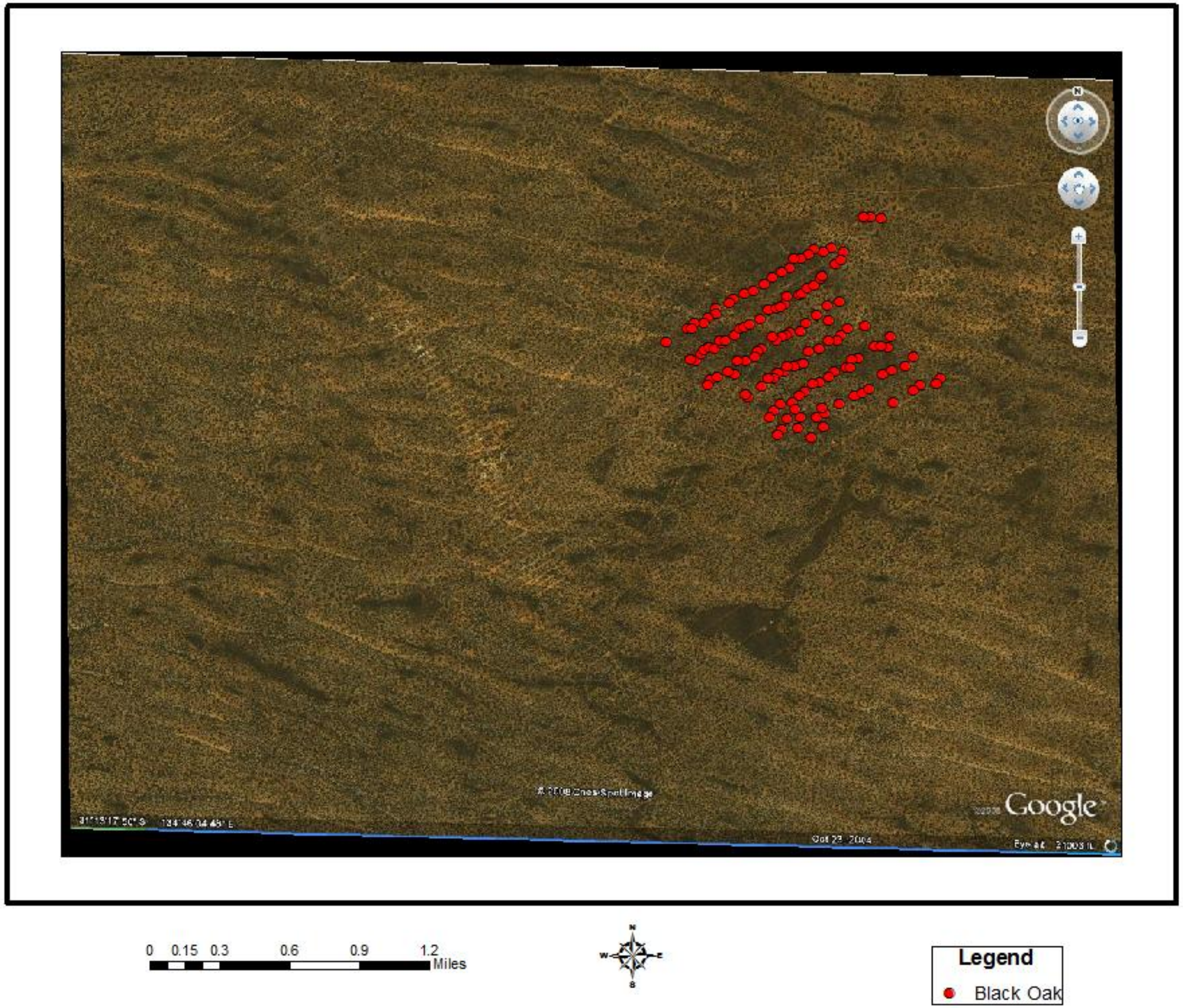
Figure 5

Sample Locations



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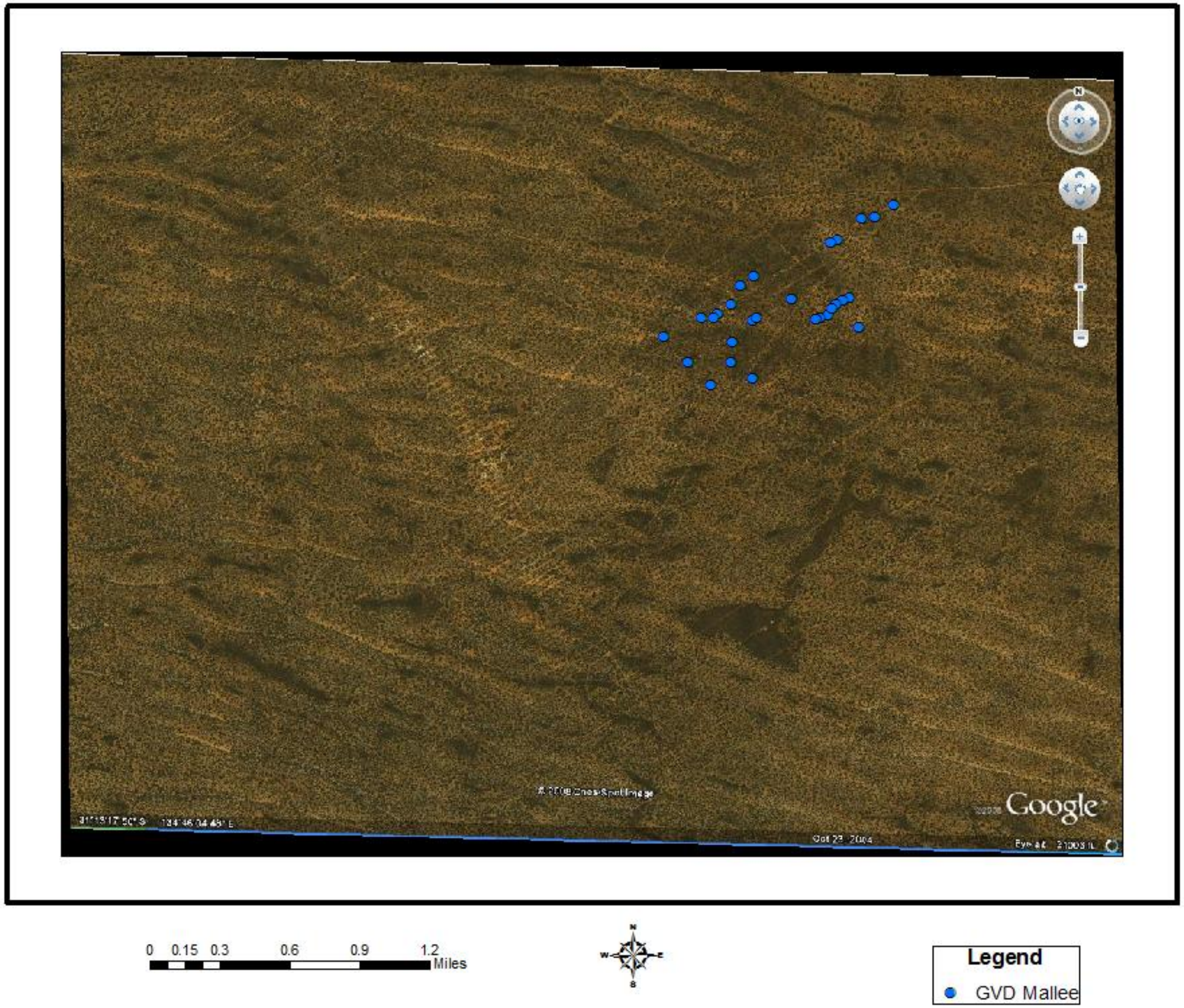

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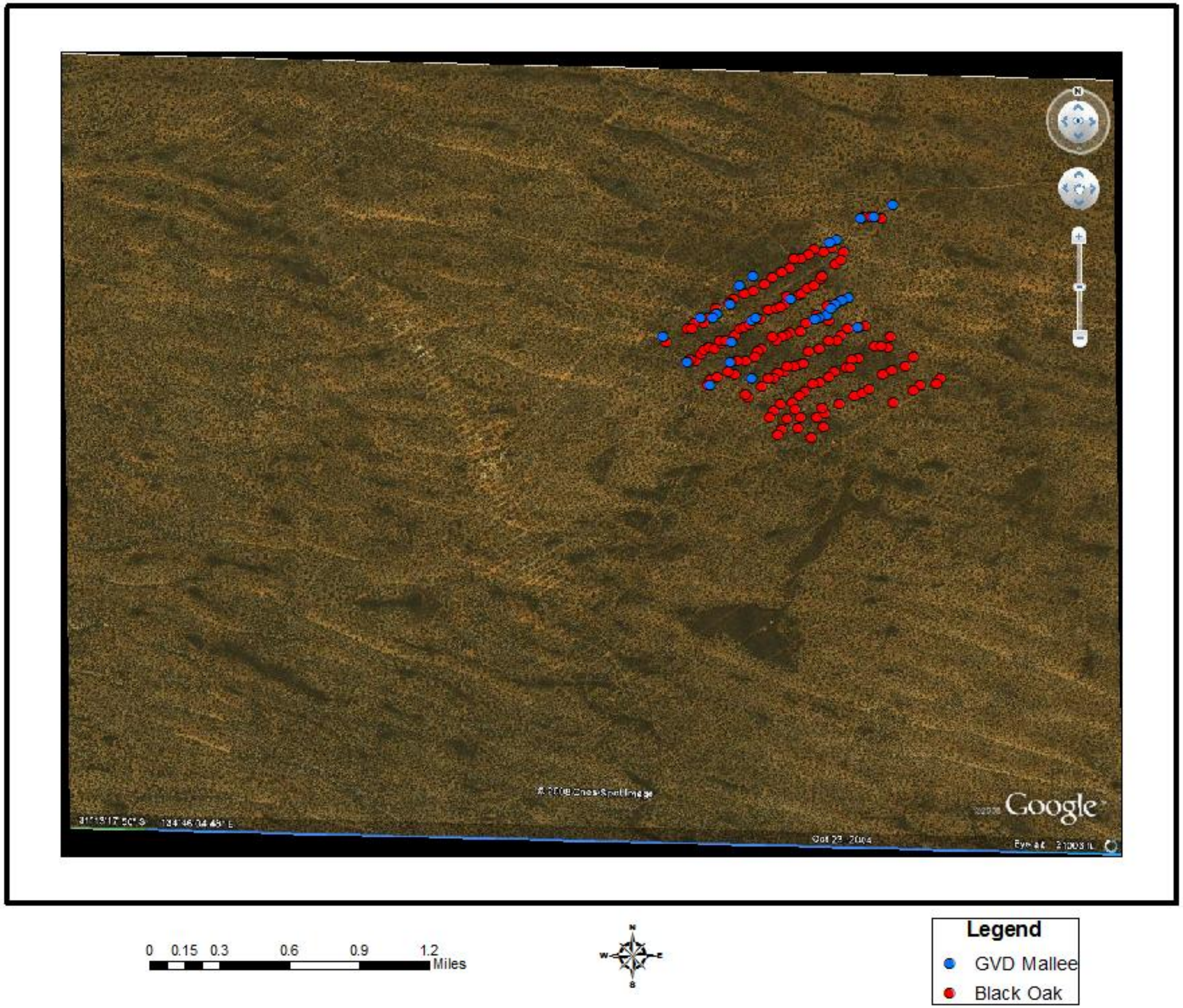

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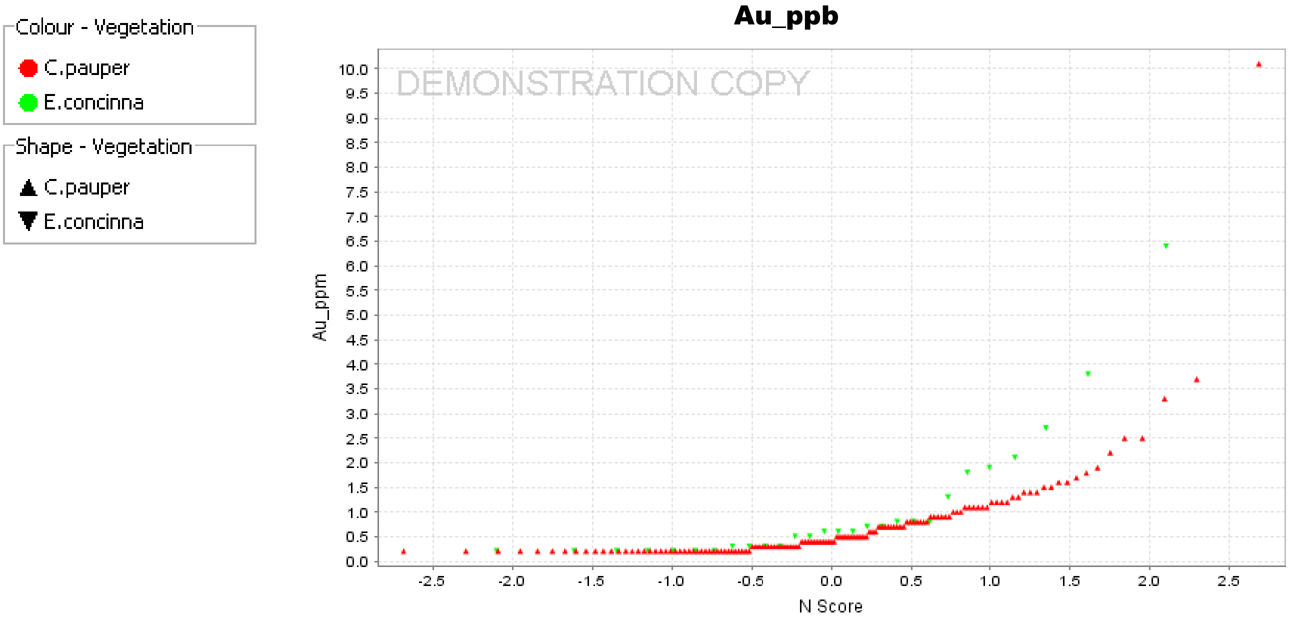

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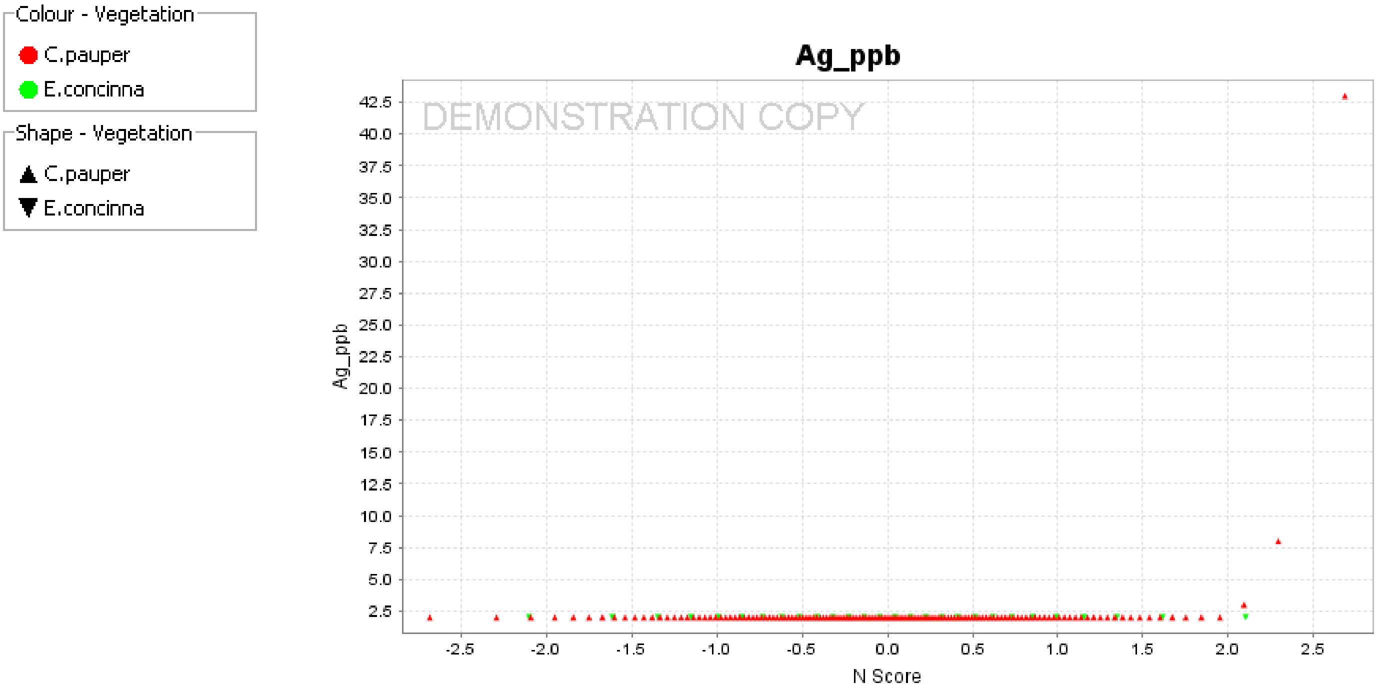

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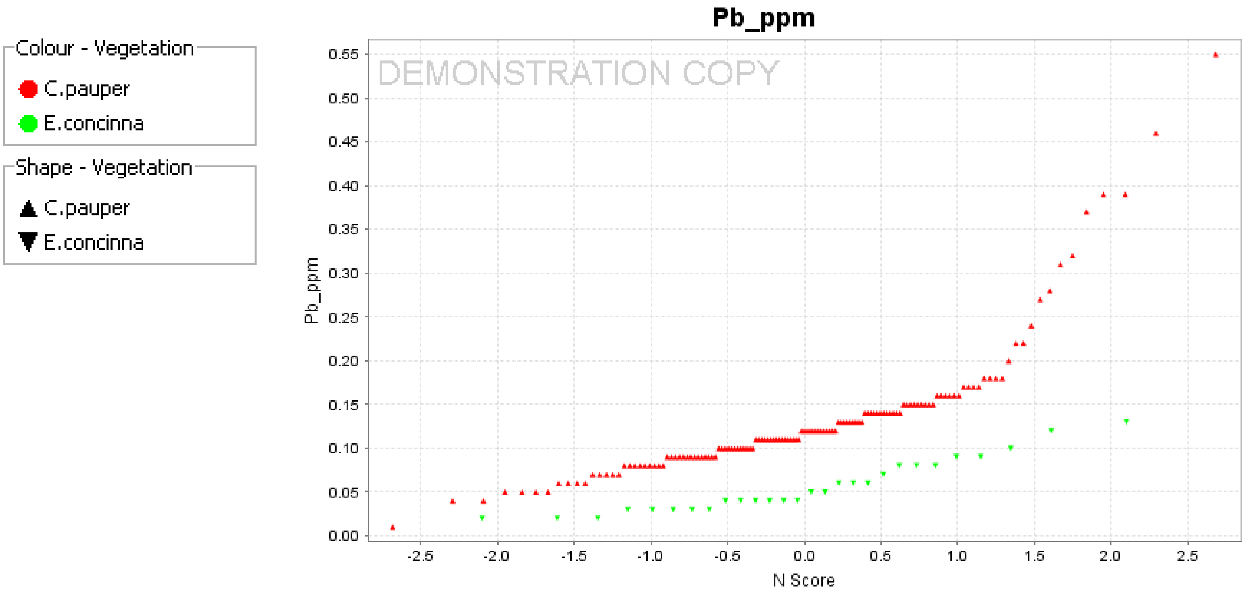

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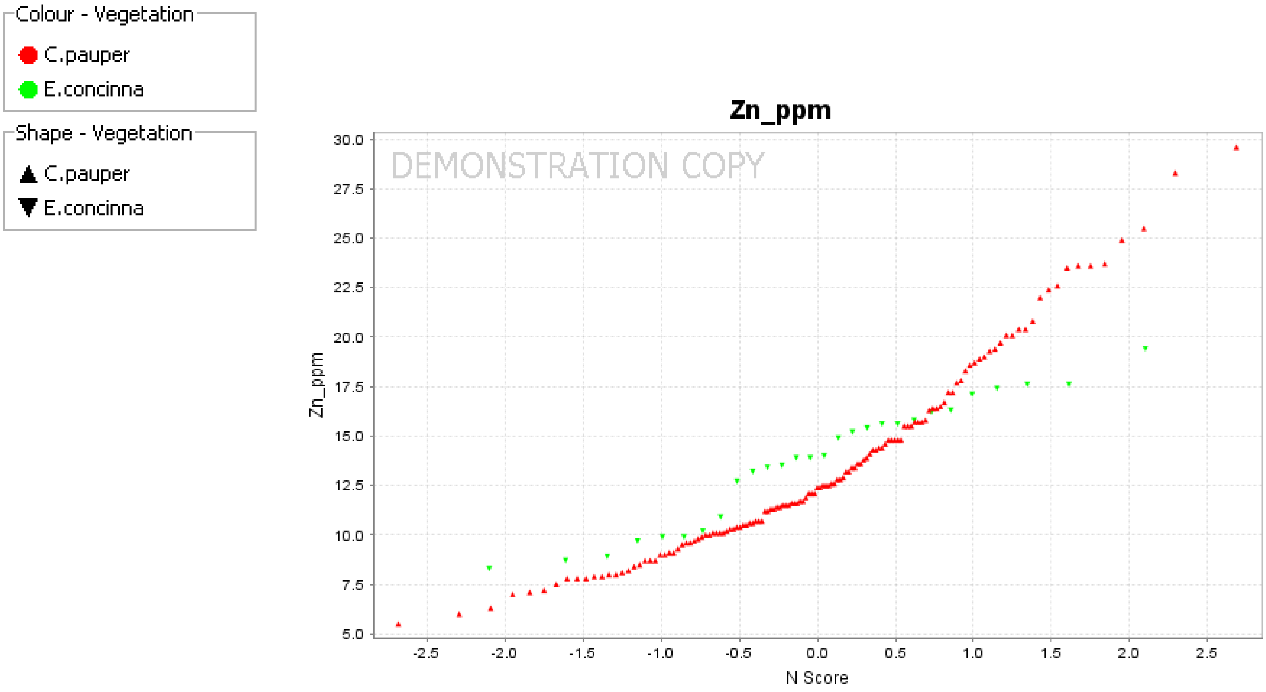

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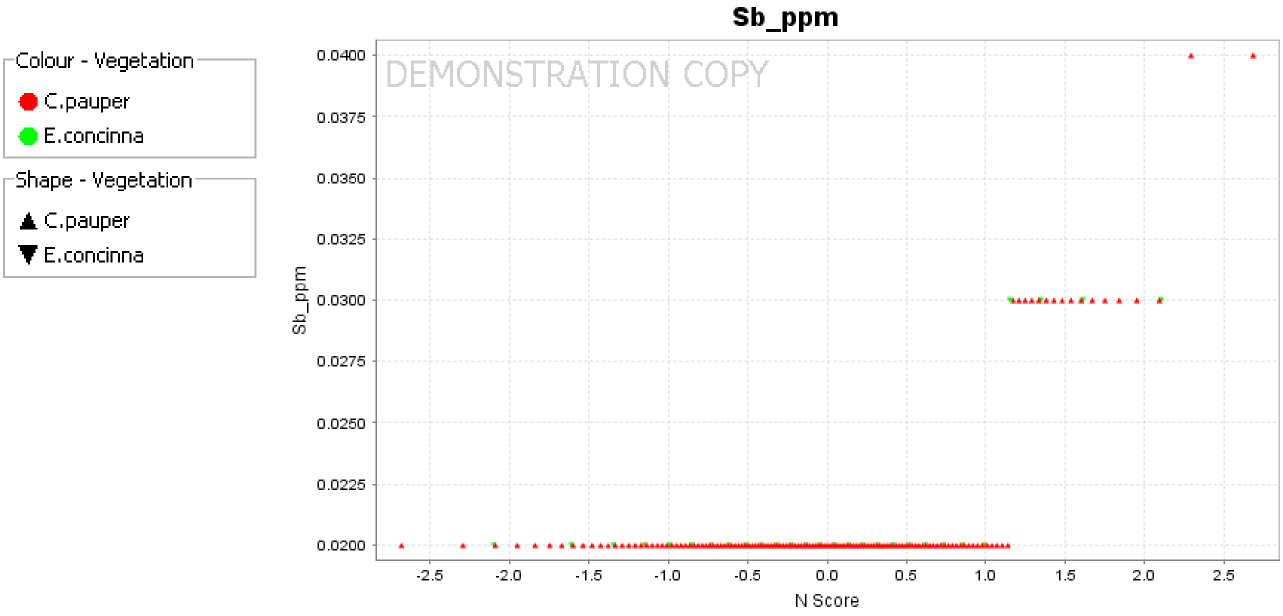


Figure 13

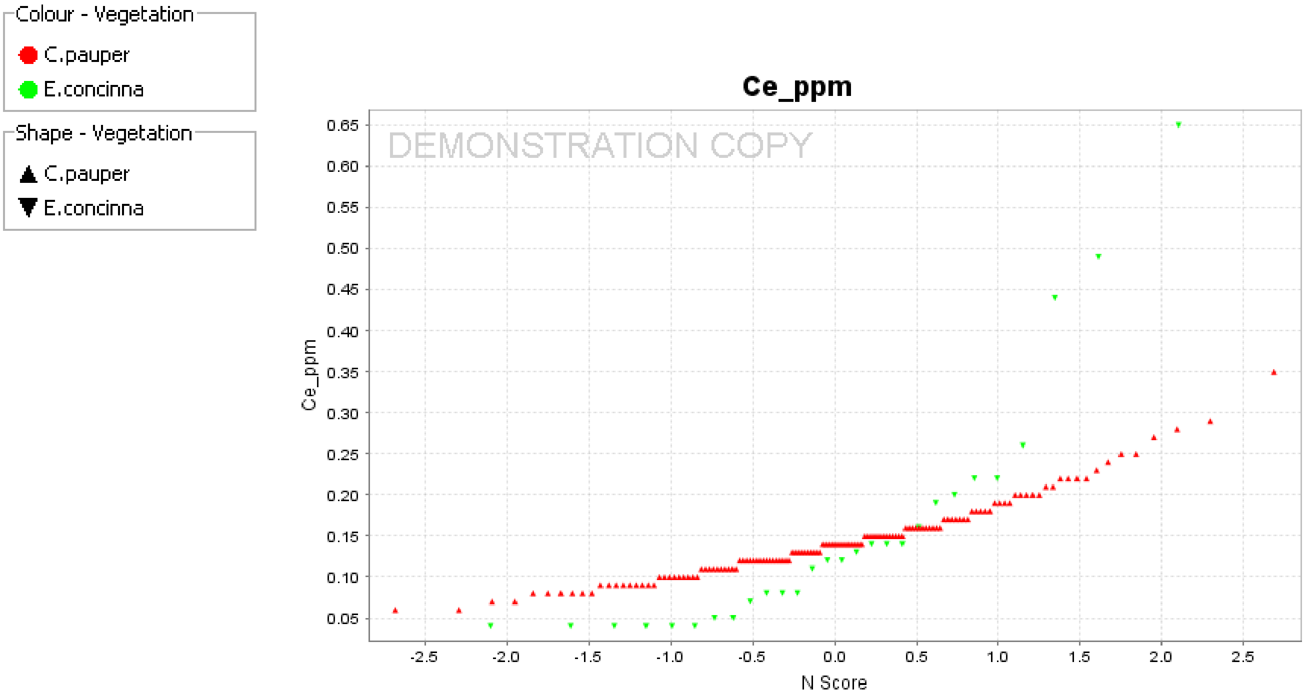


Figure 14

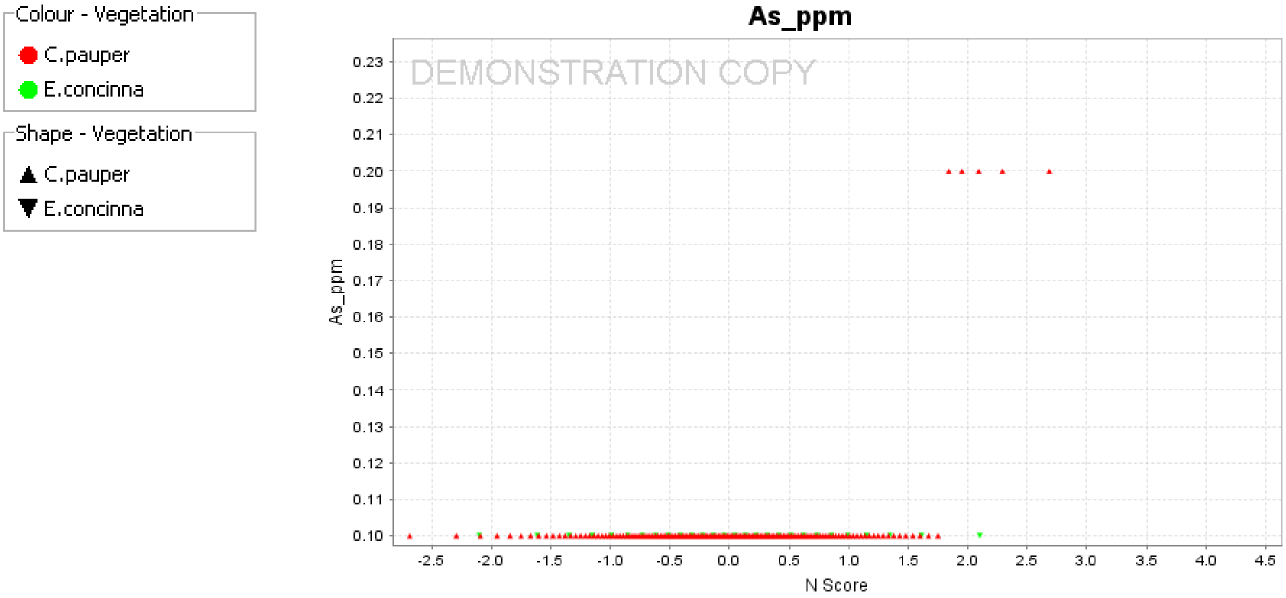


Figure 15

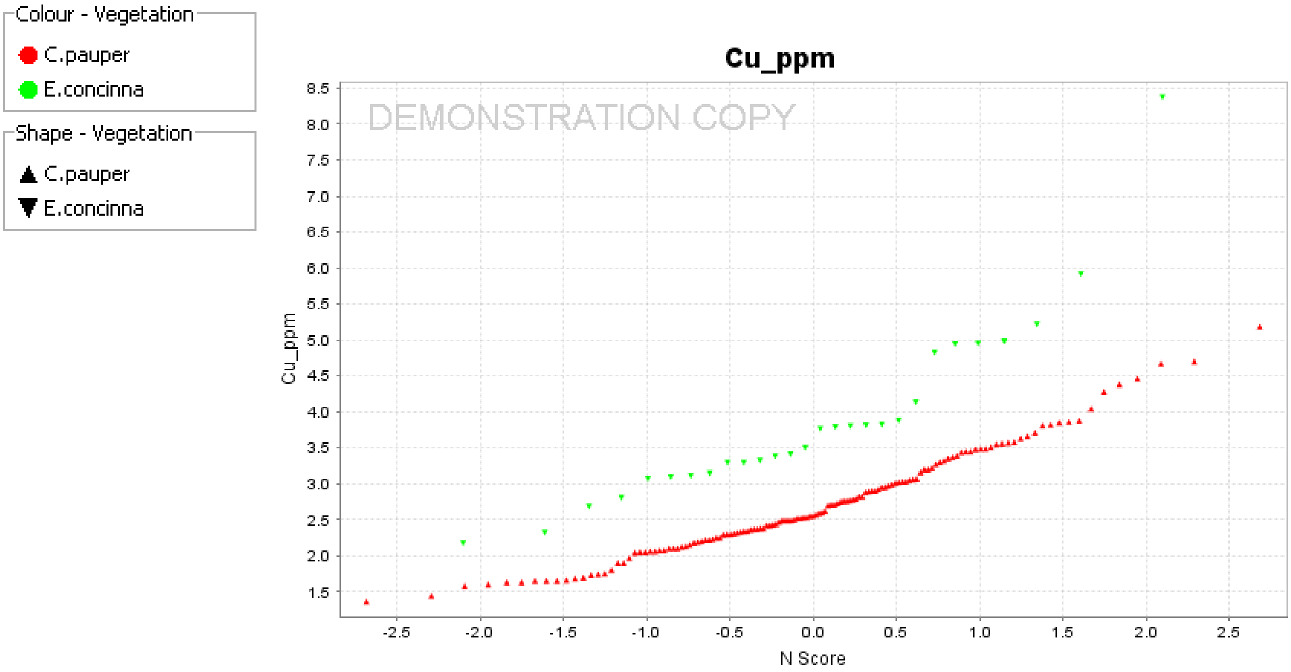


Figure 16

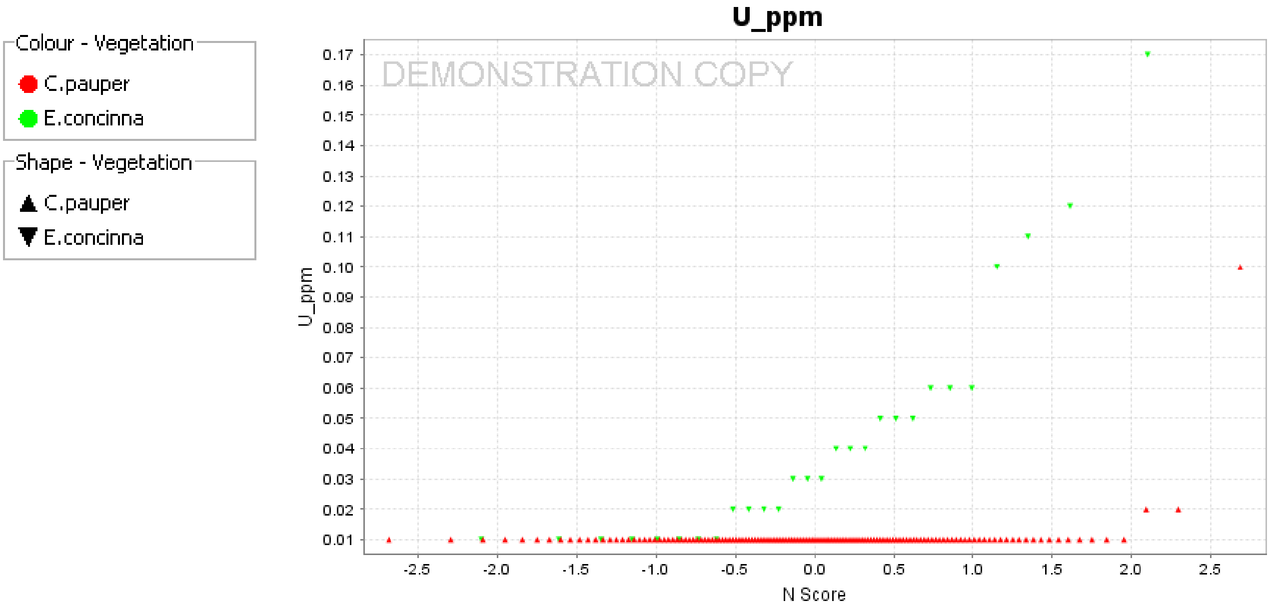


Figure 17

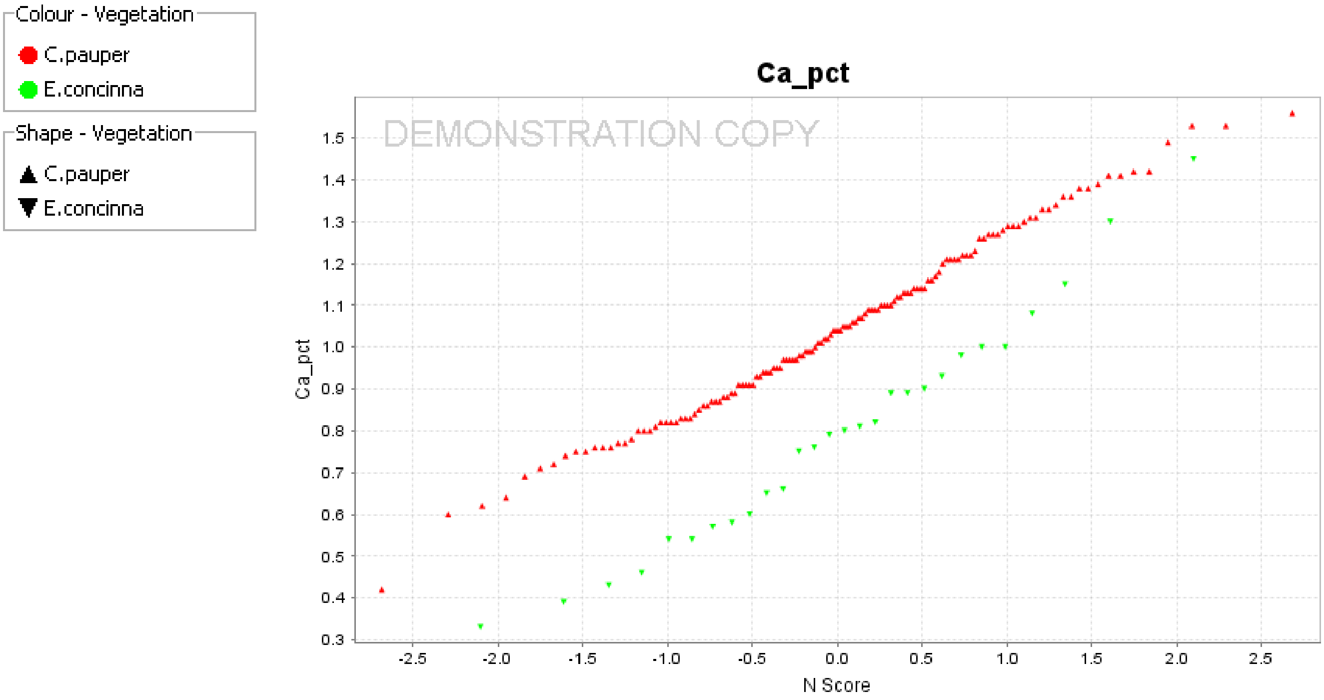


Figure 18

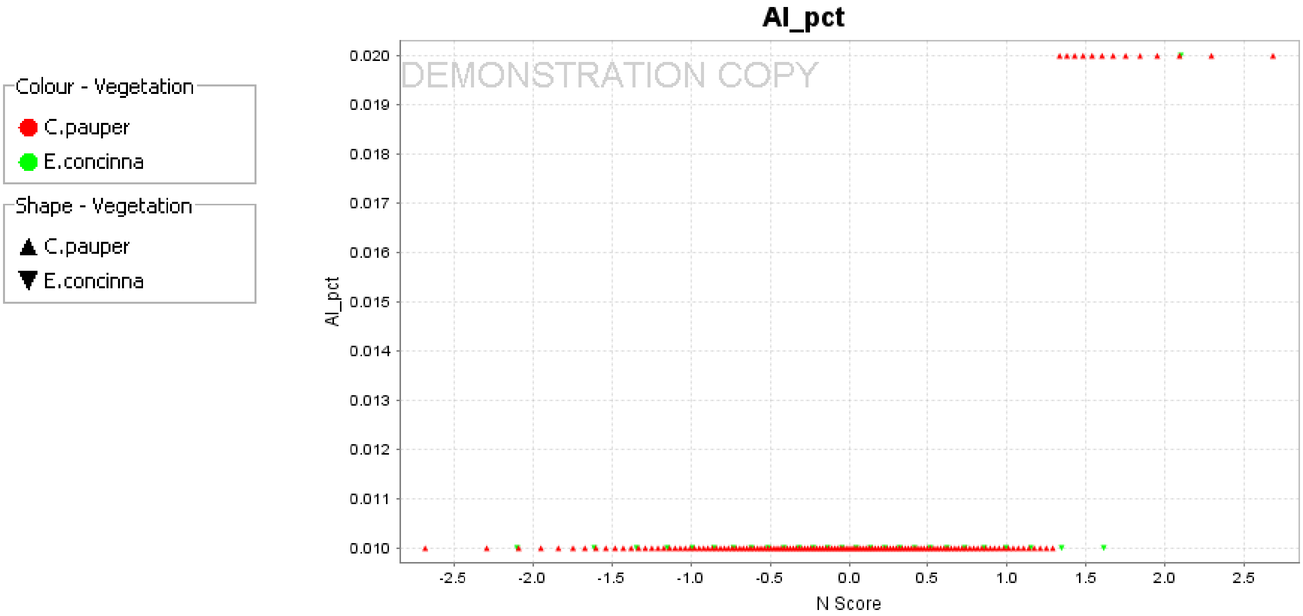


Figure 19

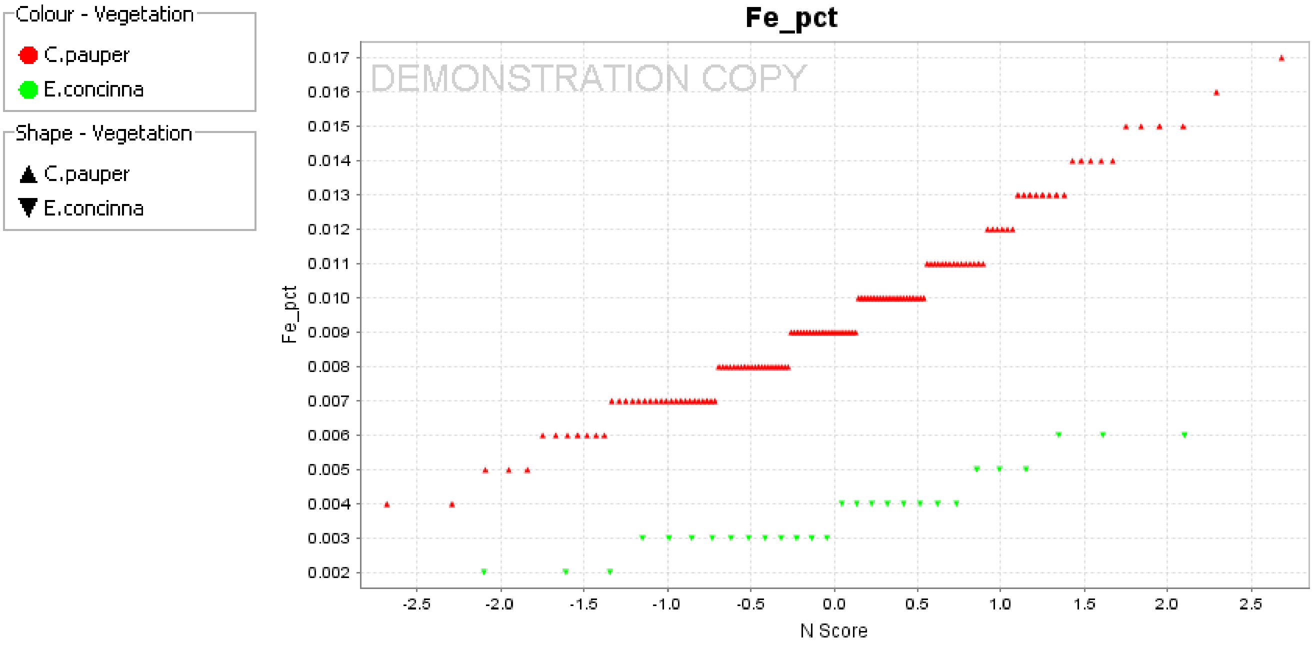


Figure 20

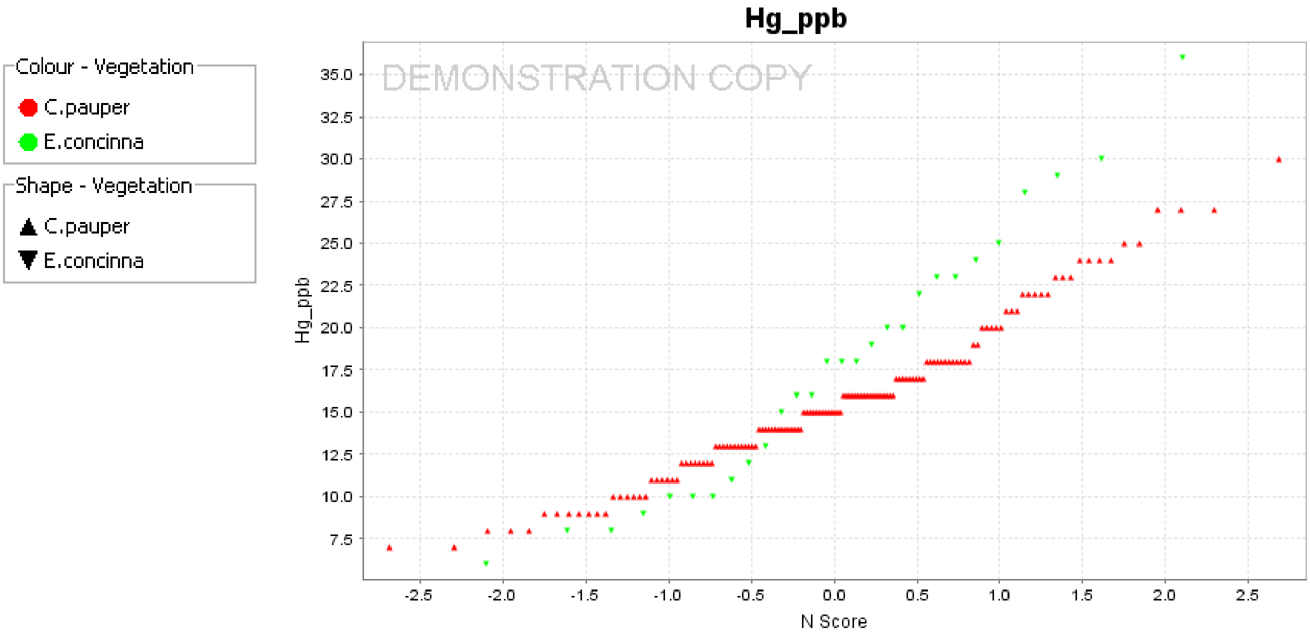

Colour - Vegetation
● C.pauper
● E.concinna
Shape - Vegetation
▲ C.pauper
▼ E.concinna
Hg_ppb
Hg_ppb
35.0
32.5
30.0
27.5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
N Score

Figure 21

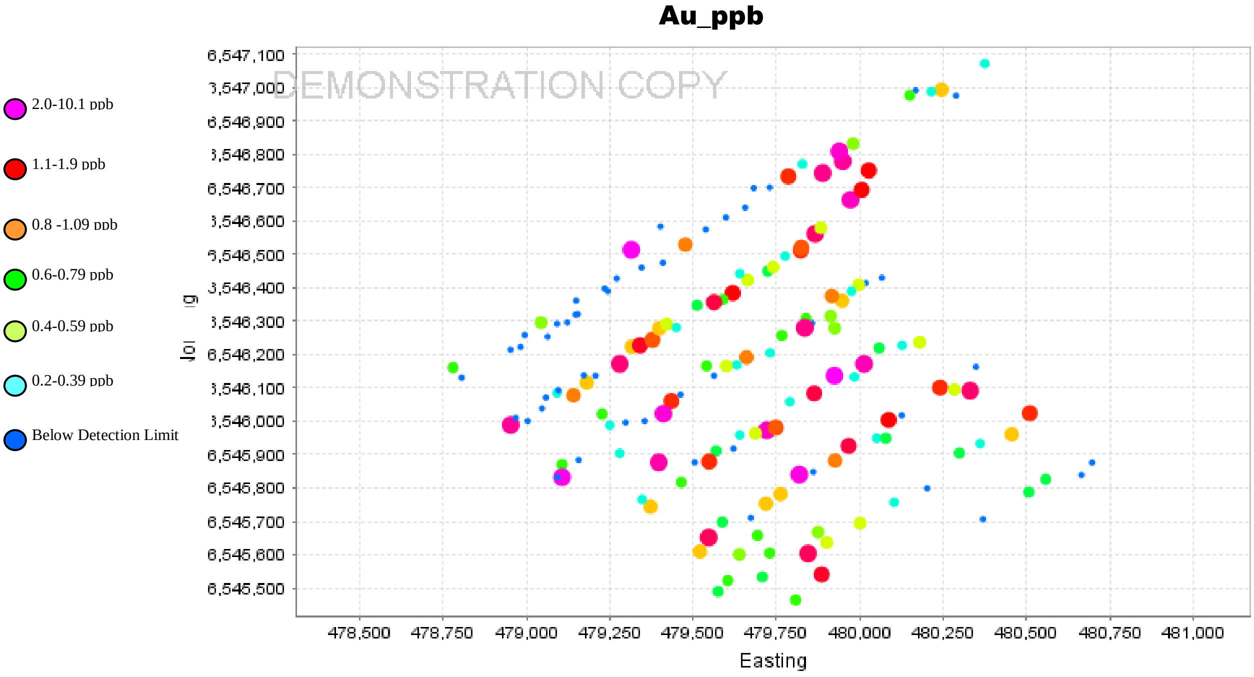


Figure 22

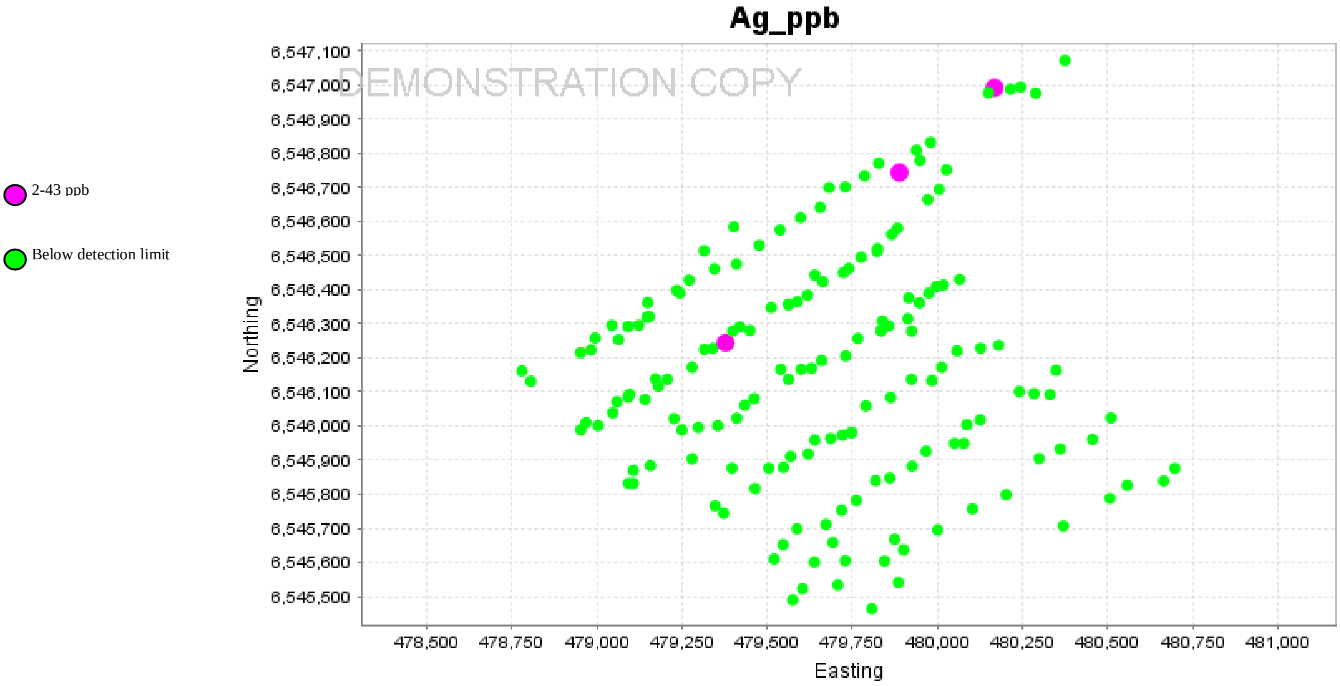


Figure 23

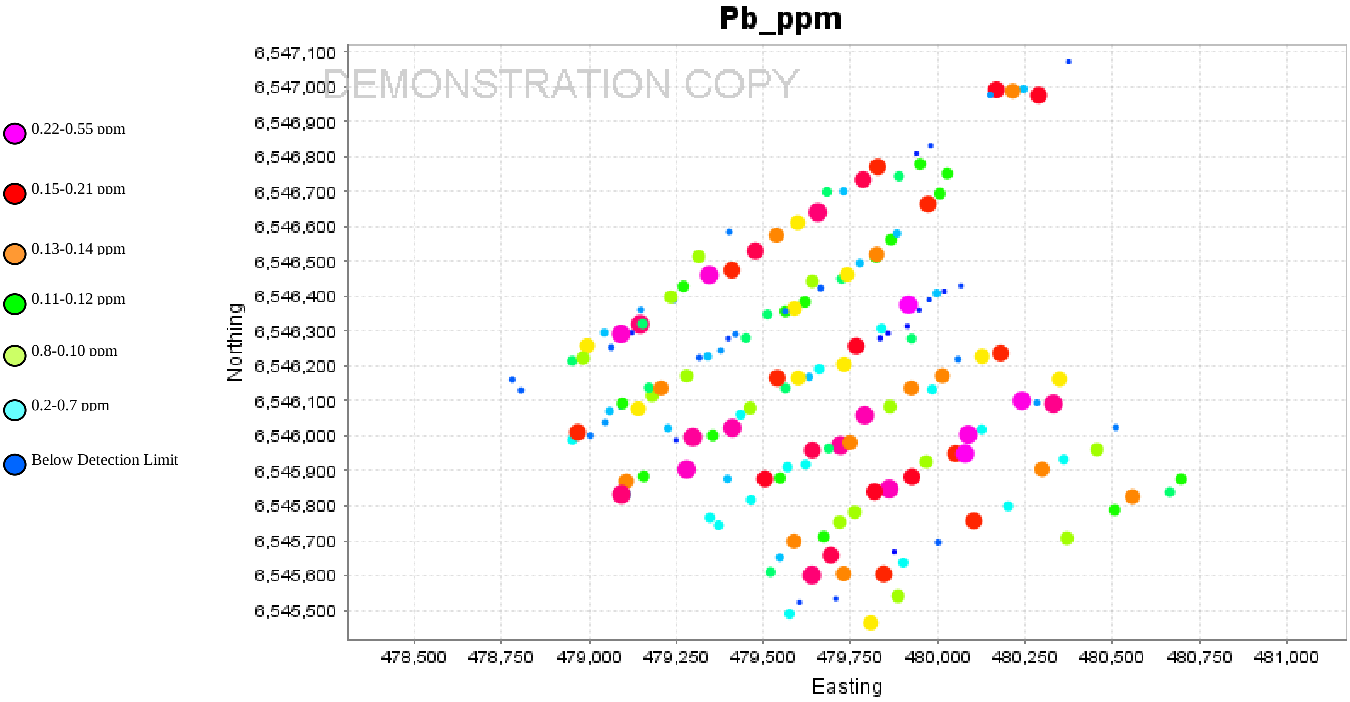


Figure 24

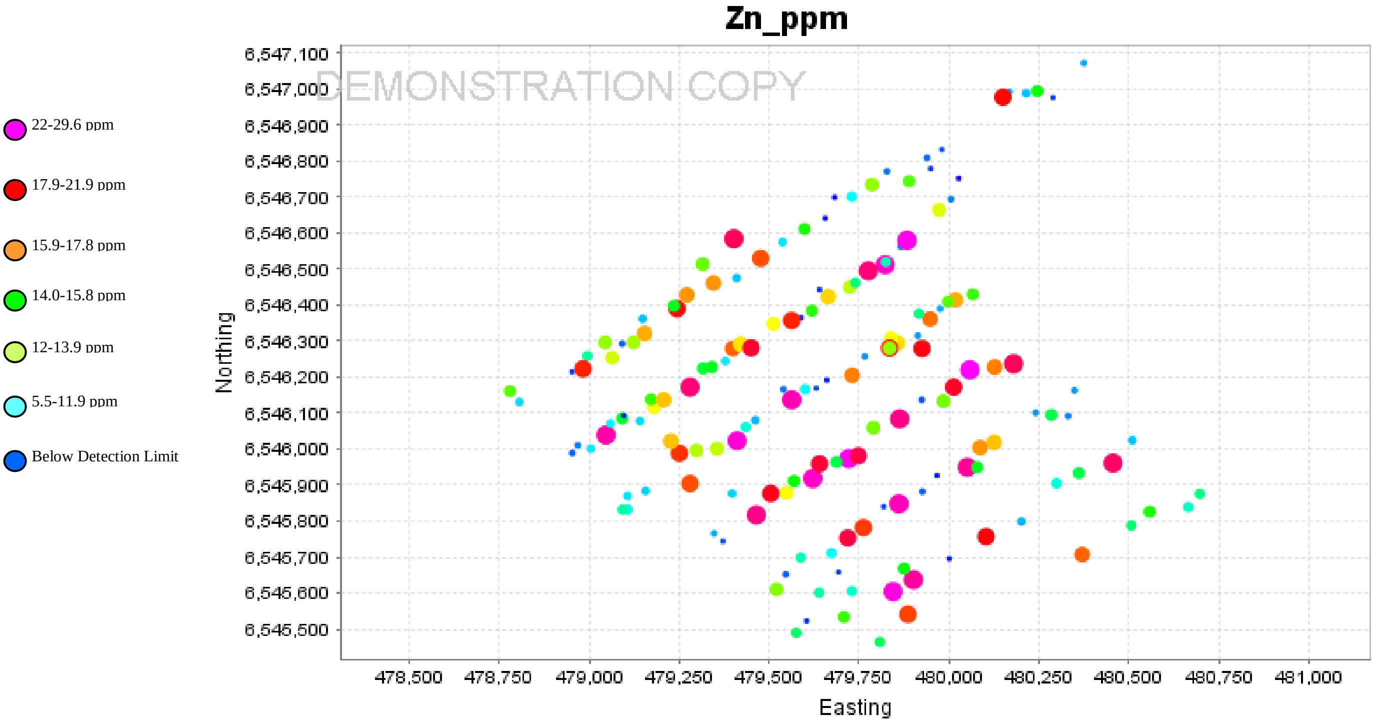


Figure 25

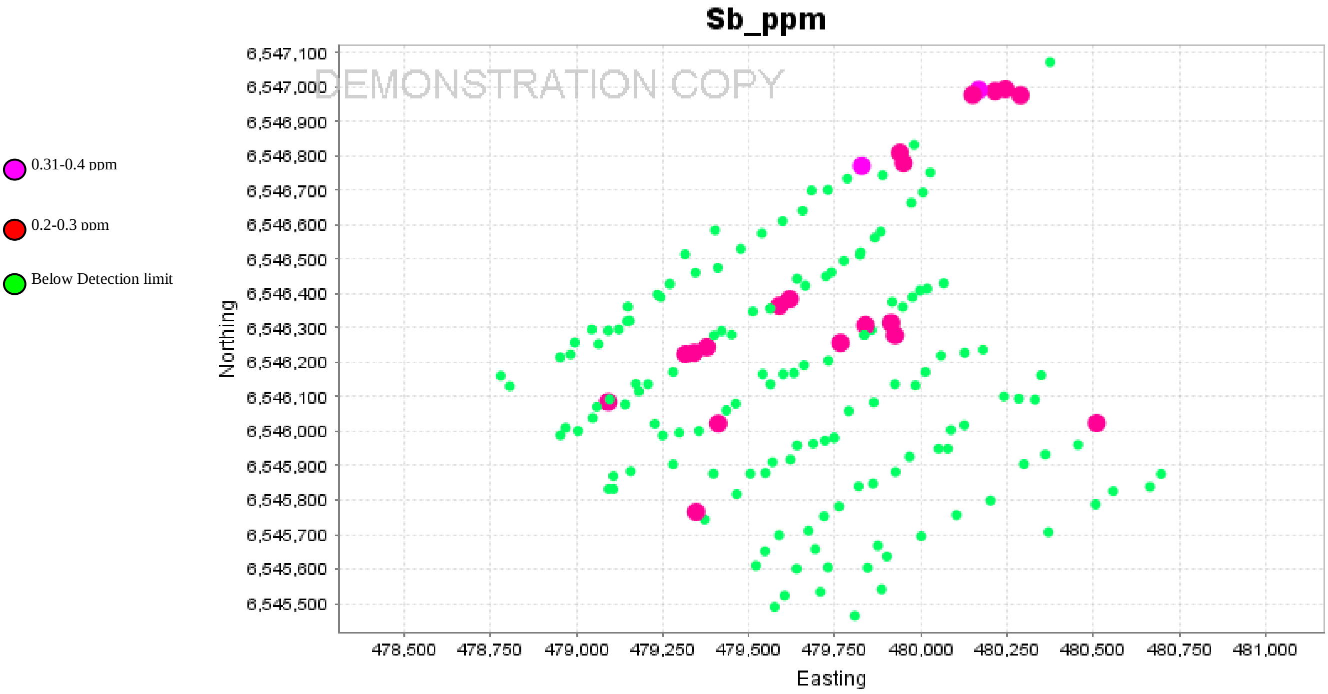


Figure 26

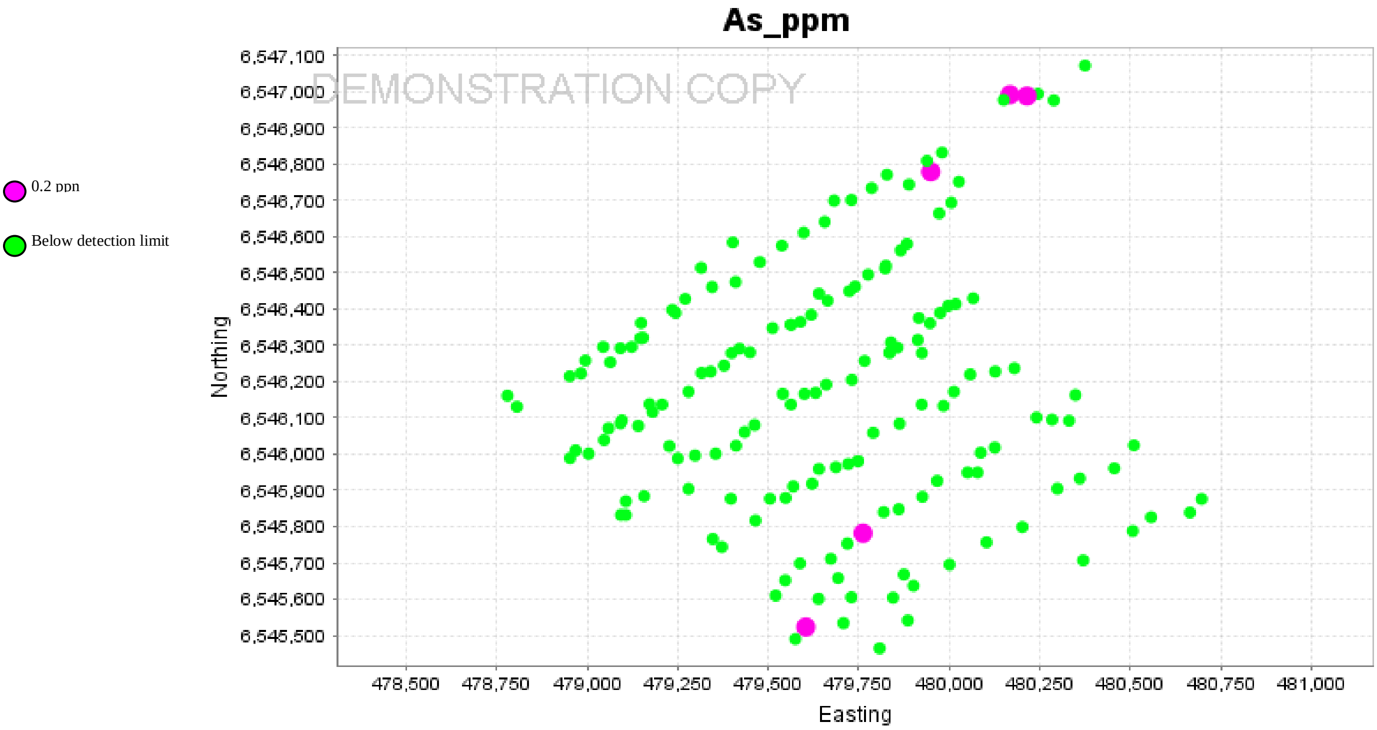


Figure 27

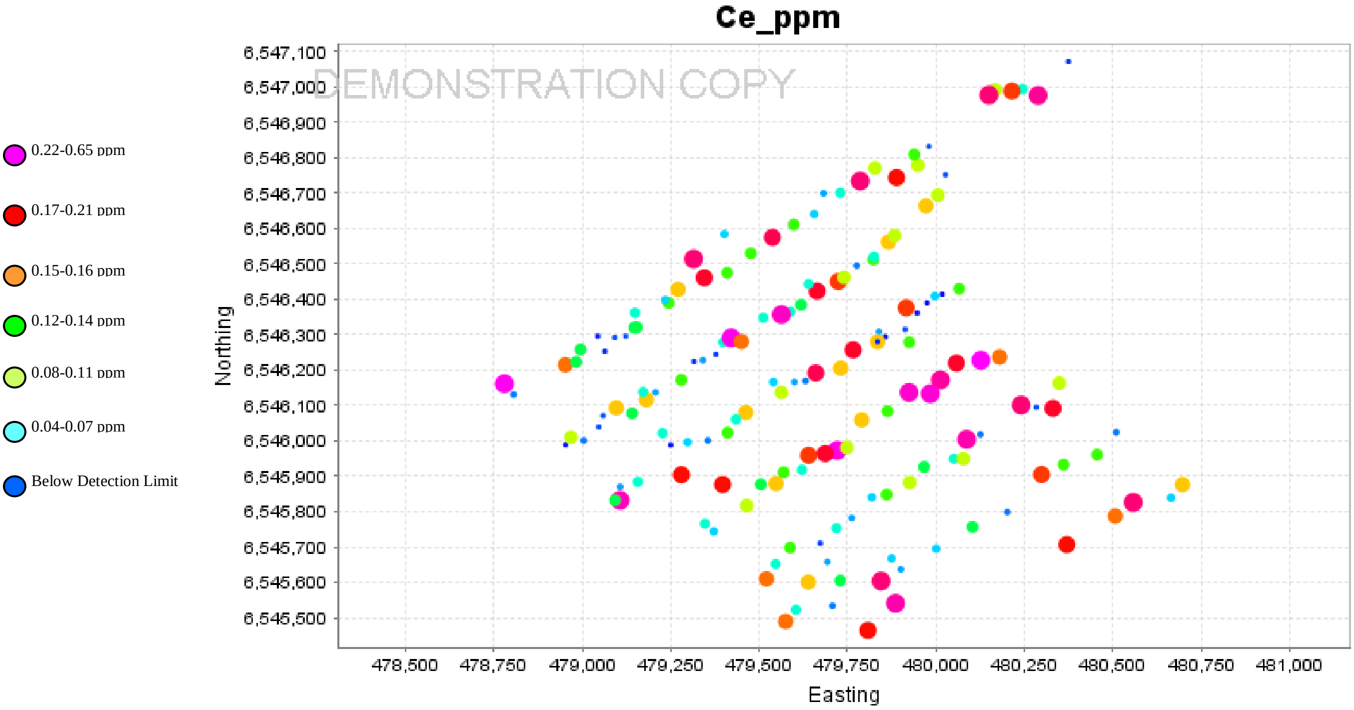


Figure 28

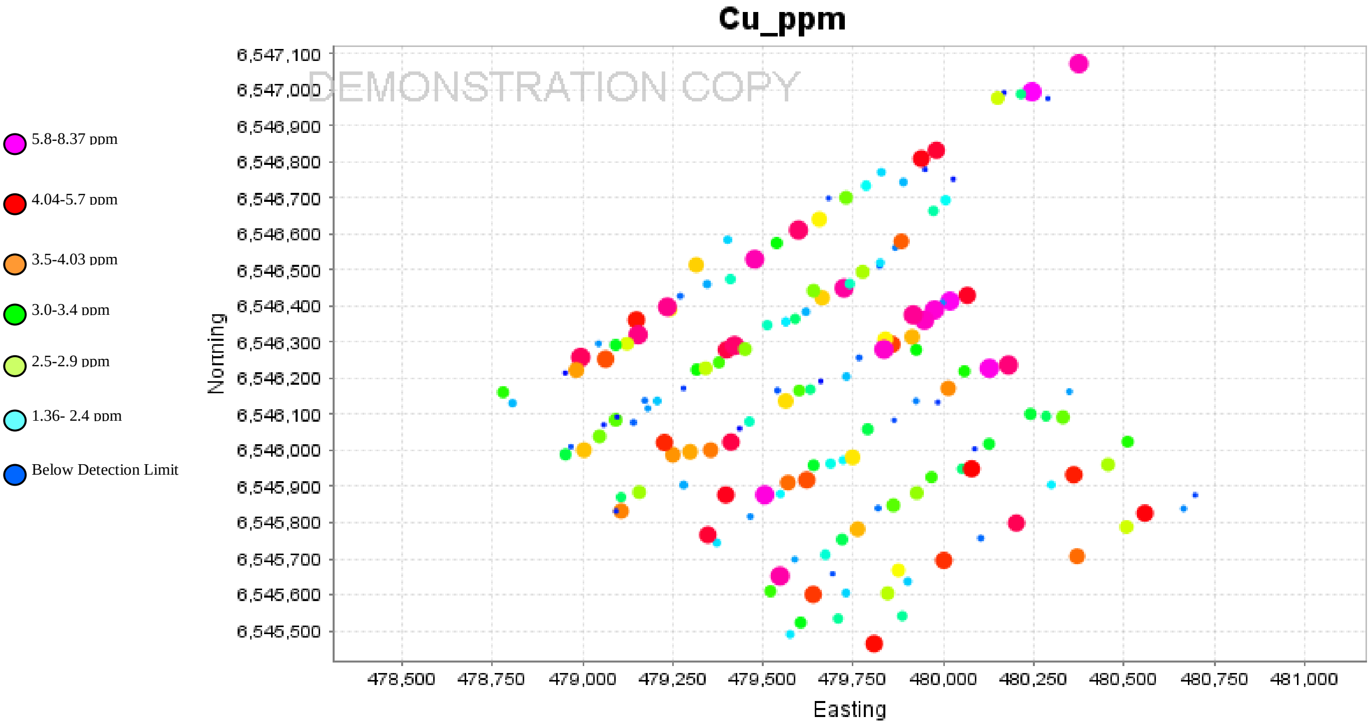


Figure 29

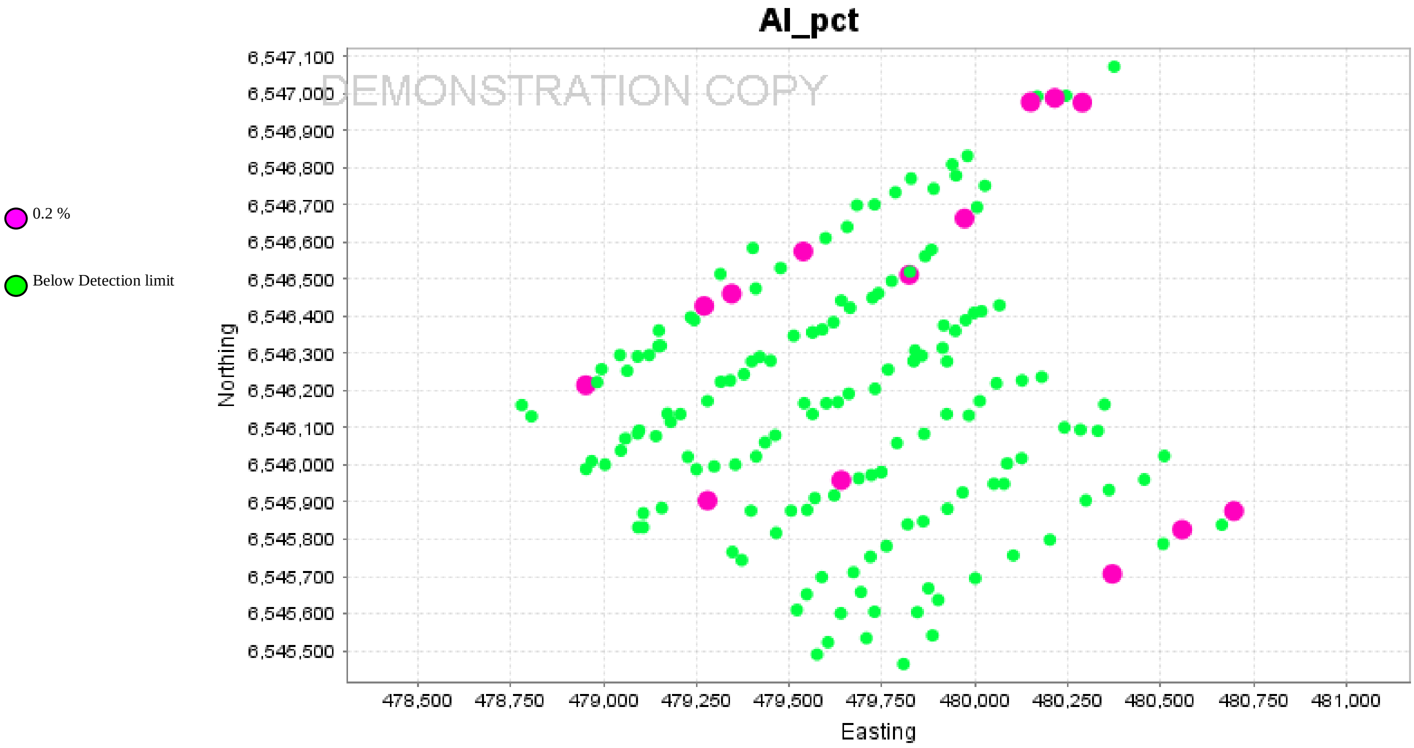


Figure 30

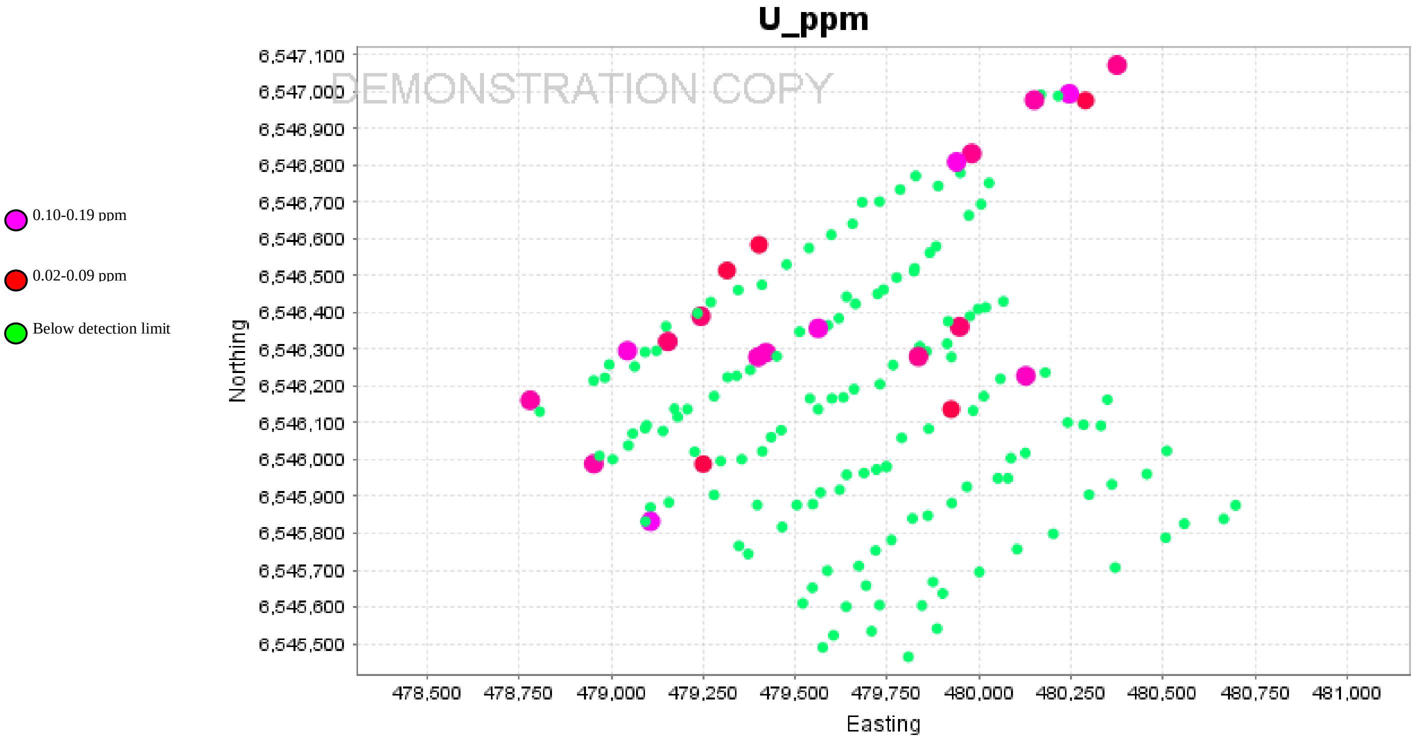


Figure 31

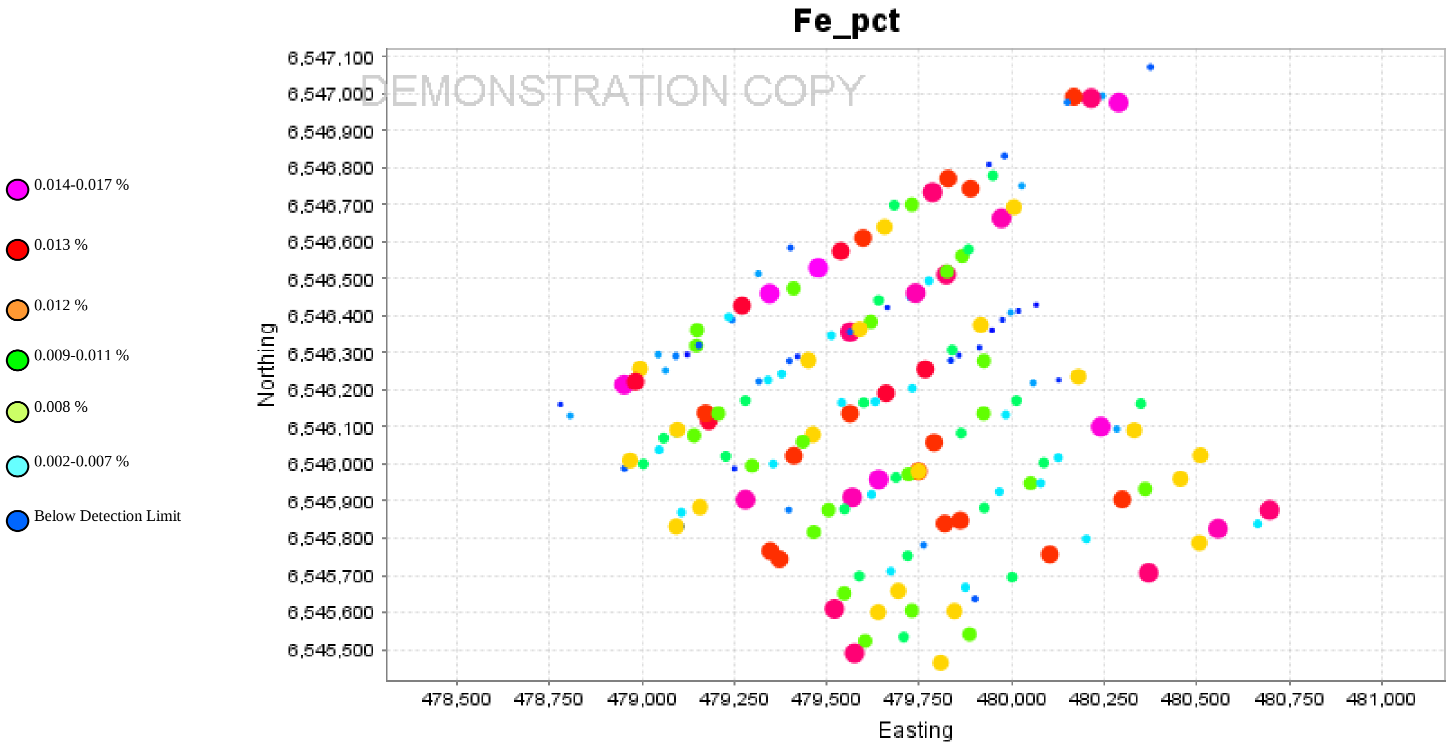


Figure 32

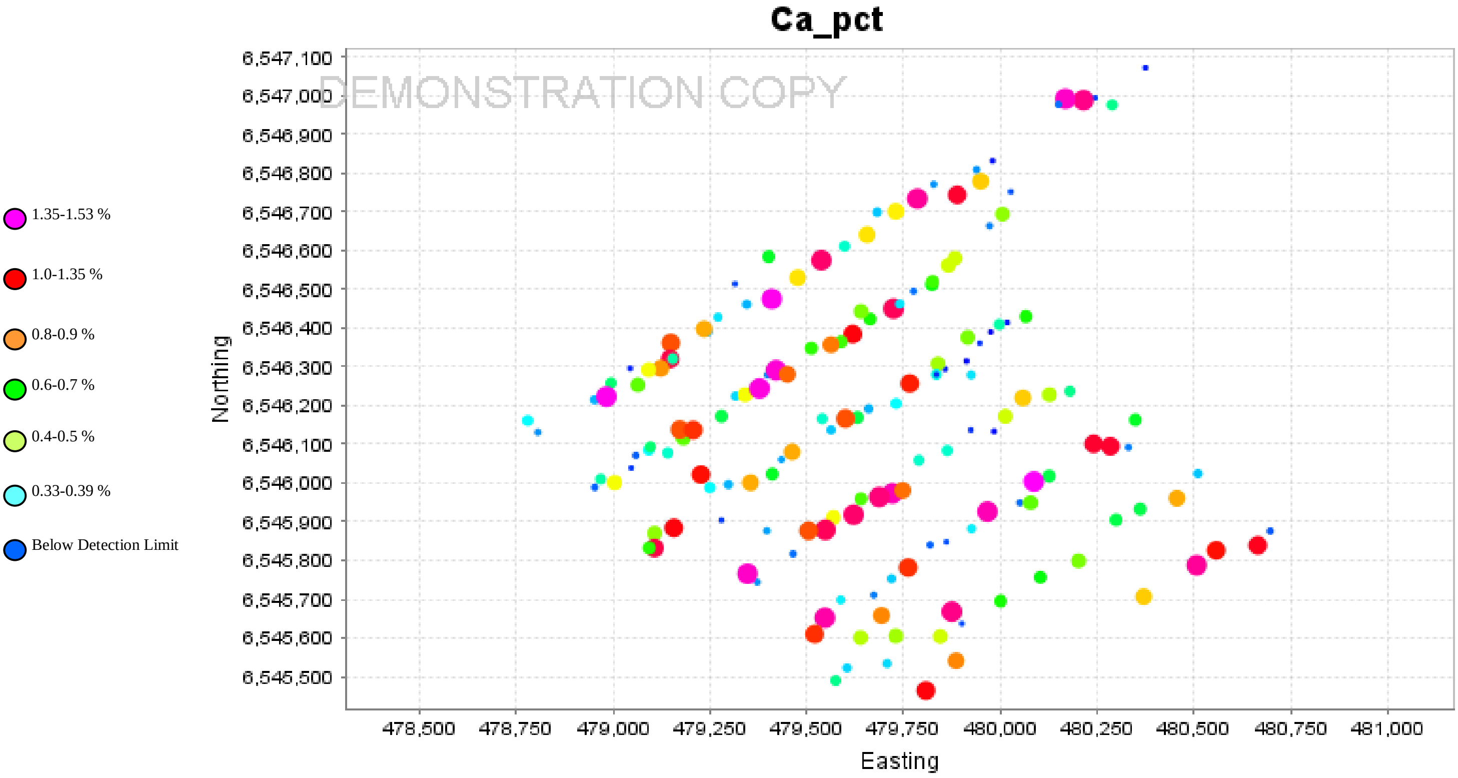


Figure 33

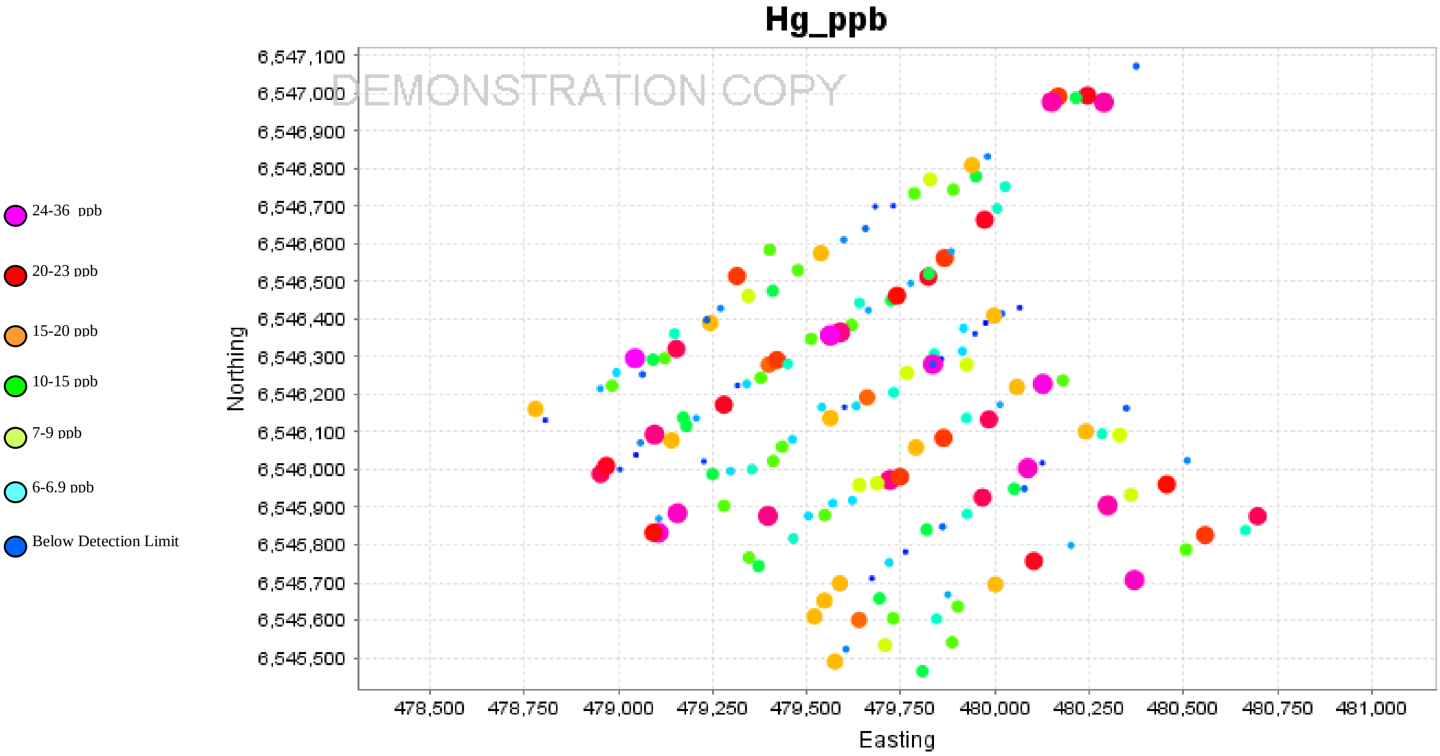

Hg_ppb
24-36 ppb
20-23 ppb
15-20 ppb
10-15 ppb
7-9 ppb
6-6.9 ppb
Below Detection Limit
Northing
6,547,100
6,547,000
6,546,900
6,546,800
6,546,700
6,546,600
6,546,500
6,546,400
6,546,300
6,546,200
6,546,100
6,546,000
6,545,900
6,545,800
6,545,700
6,545,600
6,545,500
Easting
478,500
478,750
479,000
479,250
479,500
479,750
480,000
480,250
480,500
480,750
481,000

Figure 34

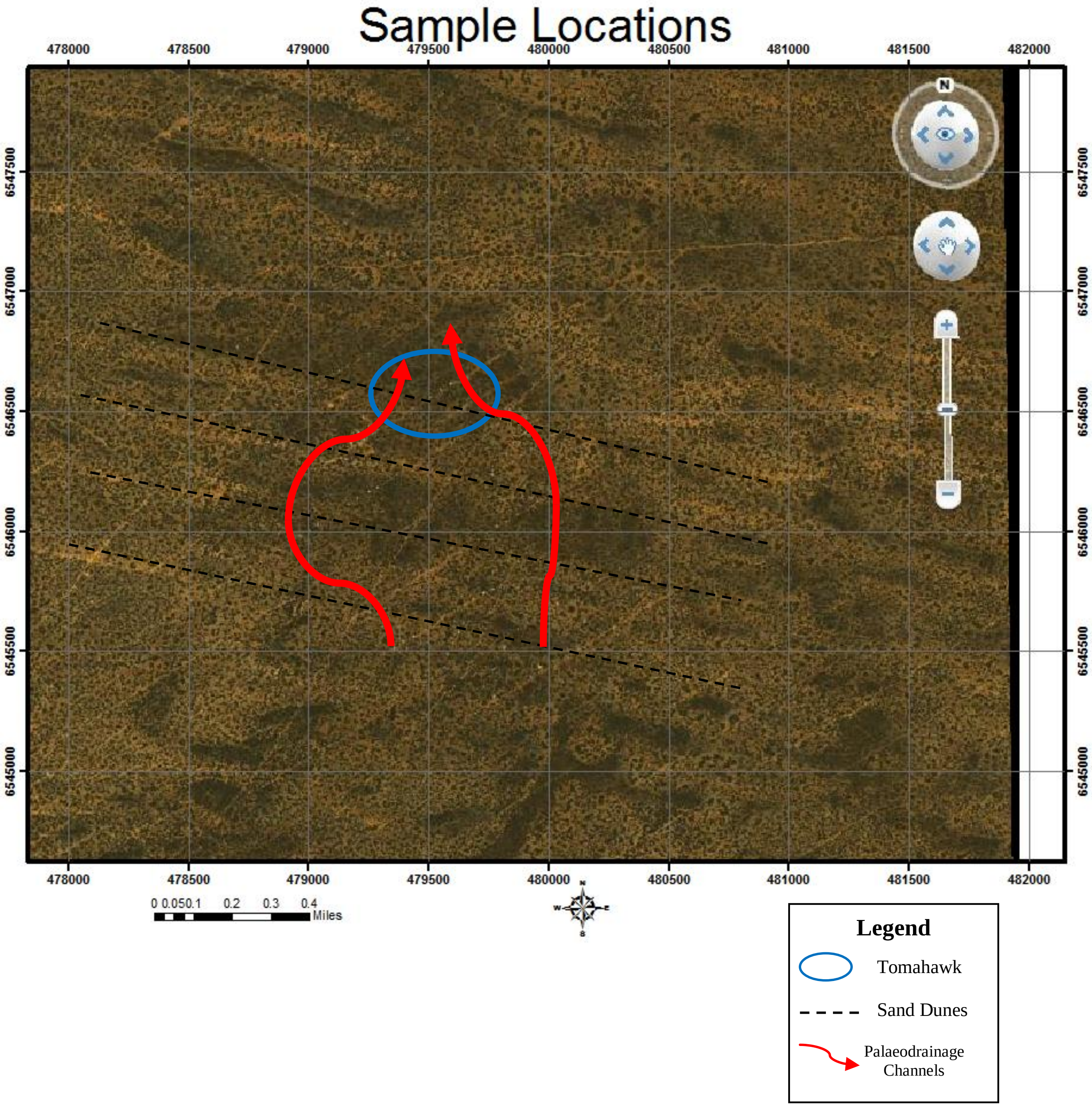

Sample Locations
478000
478500
479000
479500
480000
480500
481000
481500
482000
6547500
6547000
6546500
6546000
6545500
6545000
0 0.050.1 0.2 0.3 0.4
Miles
N
W
E
S
Legend
Tomahawk
Sand Dunes
Palaeodrainage Channels

Figure 35

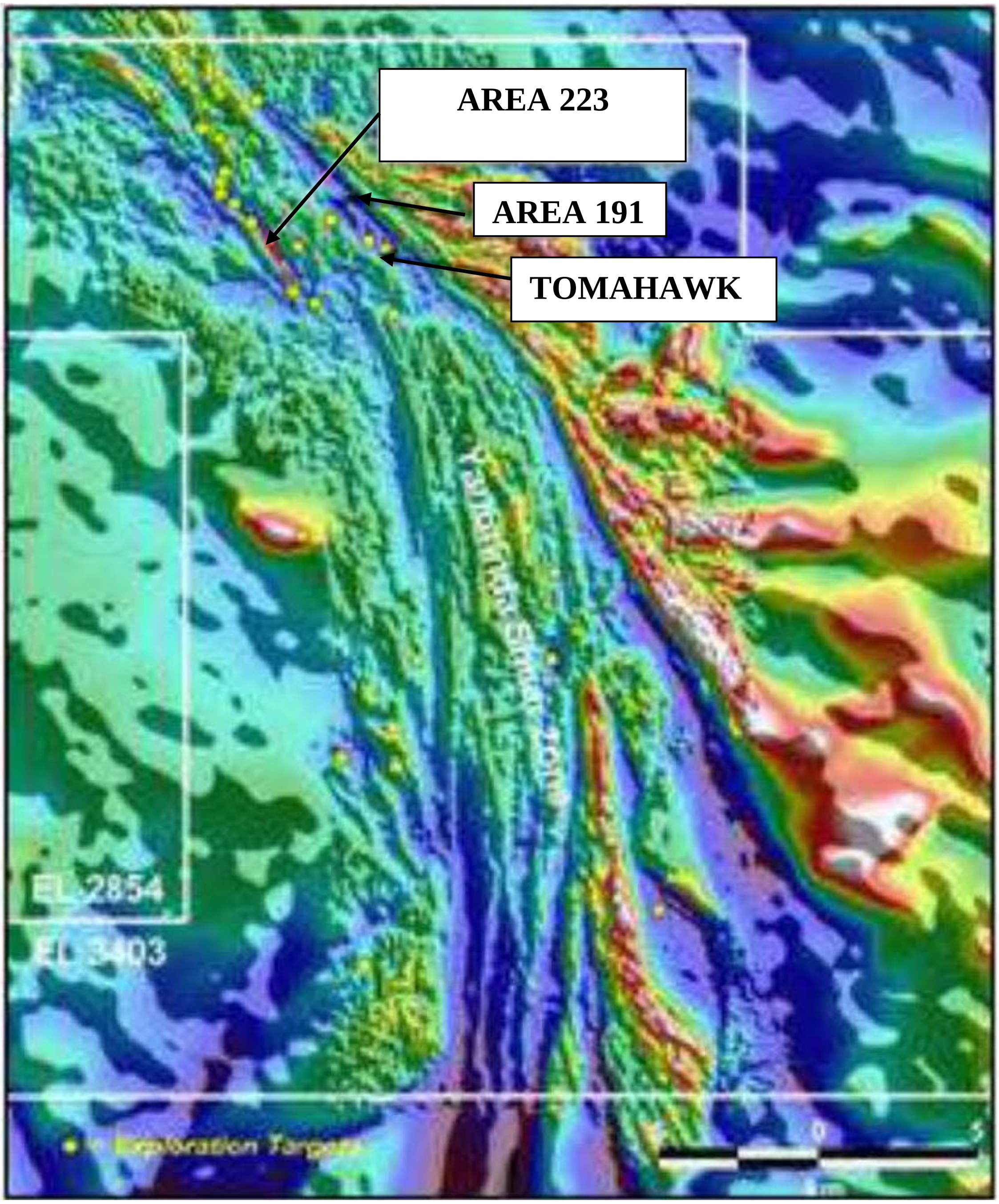

AREA 223
AREA 191
TOMAHAWK
[illegible] Shear Zone
EL 2854
EL 3403
● = Exploration Targets
5
0
5
km

Figure 36

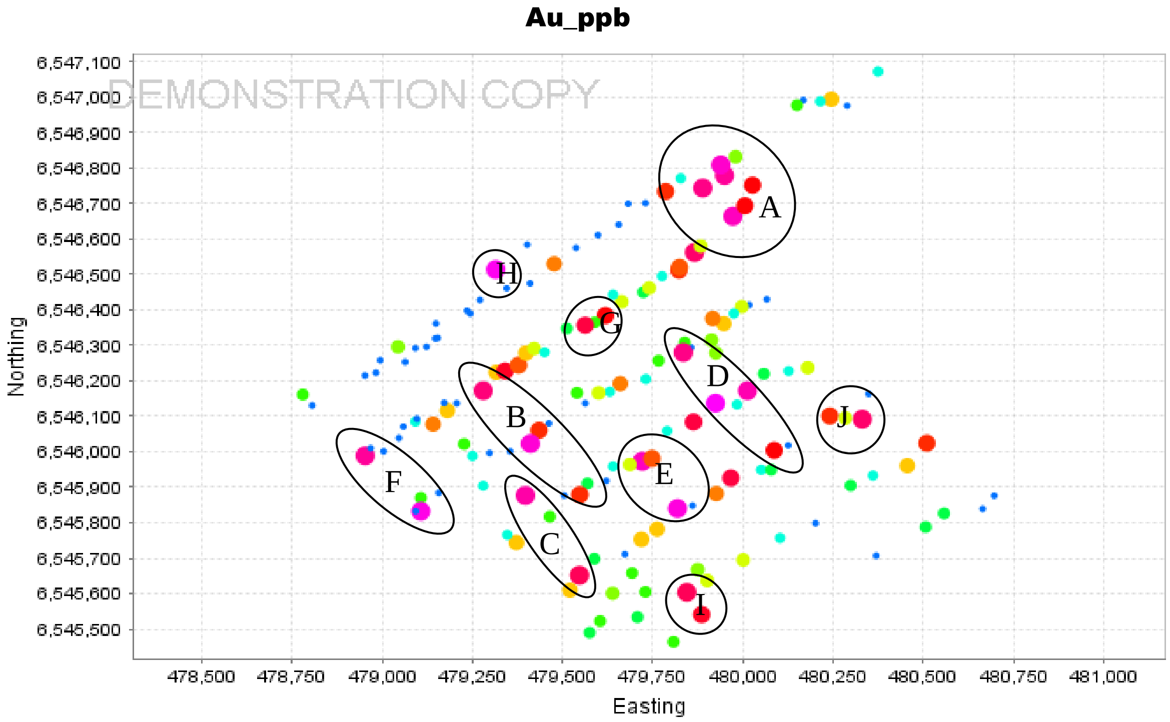


Figure 37

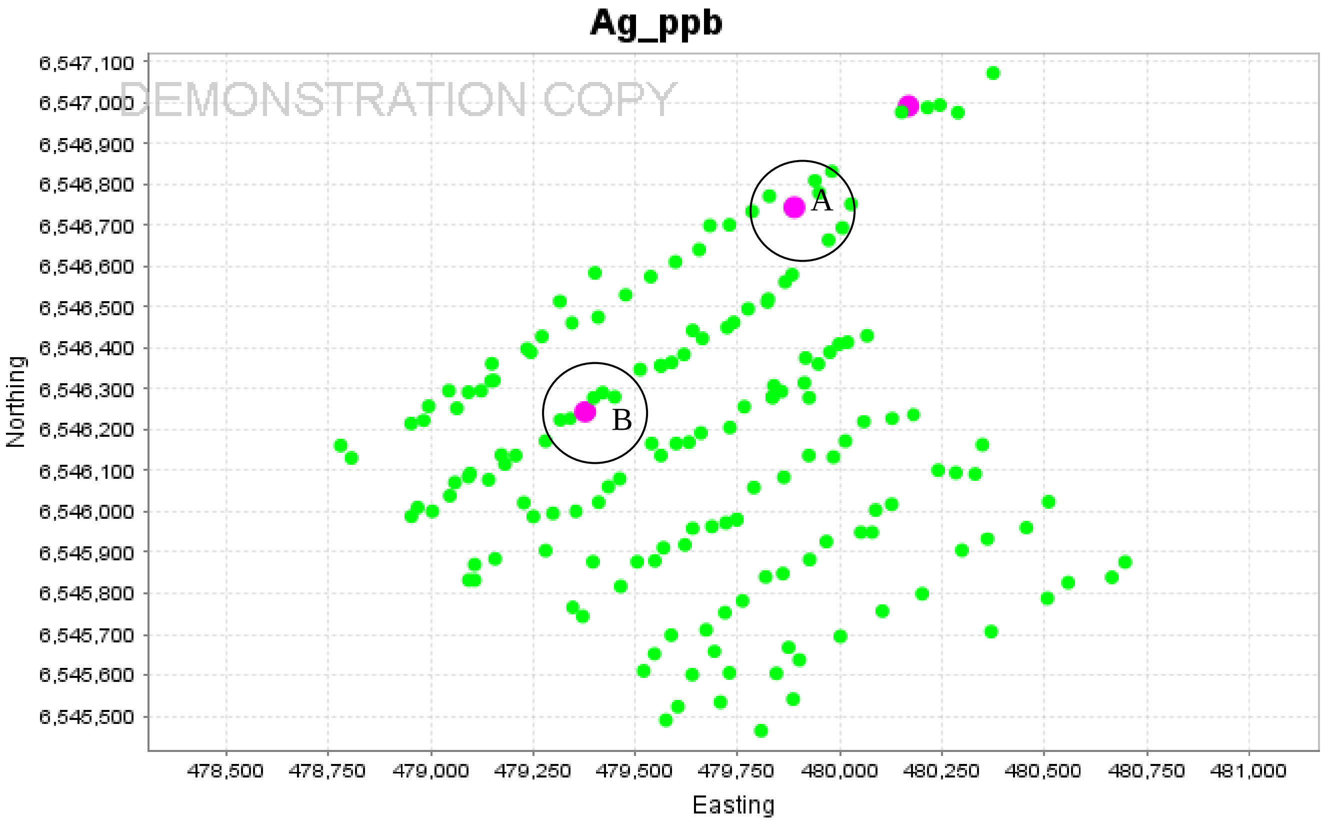


Figure 38

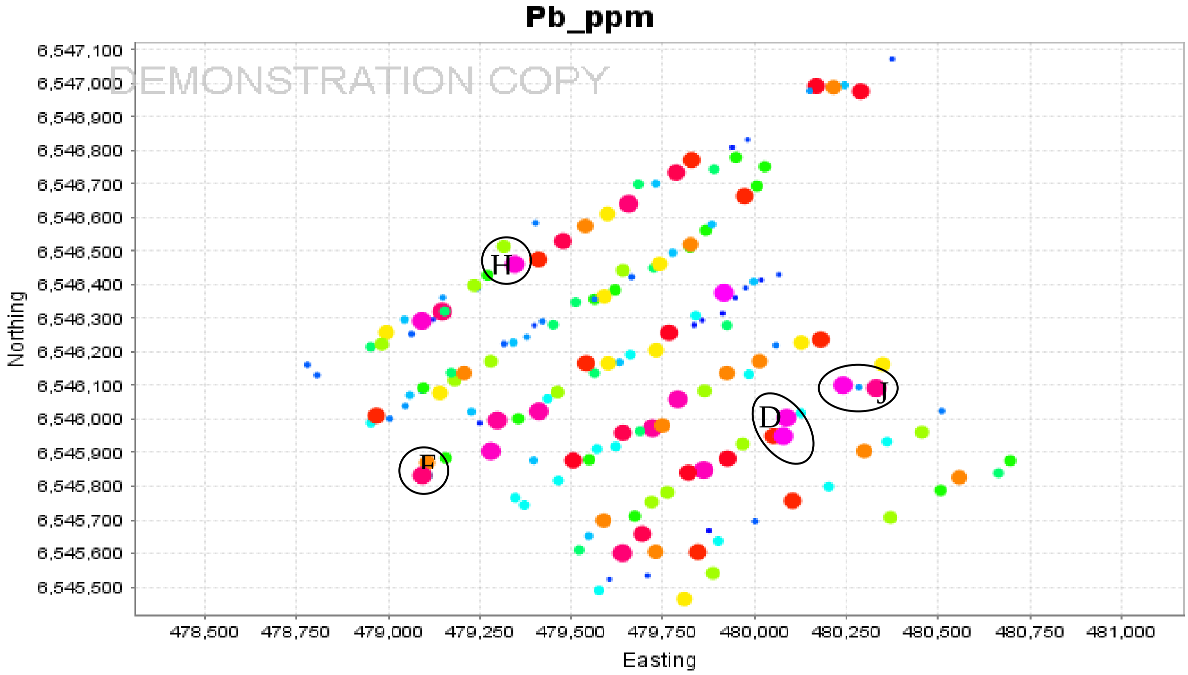


Figure 39

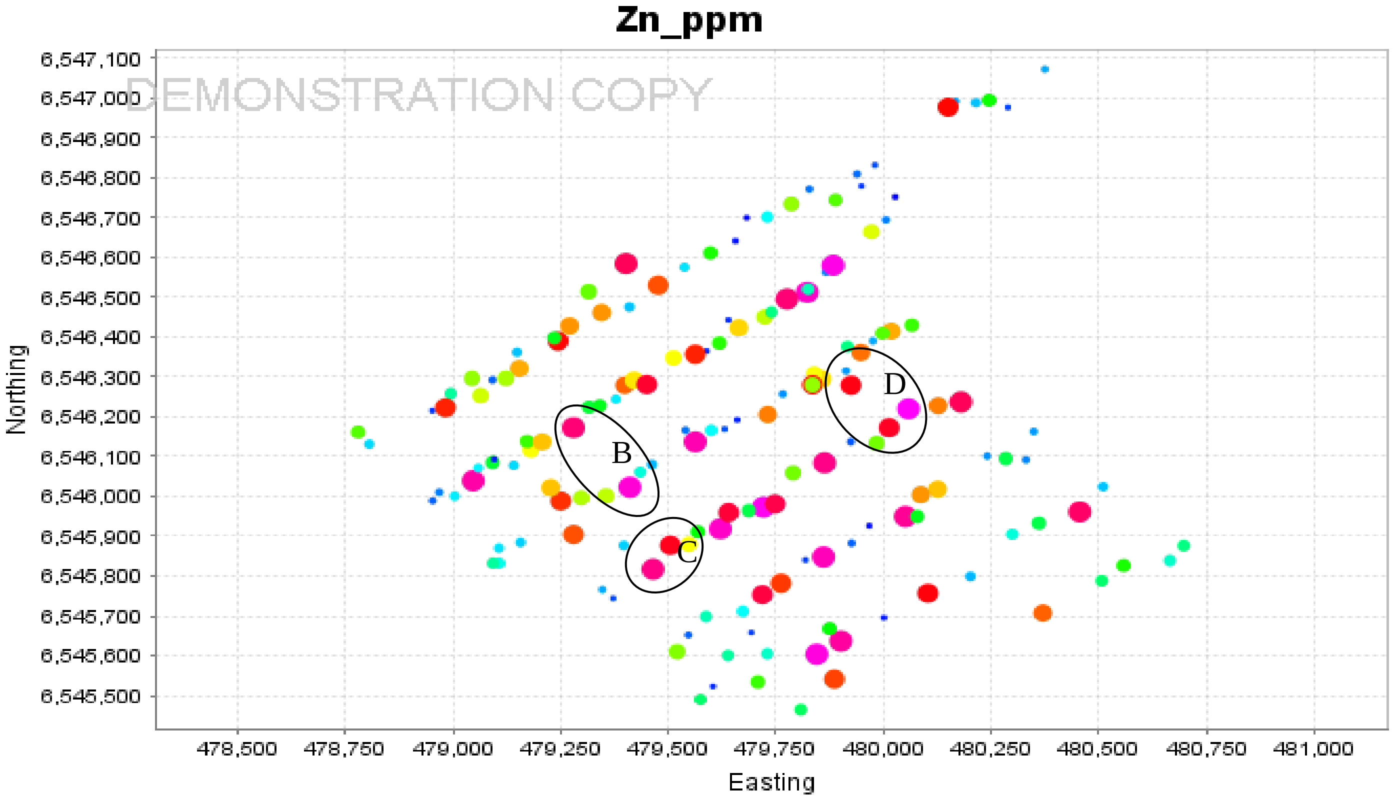


Figure 40

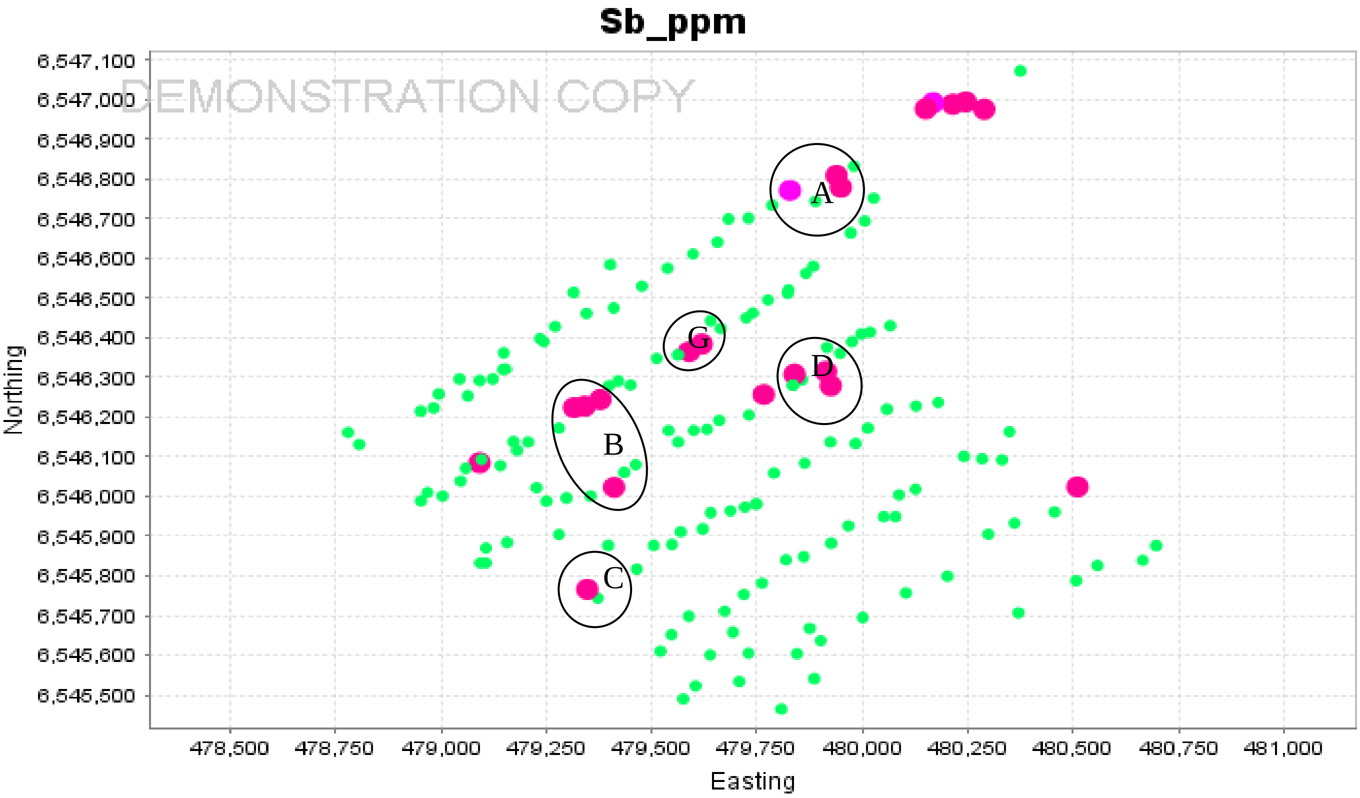


Figure 41

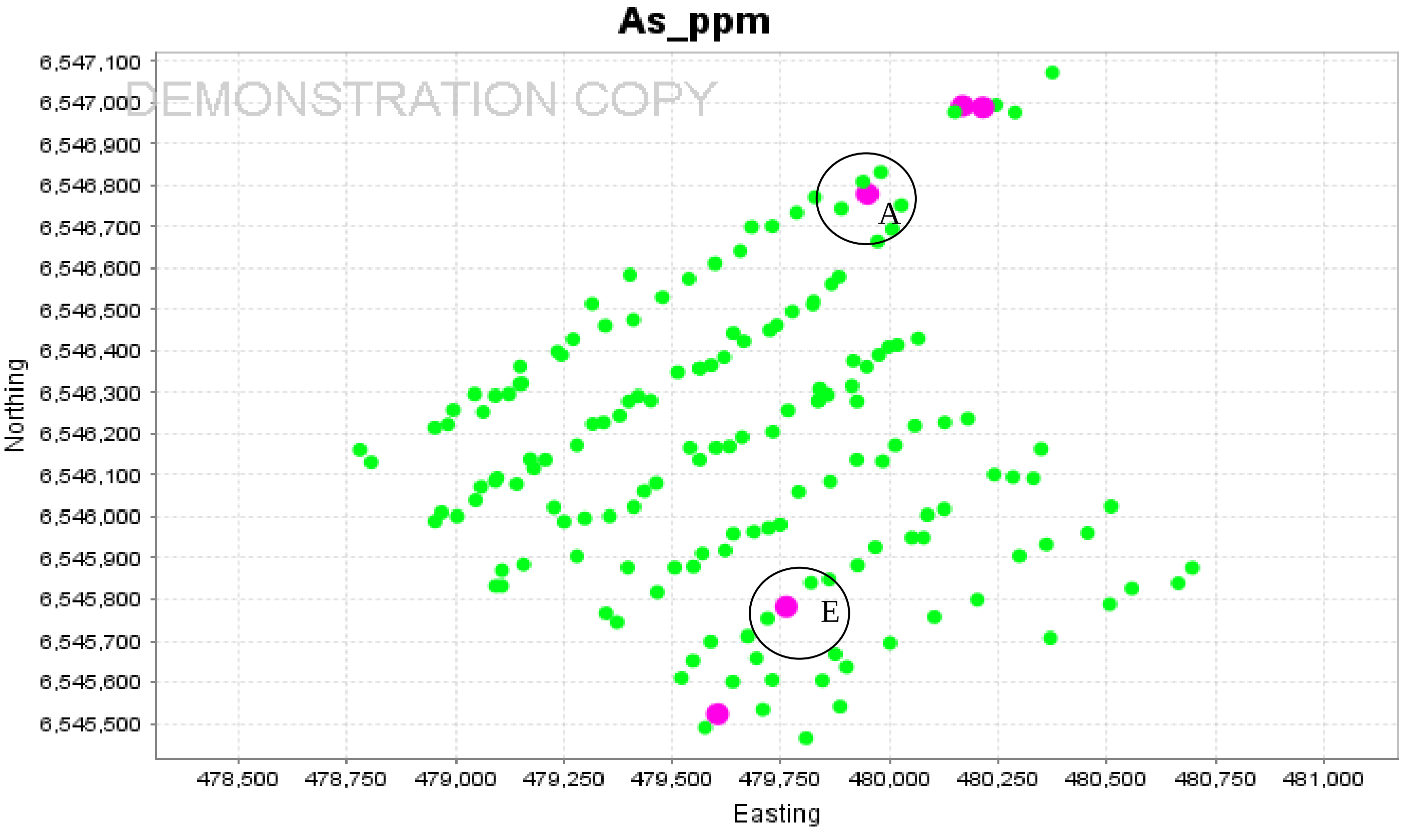


Figure 42

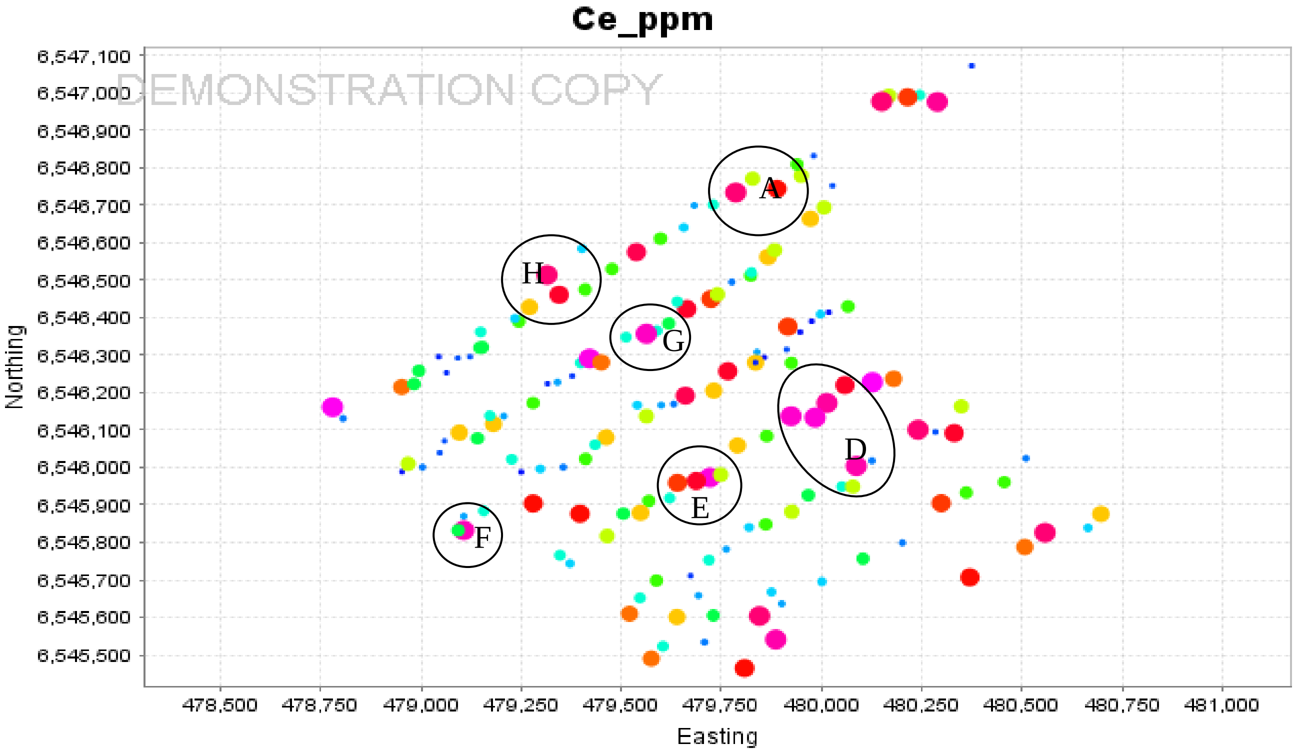


Figure 43

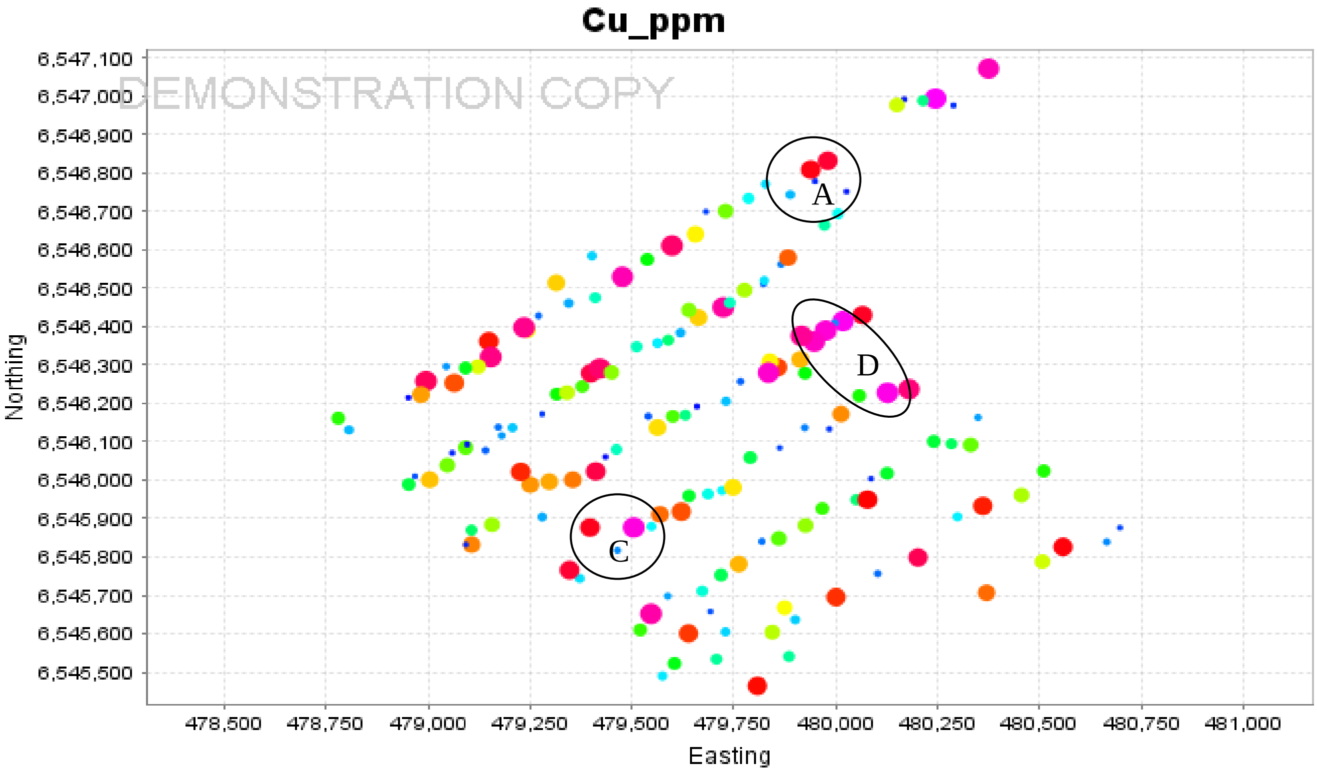


Figure 44

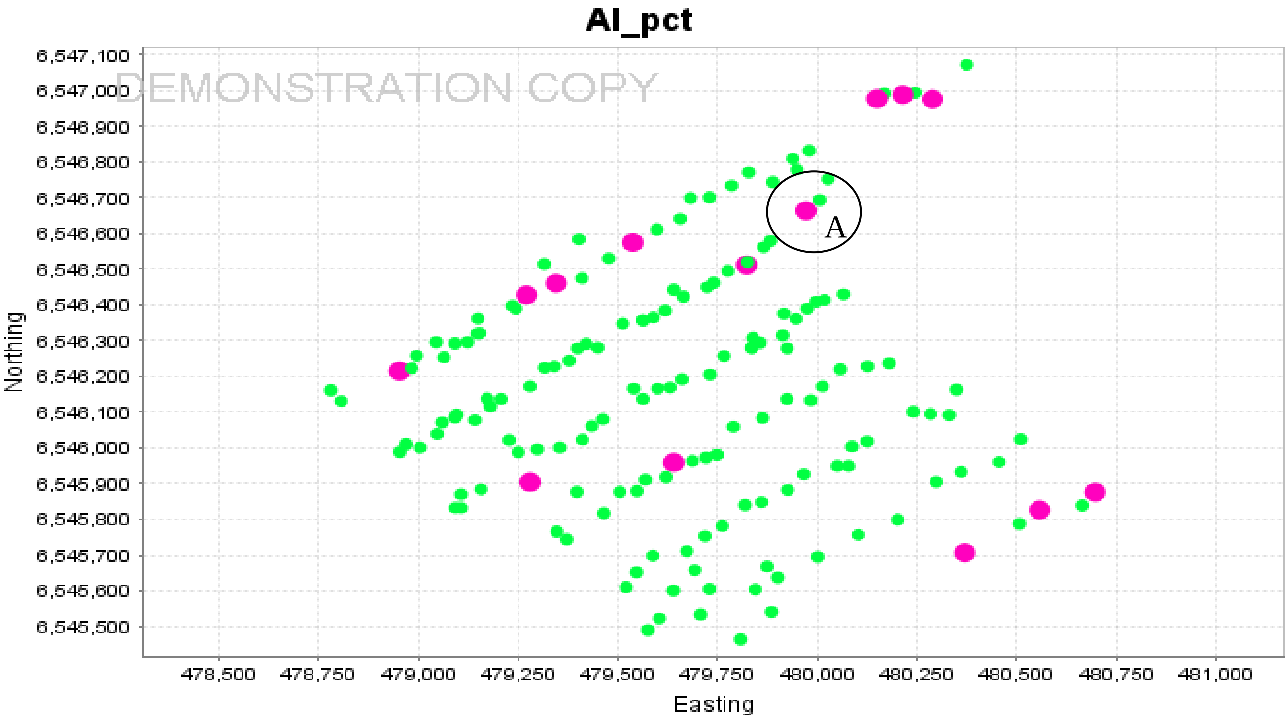


Figure 45

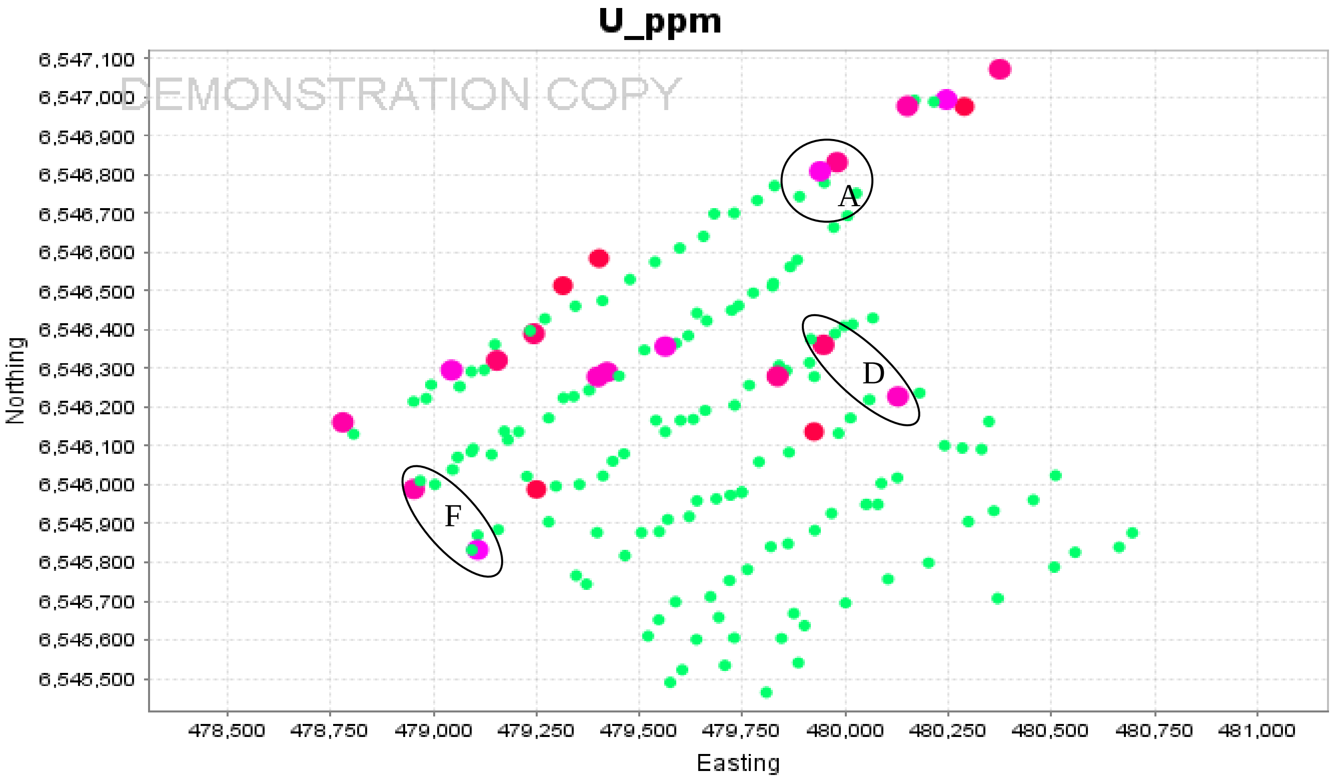


Figure 46

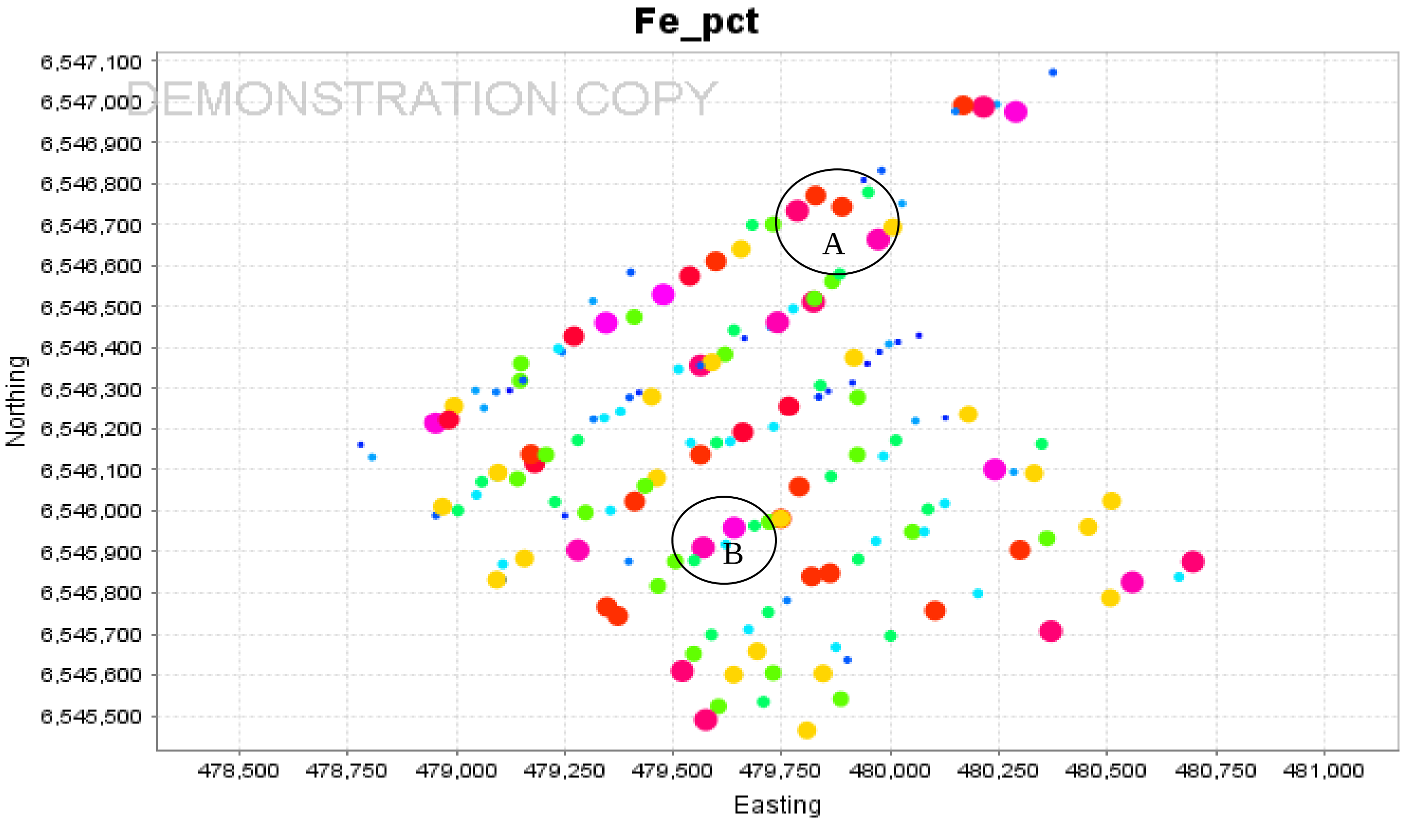


Figure 47

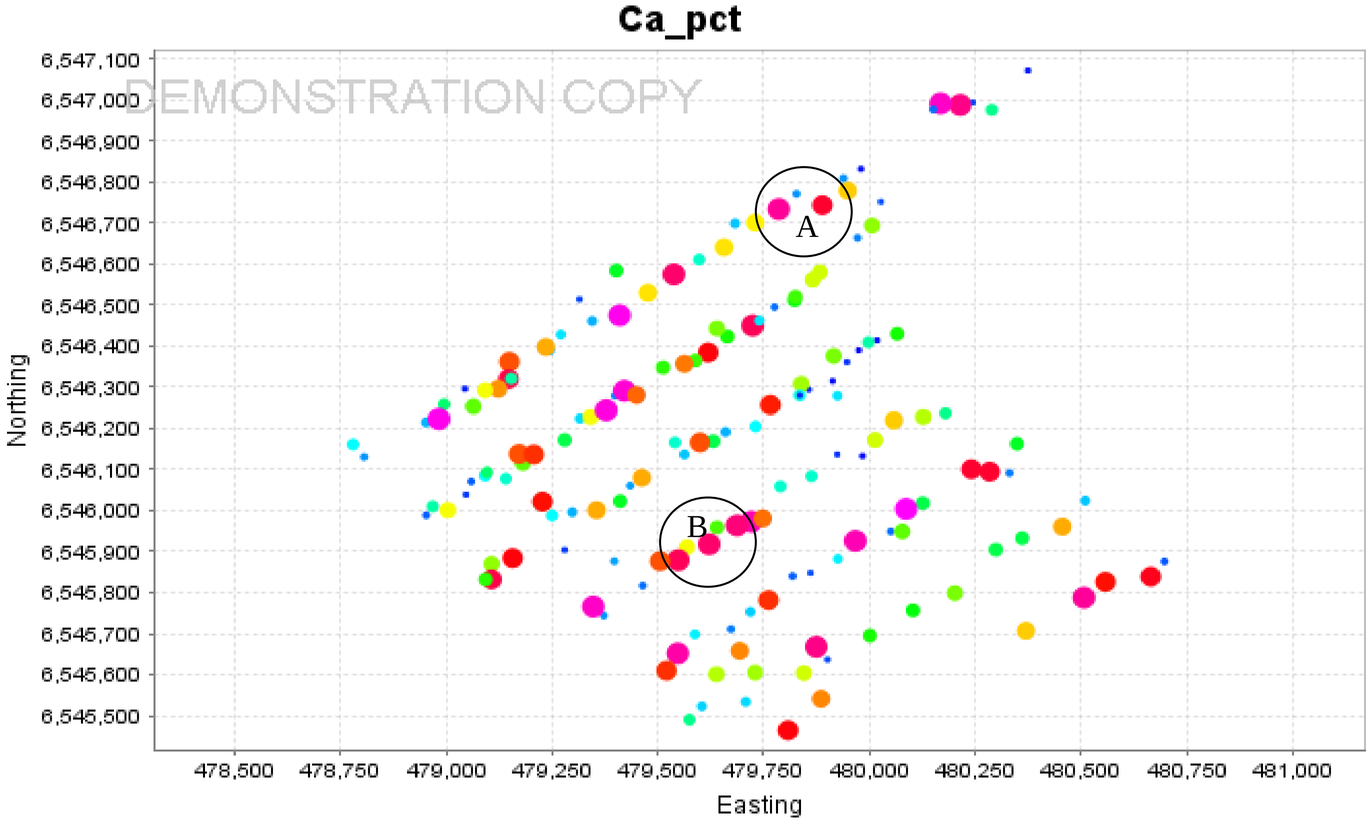
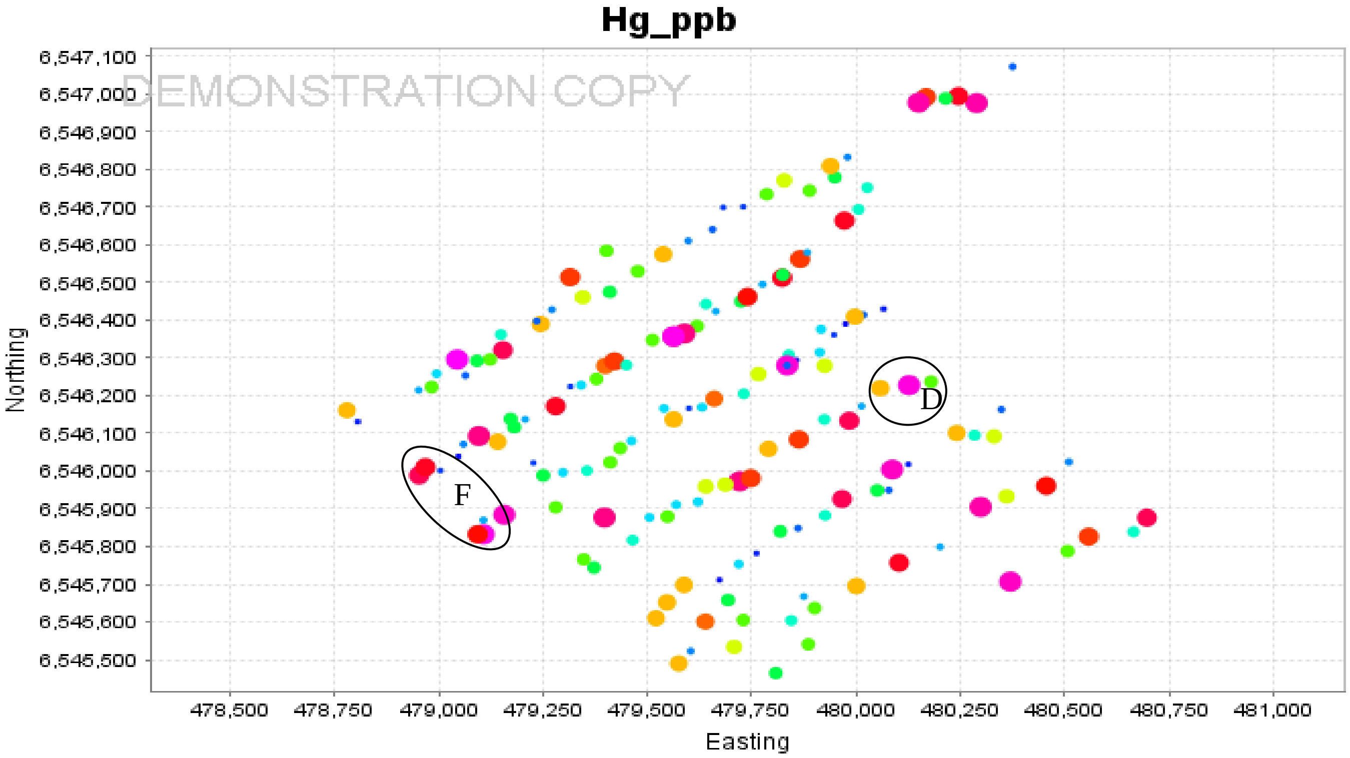


Figure 48


Hg_ppb
DEMONSTRATION COPY
Northing
6,547,100
6,547,000
6,546,900
6,546,800
6,546,700
6,546,600
6,546,500
6,546,400
6,546,300
6,546,200
6,546,100
6,546,000
6,545,900
6,545,800
6,545,700
6,545,600
6,545,500
478,500
478,750
479,000
479,250
479,500
479,750
480,000
480,250
480,500
480,750
481,000
Easting
F
D

APPENDIX 12.1

Sample No	Easting	Northing	Vegetation	Type	Ag (2 ppb)	Al (0.1 %)	As (0.1 ppm)	Au (0.2 ppm)	B (1 ppm)
TOK AH 001	480375	6547072	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.3	56
TOK AH 002	480289	6546976	*C.pauper*	Vegetation	<2	0.02	<0.1	0.2	84
TOK AH 003	480245	6546994	*E.concinna*	Vegetation	<2	0.01	<0.1	0.8	146
TOK AH 004	480215	6546988	*C.pauper*	Vegetation	<2	0.02	0.2	0.3	57
TOK AH 005	480168	6546992	*C.pauper*	Vegetation	8	0.01	0.2	0.2	35
TOK AH 006	480150	6546977	*E.concinna*	Vegetation	<2	0.02	<0.1	0.5	116
TOK AH 007	479980	6546832	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.6	46
TOK AH 008	480027	6546752	*C.pauper*	Vegetation	<2	<0.01	<0.1	1.2	30
TOK AH 009	479949	6546779	*C.pauper*	Vegetation	<2	0.01	0.2	1.9	64
TOK AH 010	479939	6546809	*E.concinna*	Vegetation	<2	0.01	0.1	2.7	104
TOK AH 011	479889	6546744	*C.pauper*	Vegetation	43	0.01	<0.1	1.8	57
TOK AH 012	479828	6546771	*C.pauper*	Vegetation	<2	0.01	0.1	0.3	52
TOK AH 013	479786	6546734	*C.pauper*	Vegetation	<2	0.01	<0.1	1.1	41
TOK AH 014	479730	6546701	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.2	55
TOK AH 015	479682	6546699	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	59
TOK AH 016	479656	6546641	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	53
TOK AH 017	479598	6546611	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	60
TOK AH 018	479538	6546575	*C.pauper*	Vegetation	<2	0.02	<0.1	<0.2	62
TOK AH 019	479477	6546530	*C.pauper*	Vegetation	<2	0.01	<0.1	0.9	66
TOK AH 020	479345	6546461	*C.pauper*	Vegetation	<2	0.02	<0.1	<0.2	38
TOK AH 021	479402	6546584	*E.concinna*	Vegetation	<2	<0.01	<0.1	<0.2	123
TOK AH 022	479315	6546514	*E.concinna*	Vegetation	<2	0.01	<0.1	6.4	113
TOK AH 023	479244	6546390	*E.concinna*	Vegetation	<2	<0.01	<0.1	<0.2	45
TOK AH 024	479410	6546475	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	68
TOK AH 025	479271	6546428	*C.pauper*	Vegetation	<2	0.02	<0.1	<0.2	45
TOK AH 026	479149	6546362	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	46
TOK AH 027	479235	6546398	*C.pauper*	Vegetation	<2	<0.01	0.1	<0.2	49
TOK AH 028	479092	6546085	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.3	100
TOK AH 029	479147	6546320	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	37
TOK AH 030	479154	6546321	*E.concinna*	Vegetation	<2	0.01	<0.1	<0.2	96
TOK AH 031	479123	6546296	*E.concinna*	Vegetation	<2	<0.01	<0.1	<0.2	100
TOK AH 032	479044	6546296	*E.concinna*	Vegetation	<2	0.01	0.1	0.6	120
TOK AH 033	479092	6546292	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	66
TOK AH 034	479064	6546253	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	50
TOK AH 035	478995	6546258	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	38
TOK AH 036	478952	6546215	*C.pauper*	Vegetation	<2	0.02	<0.1	<0.2	38
TOK AH 037	478983	6546223	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	41
TOK AH 038	478953	6545989	*E.concinna*	Vegetation	<2	<0.01	<0.1	1.9	110
TOK AH 039	479004	6546001	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	98
TOK AH 040	479047	6546039	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	36
TOK AH 041	479059	6546071	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	43
TOK AH 042	479096	6546093	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	57
TOK AH 043	478780	6546161	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.5	103
TOK AH 044	478968	6546010	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	55
TOK AH 045	478806	6546131	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	69

Sample No	Easting	Northing	Vegetation	Type	Ag (2 ppb)	Al (0.1 %)	As (0.1 ppm)	Au (0.2 ppm)	B (1 ppm)
TOK AH 046	479141	6546078	*C.pauper*	Vegetation	<2	0.01	<0.1	0.9	40
TOK AH 047	479181	6546116	*C.pauper*	Vegetation	<2	0.01	<0.1	0.8	56
TOK AH 048	479172	6546138	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	72
TOK AH 049	479207	6546137	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	59
TOK AH 050	479256	6546124	*E.concinna*	Vegetation	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
TOK AH 051	479280	6546172	*C.pauper*	Vegetation	<2	0.01	<0.1	1.7	36
TOK AH 052	479316	6546224	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.8	97
TOK AH 053	479341	6546228	*C.pauper*	Vegetation	<2	<0.01	<0.1	1.3	58
TOK AH 054	479378	6546244	*C.pauper*	Vegetation	3	<0.01	<0.1	1.0	60
TOK AH 055	479399	6546279	*E.concinna*	Vegetation	<2	0.01	<0.1	0.8	108
TOK AH 056	479421	6546291	*E.concinna*	Vegetation	<2	0.01	<0.1	0.7	111
TOK AH 057	479450	6546281	*C.pauper*	Vegetation	<2	0.01	<0.1	0.3	49
TOK AH 058	479512	6546348	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.4	58
TOK AH 059	479619	6546384	*C.pauper*	Vegetation	<2	0.01	<0.1	1.2	58
TOK AH 060	479563	6546357	*C.pauper*	Vegetation	<2	0.01	<0.1	0.4	38
TOK AH 061	479589	6546365	*C.pauper*	Vegetation	<2	0.01	<0.1	0.5	54
TOK AH 062	479664	6546423	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.7	60
TOK AH 063	479640	6546443	*C.pauper*	Vegetation	<2	0.01	<0.1	0.3	35
TOK AH 064	479724	6546450	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.4	45
TOK AH 065	479823	6546512	*C.pauper*	Vegetation	<2	0.02	<0.1	1.1	26
TOK AH 066	479740	6546462	*C.pauper*	Vegetation	<2	0.01	<0.1	0.7	39
TOK AH 067	479776	6546495	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.3	50
TOK AH 068	479825	6546520	*C.pauper*	Vegetation	<2	<0.01	<0.1	1.0	81
TOK AH 069	479866	6546562	*C.pauper*	Vegetation	<2	0.01	<0.1	1.6	125
TOK AH 070	479883	6546580	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.7	45
TOK AH 071	479972	6546664	*C.pauper*	Vegetation	<2	0.02	<0.1	2.5	54
TOK AH 072	480006	6546694	*C.pauper*	Vegetation	<2	0.01	<0.1	1.2	69
TOK AH 073	480066	6546430	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.2	28
TOK AH 074	480018	6546414	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.2	34
TOK AH 075	479997	6546409	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.7	52
TOK AH 076	479975	6546390	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.3	27
TOK AH 077	479947	6546361	*unknown*	Vegetation	<2	<0.01	<0.1	0.8	58
TOK AH 078	479916	6546376	*C.pauper*	Vegetation	<2	0.01	<0.1	0.9	73
TOK AH 079	479913	6546315	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.6	58
TOK AH 080	479857	6546294	*E.concinna*	Vegetation	<2	<0.01	<0.1	<0.2	50
TOK AH 081	479925	6546279	*C.pauper*	Vegetation	<2	0.01	<0.1	0.6	67
TOK AH 082	479839	6546308	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.5	47
TOK AH 083	479835	6546280	*E.concinna*	Vegetation	<2	<0.01	<0.1	1.3	91
TOK AH 084	479835	6546280	*E.concinna*	Vegetation	<2	<0.01	<0.1	1.8	65
TOK AH 085	479766	6546257	*C.pauper*	Vegetation	<2	0.01	<0.1	0.5	74
TOK AH 086	479731	6546205	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.3	79
TOK AH 087	479660	6546192	*C.pauper*	Vegetation	<2	0.01	<0.1	0.9	97
TOK AH 088	479631	6546169	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.3	41
TOK AH 089	479600	6546166	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.7	45
TOK AH 090	479563	6546137	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	69
TOK AH 091	479462	6546080	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	62
TOK AH 092	479540	6546166	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.5	70

Sample No	Easting	Northing	Vegetation	Type	Ag (2 ppb)	Al (0.1 %)	As (0.1 ppm)	Au (0.2 ppm)	B (1 ppm)
TOK AH 093	479435	6546061	*C.pauper*	Vegetation	<2	0.01	<0.1	1.1	69
TOK AH 094	479355	6546001	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	47
TOK AH 095	479250	6545988	*E.concinna*	Vegetation	<2	<0.01	<0.1	0.3	162
TOK AH 096	479280	6545904	*C.pauper*	Vegetation	<2	0.02	<0.1	0.3	38
TOK AH 097	479107	6545870	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.5	75
TOK AH 098	479107	6545832	*E.concinna*	Vegetation	<2	0.01	<0.1	3.8	165
TOK AH 099	479157	6545884	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	64
TOK AH 100	479093	6545832	*C.pauper*	Vegetation	<2	0.01	<0.1	0.2	34
TOK AH 101	479298	6545996	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	66
TOK AH 102	479411	6546023	*C.pauper*	Vegetation	<2	0.01	<0.1	3.3	67
TOK AH 103	479227	6546022	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.5	68
TOK AH 104	479563	6546357	*C.pauper*	Vegetation	<2	0.01	<0.1	1.4	160
TOK AH 105	480127	6546228	*E.concinna*	Vegetation	<2	0.01	<0.1	0.3	86
TOK AH 106	480180	6546237	*C.pauper*	Vegetation	<2	0.01	<0.1	0.7	56
TOK AH 107	480058	6546220	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.4	28
TOK AH 108	480013	6546172	*C.pauper*	Vegetation	<2	<0.01	<0.1	2.2	36
TOK AH 109	479984	6546133	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.3	41
TOK AH 110	479863	6546084	*C.pauper*	Vegetation	<2	<0.01	<0.1	1.4	44
TOK AH 111	479924	6546137	*C.pauper*	Vegetation	<2	<0.01	<0.1	10.1	37
TOK AH 112	479748	6545981	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.9	63
TOK AH 113	479790	6546059	*C.pauper*	Vegetation	<2	0.01	<0.1	0.3	62
TOK AH 114	479721	6545973	*C.pauper*	Vegetation	<2	<0.01	<0.1	2.5	50
TOK AH 115	479748	6545981	*C.pauper*	Vegetation	<2	0.01	<0.1	1.0	44
TOK AH 116	479687	6545964	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.7	37
TOK AH 117	479621	6545918	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	50
TOK AH 118	479640	6545959	*C.pauper*	Vegetation	<2	0.02	<0.1	0.3	55
TOK AH 119	479569	6545911	*C.pauper*	Vegetation	<2	0.01	<0.1	0.4	51
TOK AH 120	479548	6545879	*C.pauper*	Vegetation	<2	<0.01	<0.1	1.1	50
TOK AH 121	479465	6545817	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.5	38
TOK AH 122	479505	6545877	*C.pauper*	Vegetation	<2	0.01	<0.1	<0.2	36
TOK AH 123	479397	6545877	*E.concinna*	Vegetation	<2	0.01	<0.1	2.1	128
TOK AH 124	479372	6545744	*C.pauper*	Vegetation	<2	0.01	<0.1	0.8	59
TOK AH 125	480241	6546101	*C.pauper*	Vegetation	<2	0.01	<0.1	1.1	43
TOK AH 126	479347	6545766	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.3	63
TOK AH 127	480349	6546163	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	55
TOK AH 128	480331	6546092	*C.pauper*	Vegetation	<2	0.01	<0.1	1.6	57
TOK AH 129	480284	6546095	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.7	46
TOK AH 130	480126	6546018	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	50
TOK AH 131	480087	6546004	*C.pauper*	Vegetation	<2	0.01	<0.1	1.2	51
TOK AH 132	480051	6545949	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.3	39
TOK AH 133	480078	6545949	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.4	53
TOK AH 134	479967	6545926	*C.pauper*	Vegetation	<2	<0.01	<0.1	1.4	87
TOK AH 135	479926	6545882	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.9	40
TOK AH 136	479861	6545848	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.2	30
TOK AH 137	479762	6545782	*C.pauper*	Vegetation	<2	<0.01	0.2	0.8	54
TOK AH 138	479819	6545840	*C.pauper*	Vegetation	<2	<0.01	<0.1	3.7	49
TOK AH 139	479719	6545753	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.8	42

Sample No	Easting	Northing	Vegetation	Type	Ag (2 ppb)	Al (0.1 %)	As (0.1 ppm)	Au (0.2 ppm)	B (1 ppm)
TOK AH 140	479673	6545711	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	49
TOK AH 141	479588	6545698	*C.pauper*	Vegetation	<2	0.01	<0.1	0.4	65
TOK AH 142	479730	6545605	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.5	103
TOK AH 143	479547	6545652	*C.pauper*	Vegetation	<2	<0.01	<0.1	1.5	66
TOK AH 144	479521	6545610	*C.pauper*	Vegetation	<2	0.01	<0.1	0.8	58
TOK AH 145	479708	6545534	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.4	72
TOK AH 146	479693	6545658	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.5	72
TOK AH 147	479639	6545601	*C.pauper*	Vegetation	<2	0.01	<0.1	0.6	87
TOK AH 148	479845	6545604	*C.pauper*	Vegetation	<2	0.01	0.1	1.5	22
TOK AH 149	479604	6545523	*C.pauper*	Vegetation	<2	<0.01	0.2	0.5	102
TOK AH 150	479575	6545490	*C.pauper*	Vegetation	<2	0.01	<0.1	0.4	55
TOK AH 151	479886	6545541	*C.pauper*	Vegetation	<2	0.01	0.1	1.3	36
TOK AH 152	479808	6545464	*C.pauper*	Vegetation	<2	0.01	0.1	0.5	77
TOK AH 153	479901	6545637	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.7	40
TOK AH 154	480001	6545695	*C.pauper*	Vegetation	<2	<0.01	0.1	0.7	61
TOK AH 155	479875	6545668	*C.pauper*	Vegetation	<2	<0.01	<0.1	0.6	74
TOK AH 156	480510	6546024	*C.pauper*	Vegetation	<2	<0.01	<0.1	1.1	47
TOK AH 157	480103	6545757	*C.pauper*	Vegetation	<2	0.01	<0.1	0.3	52
TOK AH 158	480159	6545778	*C.pauper*	Vegetation	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
TOK AH 159	480202	6545799	*C.pauper*	Vegetation	<2	<0.01	0.1	<0.2	79
TOK AH 160	480299	6545905	*C.pauper*	Vegetation	<2	0.01	<0.1	0.4	30
TOK AH 161	480361	6545933	*C.pauper*	Vegetation	2	0.01	<0.1	0.3	46
TOK AH 162	480456	6545961	*C.pauper*	Vegetation	<2	0.01	<0.1	0.8	47
TOK AH 163	480697	6545876	*C.pauper*	Vegetation	<2	0.02	<0.1	<0.2	39
TOK AH 164	480665	6545839	*C.pauper*	Vegetation	<2	<0.01	<0.1	<0.2	69
TOK AH 165	480558	6545826	*C.pauper*	Vegetation	2	0.02	<0.1	0.4	35
TOK AH 166	480507	6545788	*C.pauper*	Vegetation	<2	0.01	0.1	0.4	39
TOK AH 167	480370	6545707	*C.pauper*	Vegetation	<2	0.02	<0.1	<0.2	65

Ba (0.1ppm)	Be (0.1 ppm)	Bi (0.02 ppm)	Ca (0.01 %)	Cd (0.01 ppm)	Ce (0.01 ppm)	Co (0.01 ppm)	Cr (0.1 ppm)	Cs (0.005 ppm)
3.1	<0.1	<0.02	0.54	<0.01	0.07	0.09	1.5	<0.005
6.7	<0.1	<0.02	0.94	<0.01	0.23	0.05	1.7	0.014
5.1	0.1	<0.02	0.65	0.01	0.12	0.08	1.7	0.006
4.6	<0.1	<0.02	1.36	<0.01	0.18	0.05	1.6	0.015
5.5	<0.1	<0.02	1.42	<0.01	0.15	0.02	1.5	0.009
6.3	<0.1	<0.02	0.76	0.01	0.22	0.05	1.5	0.006
6.2	<0.1	<0.02	0.43	<0.01	0.08	0.10	1.5	<0.005
5.0	<0.1	<0.02	0.72	<0.01	0.08	0.02	1.4	0.006
10.8	<0.1	<0.02	1.13	<0.01	0.15	0.03	1.6	0.010
8.6	0.1	<0.02	0.80	<0.01	0.14	0.06	1.5	<0.005
10.1	<0.1	<0.02	1.29	<0.01	0.19	0.02	1.4	0.012
6.6	<0.1	<0.02	0.80	<0.01	0.15	0.04	1.4	0.010
8.9	<0.1	<0.02	1.38	<0.01	0.22	0.03	1.4	0.012
5.6	<0.1	<0.02	1.11	<0.01	0.12	0.03	1.5	0.009
3.0	<0.1	<0.02	0.83	<0.01	0.10	0.01	1.3	0.006
4.7	<0.1	<0.02	1.12	<0.01	0.11	0.08	5.6	0.009
4.3	<0.1	<0.02	0.91	<0.01	0.14	0.05	1.5	0.010
6.9	<0.1	<0.02	1.33	<0.01	0.21	0.03	1.4	0.010
10.0	<0.1	<0.02	1.12	<0.01	0.14	0.09	17.7	0.010
4.5	<0.1	<0.02	0.82	<0.01	0.20	0.04	1.1	0.014
5.4	<0.1	<0.02	0.98	<0.01	0.11	0.01	1.4	<0.005
4.9	<0.1	<0.02	0.66	<0.01	0.22	0.02	1.8	<0.005
3.2	<0.1	<0.02	0.82	0.01	0.14	0.01	1.8	<0.005
5.1	<0.1	<0.02	1.53	<0.01	0.14	0.01	1.9	0.008
5.2	<0.1	<0.02	0.87	<0.01	0.16	0.03	1.4	0.014
5.7	<0.1	<0.02	1.21	<0.01	0.12	0.03	1.4	0.008
4.1	<0.1	<0.02	1.14	<0.01	0.11	0.04	1.5	0.008
6.0	<0.1	<0.02	0.89	<0.01	0.08	0.01	1.3	0.006
3.2	<0.1	<0.02	1.30	<0.01	0.13	0.02	1.5	0.009
1.7	<0.1	<0.02	0.93	<0.01	0.13	<0.01	1.6	<0.005
6.2	<0.1	<0.02	1.15	0.01	0.08	0.01	1.6	<0.005
7.1	0.1	<0.02	0.54	0.02	0.05	0.12	1.5	<0.005
3.2	<0.1	<0.02	1.10	<0.01	0.08	<0.01	1.5	0.006
5.5	<0.1	<0.02	1.04	<0.01	0.06	0.02	1.4	0.006
6.4	<0.1	<0.02	0.95	<0.01	0.13	0.02	1.5	0.009
6.8	<0.1	<0.02	0.82	<0.01	0.17	0.02	1.5	0.015
9.0	<0.1	<0.02	1.53	<0.01	0.13	0.05	1.5	0.010
5.7	<0.1	<0.02	0.75	<0.01	0.04	0.13	1.5	<0.005
4.2	<0.1	<0.02	1.10	<0.01	0.09	<0.01	1.5	0.007
4.1	<0.1	<0.02	0.62	<0.01	0.08	0.02	1.5	0.006
3.2	<0.1	<0.02	0.75	<0.01	0.08	0.02	1.5	0.007
7.9	<0.1	<0.02	0.95	<0.01	0.16	0.02	1.5	0.008
5.1	<0.1	<0.02	0.89	0.01	0.49	0.01	1.6	<0.005
4.9	<0.1	<0.02	0.93	<0.01	0.15	0.03	1.5	0.009
3.3	<0.1	<0.02	0.80	<0.01	0.09	<0.01	1.4	0.009

Ba (0.1ppm)	Be (0.1 ppm)	Bi (0.02 ppm)	Ca (0.01 %)	Cd (0.01 ppm)	Ce (0.01 ppm)	Co (0.01 ppm)	Cr (0.1 ppm)	Cs (0.005 ppm)
4.2	<0.1	<0.02	0.91	<0.01	0.13	0.02	1.4	0.010
4.8	<0.1	<0.02	1.04	<0.01	0.16	0.05	1.5	0.011
4.6	<0.1	<0.02	1.21	<0.01	0.12	0.03	1.5	0.010
5.9	<0.1	<0.02	1.22	<0.01	0.10	0.02	1.5	0.008
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
5.1	<0.1	0.02	0.97	<0.01	0.14	0.02	1.4	0.009
7.4	<0.1	<0.02	0.86	<0.01	0.06	0.02	1.3	0.008
12.1	<0.1	<0.02	1.10	<0.01	0.10	0.02	1.2	0.008
17.8	<0.1	<0.02	1.49	<0.01	0.07	0.02	1.4	0.007
7.0	<0.1	<0.02	0.79	0.01	0.12	0.02	1.7	<0.005
6.8	<0.1	<0.02	1.45	0.02	0.44	0.03	1.4	<0.005
6.8	<0.1	<0.02	1.20	<0.01	0.17	0.04	1.4	0.009
4.0	<0.1	<0.02	1.01	<0.01	0.12	0.03	1.3	0.008
5.3	<0.1	<0.02	1.27	<0.01	0.13	0.04	1.4	0.009
2.8	<0.1	<0.02	0.99	<0.01	0.17	0.04	1.4	0.012
3.6	<0.1	<0.02	1.02	<0.01	0.12	0.02	1.7	0.010
11.6	<0.1	<0.02	1.00	<0.01	0.20	0.05	1.5	0.005
11.3	<0.1	<0.02	1.05	<0.01	0.12	0.03	1.4	0.010
10.4	<0.1	<0.02	1.31	<0.01	0.18	0.04	1.3	0.009
4.8	<0.1	<0.02	0.99	<0.01	0.14	0.03	1.3	0.013
3.5	<0.1	<0.02	0.87	<0.01	0.15	0.03	1.5	0.012
3.4	<0.1	<0.02	0.76	<0.01	0.09	0.03	1.3	0.008
4.7	<0.1	<0.02	1.02	<0.01	0.12	0.03	1.4	0.009
5.6	<0.1	<0.02	1.09	<0.01	0.16	0.03	1.3	0.008
5.8	<0.1	<0.02	1.09	<0.01	0.15	0.05	1.3	0.008
6.7	<0.1	<0.02	0.78	<0.01	0.16	0.05	1.4	0.013
5.1	<0.1	<0.02	1.06	<0.01	0.15	0.03	1.4	0.011
11.0	<0.1	<0.02	1.00	0.02	0.14	0.05	1.5	<0.005
3.3	<0.1	<0.02	0.46	0.02	0.04	0.14	1.5	<0.005
4.2	<0.1	<0.02	0.93	<0.01	0.11	0.04	1.4	0.006
2.1	<0.1	<0.02	0.33	<0.01	0.04	0.29	1.3	<0.005
4.7	<0.1	<0.02	0.60	0.02	0.04	0.23	1.4	<0.005
7.1	<0.1	<0.02	1.05	<0.01	0.18	0.05	1.4	0.009
4.9	<0.1	<0.02	0.39	<0.01	0.08	0.08	1.5	<0.005
3.3	<0.1	<0.02	0.57	<0.01	0.04	0.07	1.5	<0.005
5.8	<0.1	<0.02	0.87	<0.01	0.14	0.03	1.6	0.009
5.4	<0.1	<0.02	1.07	<0.01	0.10	0.04	1.4	0.007
9.1	<0.1	<0.02	0.90	0.01	0.16	0.05	1.5	0.006
2.9	<0.1	<0.02	0.58	<0.01	0.05	0.05	1.5	<0.005
5.6	<0.1	<0.02	1.23	<0.01	0.20	0.03	1.5	0.012
3.9	<0.1	<0.02	0.89	<0.01	0.16	0.03	1.4	0.010
5.6	<0.1	<0.02	0.82	<0.01	0.21	0.03	1.5	0.014
7.7	<0.1	<0.02	0.97	<0.01	0.09	0.02	1.4	0.010
4.7	<0.1	<0.02	1.21	<0.01	0.10	0.04	1.4	0.008
5.0	<0.1	<0.02	0.83	<0.01	0.15	0.04	1.5	0.011
7.8	<0.1	<0.02	1.14	<0.01	0.16	0.05	1.4	0.011
3.6	<0.1	<0.02	0.91	<0.01	0.11	0.02	1.4	0.006

Ba (0.1ppm)	Be (0.1 ppm)	Bi (0.02 ppm)	Ca (0.01 %)	Cd (0.01 ppm)	Ce (0.01 ppm)	Co (0.01 ppm)	Cr (0.1 ppm)	Cs (0.005 ppm)
3.4	<0.1	<0.02	0.81	<0.01	0.12	0.03	1.3	0.009
10.7	<0.1	<0.02	1.14	<0.01	0.09	0.03	1.6	0.008
4.7	<0.1	<0.02	0.89	<0.01	0.04	<0.01	1.5	<0.005
4.0	<0.1	<0.02	0.64	<0.01	0.19	0.04	1.5	0.011
11.9	<0.1	<0.02	1.06	<0.01	0.10	0.02	1.4	0.007
15.4	0.1	<0.02	1.30	0.02	0.26	0.36	1.5	<0.005
6.0	<0.1	<0.02	1.27	<0.01	0.12	0.04	1.5	0.009
7.4	<0.1	<0.02	1.01	<0.01	0.13	0.03	1.4	0.009
7.0	<0.1	<0.02	0.82	<0.01	0.11	0.05	1.5	0.007
6.7	<0.1	<0.02	0.98	<0.01	0.14	0.04	1.6	0.010
7.0	<0.1	<0.02	1.26	<0.01	0.12	0.05	1.5	0.008
4.9	<0.1	<0.02	1.17	<0.01	0.27	0.03	1.6	0.005
10.9	<0.1	<0.02	1.08	0.01	0.65	0.06	1.6	<0.005
5.0	<0.1	<0.02	0.94	<0.01	0.17	0.04	1.7	0.012
8.3	<0.1	<0.02	1.13	<0.01	0.20	0.03	1.5	0.006
10.4	<0.1	<0.02	1.09	<0.01	0.24	0.07	1.5	0.008
4.8	<0.1	<0.02	0.42	<0.01	0.29	0.02	1.5	0.009
3.1	<0.1	<0.02	0.91	<0.01	0.14	0.04	1.4	0.008
5.1	<0.1	<0.02	0.60	<0.01	0.28	0.05	1.3	0.007
5.3	<0.1	<0.02	0.95	<0.01	0.14	0.02	1.4	0.008
3.7	<0.1	<0.02	0.91	<0.01	0.16	0.04	1.6	0.010
10.6	<0.1	<0.02	1.41	<0.01	0.35	0.02	1.5	0.011
5.5	<0.1	<0.02	1.18	<0.01	0.15	0.03	1.5	0.014
9.6	<0.1	<0.02	1.34	<0.01	0.20	0.03	1.5	0.007
8.6	<0.1	<0.02	1.33	<0.01	0.12	0.03	1.6	0.010
2.9	<0.1	<0.02	1.03	<0.01	0.18	0.03	1.6	0.014
4.2	<0.1	<0.02	1.10	<0.01	0.14	0.04	1.6	0.011
8.3	<0.1	<0.02	1.31	<0.01	0.16	0.03	1.5	0.007
4.3	<0.1	0.03	0.76	<0.01	0.15	0.01	1.1	0.010
8.4	<0.1	<0.02	1.21	<0.01	0.13	0.02	1.1	0.012
5.8	<0.1	<0.02	0.81	<0.01	0.19	<0.01	1.0	0.005
4.8	<0.1	<0.02	0.80	<0.01	0.11	0.02	1.0	0.010
3.8	<0.1	<0.02	1.29	<0.01	0.22	0.04	1.0	0.012
7.5	<0.1	<0.02	1.42	0.01	0.12	0.02	1.1	0.009
5.2	<0.1	<0.02	0.98	<0.01	0.15	<0.01	1.2	0.009
3.2	<0.1	<0.02	0.77	<0.01	0.20	0.02	1.1	0.013
11.2	<0.1	<0.02	1.29	<0.01	0.08	<0.01	0.9	0.008
3.7	<0.1	<0.02	0.97	<0.01	0.09	0.02	1.0	0.011
9.1	<0.1	<0.02	1.56	<0.01	0.25	<0.01	1.1	0.011
5.2	<0.1	<0.02	0.76	<0.01	0.12	0.03	1.1	0.009
4.1	<0.1	<0.02	1.04	<0.01	0.15	0.03	1.0	0.009
6.8	<0.1	<0.02	1.41	<0.01	0.13	0.02	1.2	0.009
4.9	<0.1	<0.02	0.88	<0.01	0.15	0.01	1.0	0.009
3.7	<0.1	<0.02	0.71	<0.01	0.14	0.04	1.1	0.012
10.5	<0.1	<0.02	1.22	<0.01	0.10	0.02	1.1	0.009
6.2	<0.1	<0.02	0.75	<0.01	0.11	0.03	1.2	0.012
2.8	<0.1	<0.02	0.84	0.01	0.12	<0.01	1.0	0.007

Ba (0.1ppm)	Be (0.1 ppm)	Bi (0.02 ppm)	Ca (0.01 %)	Cd (0.01 ppm)	Ce (0.01 ppm)	Co (0.01 ppm)	Cr (0.1 ppm)	Cs (0.005 ppm)
3.4	<0.1	<0.02	0.77	0.01	0.07	0.01	1.1	0.007
2.8	<0.1	<0.02	0.88	0.01	0.14	0.01	1.1	0.007
6.5	<0.1	<0.02	1.07	<0.01	0.13	0.03	1.2	0.009
5.3	<0.1	<0.02	1.39	<0.01	0.12	0.02	1.2	0.008
7.4	<0.1	<0.02	1.22	<0.01	0.17	0.02	1.3	0.010
5.8	<0.1	<0.02	0.86	<0.01	0.09	0.03	1.1	0.007
5.1	<0.1	<0.02	1.16	<0.01	0.10	0.02	1.2	0.007
8.9	<0.1	<0.02	1.08	0.01	0.16	0.03	1.2	0.010
10.2	<0.1	<0.02	1.09	<0.01	0.22	0.07	1.1	0.009
4.6	<0.1	<0.02	0.85	<0.01	0.12	<0.01	1.1	0.009
3.8	<0.1	<0.02	0.94	<0.01	0.17	<0.01	1.3	0.013
9.9	<0.1	<0.02	1.16	<0.01	0.25	<0.01	1.2	0.012
7.4	<0.1	<0.02	1.27	<0.01	0.19	0.02	1.1	0.012
8.7	<0.1	<0.02	0.69	<0.01	0.10	0.03	1.0	0.012
6.4	<0.1	<0.02	1.00	0.01	0.11	<0.01	1.3	0.008
8.2	<0.1	<0.02	1.36	<0.01	0.11	<0.01	1.1	0.010
3.7	<0.1	<0.02	0.83	<0.01	0.09	0.04	2.2	0.008
7.5	<0.1	<0.02	0.99	<0.01	0.13	0.05	2.1	0.009
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
4.7	<0.1	<0.02	1.05	<0.01	0.09	0.04	2.2	0.006
9.0	<0.1	<0.02	0.97	<0.01	0.18	0.04	2.1	0.010
6.5	<0.1	<0.02	0.97	<0.01	0.14	0.04	2.1	0.008
4.6	<0.1	<0.02	1.14	<0.01	0.14	0.04	2.2	0.010
3.3	<0.1	<0.02	0.74	<0.01	0.16	0.06	2.2	0.013
4.0	<0.1	<0.02	1.28	<0.01	0.11	0.03	2.1	0.009
5.4	<0.1	<0.02	1.26	<0.01	0.22	0.06	2.1	0.015
7.6	<0.1	<0.02	1.38	<0.01	0.17	0.05	1.9	0.009
6.1	<0.1	<0.02	1.13	<0.01	0.19	0.06	2.1	0.012

Cu (0.01 ppm)	Fe (0.001 %)	Ga (0.1 ppm)	Ge (0.01 ppm)	Hf (0.001 ppm)	Hg (1 ppb)	In (0.02 ppm)	K (0.01 %)	La (0.01 ppm)
4.82	0.004	<0.1	<0.01	0.002	10	<0.02	0.64	0.03
1.68	0.015	<0.1	0.01	0.006	25	<0.02	0.35	0.10
8.37	0.006	<0.1	<0.01	0.002	22	<0.02	0.44	0.05
2.53	0.013	<0.1	0.03	0.005	15	<0.02	0.48	0.08
1.63	0.011	<0.1	<0.01	0.002	20	<0.02	0.30	0.07
3.07	0.005	<0.1	<0.01	0.001	25	<0.02	0.50	0.09
3.81	0.004	<0.1	<0.01	0.002	11	<0.02	0.44	0.03
1.63	0.006	<0.1	0.03	0.002	14	<0.02	0.37	0.04
1.65	0.008	<0.1	<0.01	0.004	15	<0.02	0.29	0.06
3.76	0.003	<0.1	0.04	0.002	18	<0.02	0.57	0.06
2.25	0.011	<0.1	<0.01	0.005	16	<0.02	0.47	0.06
2.33	0.011	<0.1	0.01	0.003	17	<0.02	0.48	0.06
2.42	0.013	<0.1	<0.01	0.004	16	<0.02	0.48	0.09
2.95	0.009	<0.1	0.02	0.004	9	<0.02	0.69	0.05
1.74	0.008	<0.1	<0.01	0.003	9	<0.02	0.53	0.05
3.20	0.010	<0.1	<0.01	0.005	10	<0.02	0.52	0.05
3.88	0.011	<0.1	0.01	0.003	11	<0.02	0.69	0.06
2.76	0.012	<0.1	<0.01	0.004	18	<0.02	0.55	0.09
4.70	0.017	<0.1	0.01	0.003	16	<0.02	0.68	0.07
2.22	0.016	<0.1	<0.01	0.006	17	<0.02	0.78	0.08
2.32	0.004	<0.1	0.01	<0.001	16	<0.02	0.45	0.05
3.29	0.006	<0.1	<0.01	0.001	20	<0.02	0.33	0.09
3.14	0.005	<0.1	0.01	0.002	18	<0.02	0.63	0.06
2.49	0.009	<0.1	0.01	0.004	15	<0.02	0.52	0.07
2.06	0.012	<0.1	<0.01	0.001	11	<0.02	0.74	0.08
3.58	0.009	<0.1	0.02	0.002	14	<0.02	0.59	0.06
4.28	0.007	<0.1	<0.01	0.001	10	<0.02	0.60	0.07
2.90	0.007	<0.1	<0.01	0.003	9	<0.02	0.62	0.04
2.10	0.009	<0.1	<0.01	0.002	11	<0.02	0.41	0.06
4.13	0.004	<0.1	0.02	0.002	23	<0.02	0.27	0.05
3.09	0.002	<0.1	<0.01	0.002	16	<0.02	0.68	0.03
2.17	0.006	<0.1	<0.01	0.002	36	<0.02	0.47	0.02
2.73	0.005	<0.1	0.01	<0.001	15	<0.02	0.52	0.03
3.49	0.006	<0.1	0.02	0.002	10	<0.02	0.74	0.03
3.86	0.010	<0.1	<0.01	0.004	13	<0.02	0.59	0.06
1.36	0.015	<0.1	0.01	0.005	12	<0.02	0.63	0.08
3.37	0.012	<0.1	<0.01	0.003	16	<0.02	0.49	0.07
2.68	0.004	<0.1	<0.01	<0.001	23	<0.02	0.40	0.02
3.30	0.008	<0.1	<0.01	0.006	9	<0.02	0.73	0.04
2.95	0.007	<0.1	0.01	0.002	7	<0.02	0.70	0.05
1.65	0.008	<0.1	<0.01	0.003	11	<0.02	0.44	0.04
1.60	0.010	<0.1	<0.01	0.004	24	<0.02	0.51	0.08
2.80	0.003	<0.1	0.02	<0.001	18	<0.02	0.68	0.15
1.90	0.010	<0.1	<0.01	0.002	22	<0.02	0.59	0.07
2.25	0.006	<0.1	<0.01	0.003	8	<0.02	0.78	0.04

Cu (0.01 ppm)	Fe (0.001 %)	Ga (0.1 ppm)	Ge (0.01 ppm)	Hf (0.001 ppm)	Hg (1 ppb)	In (0.02 ppm)	K (0.01 %)	La (0.01 ppm)
2.05	0.009	<0.1	<0.01	<0.001	18	<0.02	0.68	0.07
2.18	0.012	<0.1	0.02	0.005	15	<0.02	0.62	0.07
2.07	0.011	<0.1	<0.01	0.002	15	<0.02	0.54	0.06
2.30	0.009	<0.1	<0.01	0.003	12	<0.02	0.77	0.04
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
1.73	0.008	<0.1	<0.01	<0.001	22	<0.02	0.38	0.06
2.77	0.005	<0.1	<0.01	<0.001	9	<0.02	0.46	0.03
3.06	0.007	<0.1	0.01	<0.001	13	<0.02	0.82	0.04
2.88	0.007	<0.1	<0.01	0.001	16	<0.02	0.65	0.03
3.82	0.004	<0.1	<0.01	<0.001	19	<0.02	0.39	0.04
3.88	0.003	<0.1	<0.01	0.002	20	<0.02	0.41	0.15
2.99	0.010	<0.1	<0.01	0.001	14	<0.02	0.48	0.08
2.49	0.007	<0.1	<0.01	<0.001	16	<0.02	0.67	0.06
2.23	0.009	<0.1	<0.01	0.002	16	<0.02	0.64	0.07
2.30	0.013	<0.1	<0.01	0.003	24	<0.02	0.63	0.07
2.55	0.010	<0.1	<0.01	0.003	24	<0.02	0.55	0.06
3.29	0.003	<0.1	<0.01	<0.001	12	<0.02	0.59	0.10
2.97	0.008	<0.1	<0.01	0.003	14	<0.02	0.62	0.05
4.46	0.006	<0.1	<0.01	<0.001	15	<0.02	0.51	0.08
2.04	0.013	<0.1	<0.01	0.004	22	<0.02	0.34	0.07
2.49	0.014	<0.1	<0.01	0.004	21	<0.02	0.51	0.08
3.03	0.007	<0.1	<0.01	<0.001	12	<0.02	0.40	0.04
2.34	0.009	<0.1	<0.01	0.003	15	<0.02	0.39	0.05
2.10	0.009	<0.1	<0.01	0.002	20	<0.02	0.58	0.08
3.48	0.008	<0.1	<0.01	0.001	12	<0.02	0.76	0.07
2.50	0.014	<0.1	<0.01	0.003	22	<0.02	0.44	0.08
2.42	0.010	<0.1	<0.01	0.004	14	<0.02	0.48	0.06
3.80	0.002	<0.1	<0.01	<0.001	8	<0.02	0.71	0.06
5.91	0.003	<0.1	<0.01	<0.001	10	<0.02	0.73	0.02
2.15	0.006	<0.1	<0.01	<0.001	18	<0.02	0.31	0.05
4.98	0.003	<0.1	<0.01	0.002	6	<0.02	0.70	0.02
4.94	0.002	<0.1	<0.01	<0.001	9	<0.02	0.69	0.02
4.38	0.010	<0.1	0.01	0.003	13	<0.02	0.62	0.10
3.32	0.003	<0.1	<0.01	<0.001	13	<0.02	0.70	0.03
3.50	0.003	<0.1	0.01	<0.001	8	<0.02	0.71	0.02
2.76	0.009	<0.1	0.01	0.004	17	<0.02	0.45	0.07
3.20	0.008	<0.1	<0.01	<0.001	14	<0.02	0.50	0.05
3.11	0.004	<0.1	<0.01	0.001	28	<0.02	0.57	0.07
4.95	0.003	<0.1	<0.01	0.001	10	<0.02	0.47	0.02
2.05	0.012	<0.1	0.01	0.002	17	<0.02	0.64	0.10
2.29	0.007	<0.1	<0.01	0.002	14	<0.02	0.59	0.08
1.58	0.012	<0.1	<0.01	0.006	19	<0.02	0.66	0.10
2.53	0.007	<0.1	<0.01	0.004	13	<0.02	0.43	0.04
2.89	0.008	<0.1	<0.01	0.002	9	<0.02	0.67	0.05
3.27	0.011	<0.1	<0.01	0.003	18	<0.02	0.71	0.07
2.49	0.010	<0.1	<0.01	0.002	13	<0.02	0.51	0.08
1.97	0.007	<0.1	<0.01	0.003	13	<0.02	0.41	0.05

Cu (0.01 ppm)	Fe (0.001 %)	Ga (0.1 ppm)	Ge (0.01 ppm)	Hf (0.001 ppm)	Hg (1 ppb)	In (0.02 ppm)	K (0.01 %)	La (0.01 ppm)
1.44	0.009	<0.1	<0.01	0.003	16	<0.02	0.66	0.06
3.44	0.007	<0.1	0.02	0.003	14	<0.02	0.51	0.05
3.38	0.003	<0.1	<0.01	0.002	15	<0.02	0.50	0.02
2.22	0.014	<0.1	<0.01	0.006	16	<0.02	0.51	0.09
2.57	0.007	<0.1	<0.01	0.003	12	<0.02	0.51	0.05
3.41	0.004	<0.1	<0.01	0.003	30	<0.02	0.48	0.11
3.02	0.010	<0.1	<0.01	0.005	27	<0.02	0.81	0.06
1.65	0.010	<0.1	0.01	0.005	21	<0.02	0.47	0.06
3.35	0.009	<0.1	<0.01	0.006	13	<0.02	0.61	0.05
3.82	0.011	<0.1	<0.01	0.004	16	<0.02	0.69	0.05
3.56	0.008	<0.1	<0.01	0.002	9	<0.02	0.43	0.06
2.37	0.004	<0.1	<0.01	0.002	30	<0.02	0.31	0.10
5.21	0.003	<0.1	0.01	<0.001	29	<0.02	0.51	0.25
4.04	0.010	<0.1	0.02	0.003	16	<0.02	1.06	0.08
2.78	0.006	<0.1	0.02	0.002	18	<0.02	0.48	0.10
3.39	0.008	<0.1	<0.01	0.005	12	<0.02	0.67	0.13
1.69	0.007	<0.1	<0.01	0.006	23	<0.02	0.38	0.13
1.80	0.008	<0.1	<0.01	0.003	20	<0.02	0.42	0.07
2.10	0.009	<0.1	<0.01	0.002	14	<0.02	0.43	0.12
2.44	0.011	<0.1	<0.01	0.002	13	<0.02	0.88	0.07
2.62	0.011	<0.1	<0.01	0.001	18	<0.02	0.32	0.08
2.38	0.009	<0.1	0.01	0.005	24	<0.02	0.62	0.18
3.22	0.010	<0.1	<0.01	0.004	20	<0.02	0.55	0.07
2.43	0.008	<0.1	<0.01	0.002	17	<0.02	0.50	0.11
3.49	0.007	<0.1	<0.01	<0.001	13	<0.02	0.73	0.06
2.71	0.015	<0.1	<0.01	0.003	17	<0.02	0.60	0.09
3.45	0.014	<0.1	<0.01	0.003	13	<0.02	0.81	0.07
2.38	0.008	<0.1	<0.01	0.003	16	<0.02	0.48	0.08
2.13	0.009	<0.1	0.01	0.009	14	<0.02	0.58	0.06
5.18	0.009	<0.1	<0.01	0.005	13	<0.02	0.75	0.06
3.79	0.005	<0.1	<0.01	0.001	24	<0.02	0.38	0.06
2.34	0.011	<0.1	0.01	0.008	15	<0.02	0.62	0.05
2.70	0.015	<0.1	<0.01	0.007	18	<0.02	0.52	0.12
3.81	0.011	<0.1	<0.01	0.002	16	<0.02	0.28	0.05
2.19	0.008	<0.1	<0.01	0.003	10	<0.02	0.51	0.08
2.92	0.010	<0.1	<0.01	0.003	17	<0.02	0.63	0.10
2.59	0.006	<0.1	<0.01	0.004	14	<0.02	0.37	0.04
2.71	0.007	<0.1	<0.01	0.002	8	<0.02	0.72	0.04
1.66	0.008	<0.1	0.03	0.003	27	<0.02	0.31	0.13
2.55	0.009	<0.1	<0.01	0.008	15	<0.02	0.49	0.06
3.66	0.007	<0.1	<0.01	<0.001	10	<0.02	0.57	0.08
2.82	0.007	<0.1	<0.01	0.003	23	<0.02	0.39	0.06
3.01	0.008	<0.1	<0.01	0.003	14	<0.02	0.86	0.08
2.90	0.011	<0.1	<0.01	0.003	10	<0.02	0.69	0.06
3.32	0.005	<0.1	0.02	0.002	8	<0.02	0.67	0.05
2.07	0.011	<0.1	<0.01	<0.001	15	<0.02	1.05	0.04
2.60	0.008	<0.1	<0.01	0.003	13	<0.02	0.67	0.05

Cu (0.01 ppm)	Fe (0.001 %)	Ga (0.1 ppm)	Ge (0.01 ppm)	Hf (0.001 ppm)	Hg (1 ppb)	In (0.02 ppm)	K (0.01 %)	La (0.01 ppm)
2.47	0.007	<0.1	<0.01	0.003	7	<0.02	0.47	0.04
2.20	0.008	<0.1	<0.01	0.003	18	<0.02	0.58	0.06
2.32	0.009	<0.1	<0.01	0.006	16	<0.02	0.54	0.06
4.67	0.009	<0.1	<0.01	0.005	18	<0.02	0.47	0.05
2.82	0.013	<0.1	<0.01	0.007	18	<0.02	0.52	0.08
2.52	0.008	<0.1	0.01	0.003	17	<0.02	0.68	0.04
1.90	0.010	<0.1	<0.01	0.003	15	<0.02	0.49	0.04
3.51	0.010	<0.1	<0.01	0.004	19	<0.02	0.63	0.07
3.05	0.010	<0.1	<0.01	0.005	14	<0.02	0.74	0.11
2.75	0.009	<0.1	0.02	0.003	11	<0.02	0.70	0.07
2.36	0.013	<0.1	<0.01	0.003	18	<0.02	0.60	0.07
2.52	0.009	<0.1	<0.01	0.004	16	<0.02	0.57	0.14
3.63	0.010	<0.1	0.02	0.005	15	<0.02	0.67	0.08
2.31	0.004	<0.1	<0.01	0.001	16	<0.02	0.45	0.05
3.55	0.008	<0.1	<0.01	0.004	18	<0.02	0.48	0.05
3.16	0.007	<0.1	<0.01	0.003	12	<0.02	0.63	0.04
2.79	0.010	<0.1	<0.01	0.002	11	<0.02	0.50	0.05
2.06	0.011	<0.1	<0.01	0.005	22	<0.02	0.34	0.06
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
3.85	0.007	<0.1	<0.01	<0.001	12	<0.02	0.72	0.04
2.37	0.011	<0.1	<0.01	0.004	25	<0.02	0.76	0.07
3.57	0.009	<0.1	<0.01	0.004	17	<0.02	0.67	0.07
3.03	0.010	<0.1	<0.01	0.002	21	<0.02	0.74	0.07
1.75	0.013	<0.1	<0.01	0.005	23	<0.02	0.65	0.09
2.12	0.007	<0.1	<0.01	0.002	14	<0.02	0.40	0.05
3.71	0.014	<0.1	<0.01	0.004	20	<0.02	0.63	0.10
3.07	0.010	<0.1	<0.01	0.003	16	<0.02	0.45	0.07
3.45	0.013	<0.1	<0.01	0.002	27	<0.02	0.50	0.08

Li (0.01 ppm)	Mg (0.001 %)	Mn (1 ppm)	Mo (0.01 ppm)	Na (0.001 %)	Nb (0.01 ppm)	Ni (0.01 ppm)	P (0.001 %)	Pb (0.01 ppm)
1.21	0.142	33	0.03	0.562	<0.01	0.3	0.071	0.04
1.28	0.268	43	0.01	0.222	<0.01	0.4	0.032	0.16
2.03	0.160	77	0.04	0.264	<0.01	0.5	0.046	0.08
0.87	0.267	44	0.09	0.278	<0.01	0.5	0.037	0.14
0.56	0.304	58	0.13	0.193	<0.01	0.2	0.036	0.16
2.08	0.185	150	0.02	0.416	<0.01	0.5	0.045	0.07
0.64	0.233	29	0.03	0.392	<0.01	0.4	0.064	0.04
0.34	0.231	25	0.03	0.113	<0.01	0.2	0.024	0.11
1.11	0.350	29	0.05	0.113	<0.01	0.2	0.034	0.11
2.63	0.181	22	0.03	0.260	<0.01	0.2	0.055	0.03
0.81	0.311	56	0.15	0.263	<0.01	0.6	0.046	0.10
1.00	0.233	48	0.14	0.271	<0.01	0.6	0.043	0.15
0.71	0.243	38	0.05	0.209	<0.01	0.6	0.050	0.17
0.71	0.255	33	0.08	0.166	<0.01	0.4	0.051	0.08
1.78	0.338	32	0.07	0.189	<0.01	0.2	0.043	0.10
0.83	0.333	52	0.19	0.146	<0.01	4.2	0.043	0.18
0.99	0.294	31	0.13	0.360	<0.01	0.5	0.055	0.13
0.73	0.320	59	0.04	0.179	<0.01	0.6	0.041	0.14
0.67	0.352	78	0.21	0.303	<0.01	4.5	0.042	0.17
0.55	0.255	25	0.03	0.178	<0.01	0.2	0.037	0.37
0.65	0.226	98	0.03	0.416	<0.01	0.3	0.047	0.06
1.32	0.208	92	0.02	0.379	<0.01	0.8	0.045	0.12
0.95	0.195	84	0.02	0.337	<0.01	0.4	0.054	0.06
0.46	0.393	79	0.05	0.087	<0.01	0.7	0.035	0.15
0.70	0.372	55	0.03	0.244	<0.01	0.4	0.038	0.11
0.31	0.235	41	0.16	0.242	<0.01	0.6	0.041	0.07
0.60	0.405	66	0.08	0.182	<0.01	0.8	0.046	0.12
0.85	0.371	41	0.06	0.264	<0.01	0.7	0.044	0.07
0.45	0.299	30	0.11	0.336	<0.01	0.4	0.042	0.18
1.38	0.225	75	<0.01	0.362	<0.01	0.6	0.041	0.10
1.40	0.187	106	0.02	0.449	<0.01	0.8	0.053	0.03
1.29	0.093	191	<0.01	0.361	<0.01	0.4	0.032	0.08
0.57	0.263	24	0.47	0.265	<0.01	0.8	0.043	0.32
0.29	0.284	37	0.52	0.170	<0.01	0.9	0.060	0.05
0.34	0.277	29	0.06	0.222	<0.01	0.7	0.036	0.13
0.50	0.281	19	0.10	0.373	<0.01	0.3	0.047	0.10
0.18	0.264	36	0.08	0.248	<0.01	0.7	0.051	0.12
0.92	0.254	71	0.06	0.349	<0.01	0.3	0.038	0.09
0.82	0.385	83	0.11	0.116	<0.01	0.5	0.055	0.06
0.27	0.197	50	0.08	0.328	<0.01	0.6	0.041	0.07
0.33	0.301	37	0.07	0.262	<0.01	0.5	0.047	0.08
0.71	0.370	62	0.10	0.041	<0.01	0.2	0.032	0.11
1.21	0.215	100	0.02	0.377	<0.01	0.4	0.052	0.05
0.53	0.281	60	0.05	0.298	<0.01	0.4	0.041	0.15
0.31	0.282	37	0.11	0.502	<0.01	0.4	0.041	0.05

Li (0.01 ppm)	Mg (0.001 %)	Mn (1 ppm)	Mo (0.01 ppm)	Na (0.001 %)	Nb (0.01 ppm)	Ni (0.01 ppm)	P (0.001 %)	Pb (0.01 ppm)
0.25	0.286	60	0.07	0.203	<0.01	0.4	0.037	0.13
0.71	0.346	72	0.08	0.204	<0.01	0.3	0.050	0.12
0.57	0.315	47	0.05	0.203	<0.01	0.5	0.038	0.10
0.85	0.298	41	0.08	0.167	<0.01	0.6	0.042	0.14
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
0.50	0.328	68	0.03	0.139	<0.01	0.2	0.033	0.12
0.79	0.341	30	0.10	0.319	<0.01	0.3	0.038	0.05
0.30	0.197	24	0.04	0.246	<0.01	0.3	0.041	0.08
0.44	0.324	17	0.10	0.169	<0.01	0.3	0.044	0.07
1.70	0.153	46	0.02	0.259	<0.01	0.3	0.039	0.04
2.04	0.260	69	0.03	0.254	<0.01	0.7	0.042	0.06
0.94	0.395	59	0.15	0.283	<0.01	0.6	0.051	0.10
0.69	0.285	37	0.06	0.196	<0.01	0.4	0.048	0.10
0.73	0.226	22	0.10	0.175	<0.01	0.6	0.037	0.11
0.45	0.464	23	0.03	0.246	<0.01	0.7	0.046	0.11
0.84	0.263	22	0.09	0.285	<0.01	0.7	0.040	0.13
1.35	0.181	31	0.03	0.479	<0.01	0.4	0.055	0.05
0.78	0.231	39	0.10	0.271	<0.01	0.5	0.046	0.12
0.90	0.310	40	0.04	0.193	<0.01	1.2	0.045	0.10
0.30	0.301	60	0.03	0.054	<0.01	0.4	0.029	0.11
0.78	0.229	54	0.07	0.199	<0.01	0.3	0.041	0.13
0.71	0.364	40	0.03	0.132	<0.01	0.6	0.038	0.08
0.72	0.367	44	0.20	0.107	<0.01	0.4	0.046	0.14
2.25	0.381	41	0.05	0.113	<0.01	0.4	0.048	0.11
0.48	0.234	54	0.04	0.174	<0.01	0.4	0.047	0.08
0.39	0.327	25	0.26	0.188	<0.01	0.5	0.042	0.15
0.63	0.255	34	0.04	0.147	<0.01	0.3	0.037	0.11
0.80	0.231	136	0.01	0.479	<0.01	0.6	0.054	0.04
0.51	0.203	75	0.02	0.541	<0.01	0.4	0.058	0.03
0.42	0.329	38	0.02	0.091	<0.01	0.9	0.028	0.08
0.40	0.197	47	0.01	0.494	<0.01	0.5	0.056	0.04
0.79	0.130	135	0.02	0.459	<0.01	0.6	0.058	0.03
1.46	0.352	74	0.04	0.141	<0.01	0.8	0.049	0.55
1.02	0.185	42	0.02	0.479	<0.01	0.5	0.065	0.02
0.59	0.230	65	<0.01	0.429	<0.01	0.5	0.053	0.02
0.89	0.308	65	0.05	0.247	<0.01	0.5	0.042	0.10
0.76	0.300	41	0.06	0.195	<0.01	0.7	0.046	0.09
1.63	0.240	160	0.01	0.367	<0.01	0.5	0.049	0.04
1.00	0.188	72	0.02	0.407	<0.01	0.3	0.048	0.02
1.12	0.342	66	0.08	0.151	<0.01	0.4	0.043	0.16
1.10	0.380	60	0.06	0.113	<0.01	0.4	0.046	0.13
1.18	0.403	40	0.08	0.092	<0.01	0.3	0.035	0.09
0.35	0.351	36	0.08	0.134	<0.01	0.7	0.041	0.08
1.25	0.285	42	0.10	0.118	<0.01	0.5	0.047	0.13
0.52	0.324	57	0.13	0.266	<0.01	0.4	0.046	0.10
1.57	0.317	49	0.32	0.243	<0.01	0.7	0.050	0.12
0.34	0.339	49	0.06	0.062	<0.01	0.4	0.028	0.15

Li (0.01 ppm)	Mg (0.001 %)	Mn (1 ppm)	Mo (0.01 ppm)	Na (0.001 %)	Nb (0.01 ppm)	Ni (0.01 ppm)	P (0.001 %)	Pb (0.01 ppm)
1.37	0.289	29	0.13	0.387	<0.01	0.3	0.043	0.09
0.48	0.305	43	0.10	0.210	<0.01	0.4	0.049	0.11
0.66	0.205	64	0.02	0.298	<0.01	0.3	0.041	0.03
0.41	0.171	43	0.05	0.496	<0.01	0.3	0.031	0.31
1.02	0.357	45	0.05	0.203	<0.01	0.8	0.042	0.14
3.94	0.201	229	0.03	0.349	<0.01	0.9	0.038	0.09
0.41	0.251	39	0.11	0.161	<0.01	0.8	0.037	0.11
0.32	0.323	41	0.10	0.097	<0.01	0.3	0.028	0.18
0.55	0.191	34	0.03	0.360	<0.01	0.6	0.053	0.22
0.73	0.259	50	0.07	0.345	<0.01	0.6	0.068	0.24
0.61	0.371	61	0.07	0.209	<0.01	0.9	0.044	0.08
2.31	0.354	61	0.01	0.186	<0.01	0.4	0.039	0.06
3.96	0.136	163	<0.01	0.486	<0.01	1.3	0.049	0.13
0.81	0.338	57	0.13	0.280	<0.01	1.2	0.059	0.15
0.25	0.293	80	0.03	0.172	<0.01	0.7	0.031	0.06
0.53	0.292	75	0.02	0.116	<0.01	1.2	0.039	0.14
0.63	0.237	77	0.04	0.163	<0.01	0.3	0.023	0.09
0.29	0.270	54	0.04	0.239	<0.01	0.4	0.034	0.12
0.31	0.440	103	<0.01	0.140	<0.01	0.4	0.038	0.14
0.68	0.238	75	0.04	0.115	<0.01	1.0	0.051	0.11
0.35	0.352	52	0.05	0.110	<0.01	0.5	0.036	0.27
1.29	0.363	149	0.04	0.073	<0.01	0.8	0.041	0.22
0.62	0.358	38	0.07	0.186	<0.01	0.8	0.044	0.14
0.39	0.308	60	0.05	0.080	<0.01	0.7	0.037	0.10
0.84	0.436	40	0.23	0.143	<0.01	0.6	0.057	0.09
0.51	0.338	36	0.05	0.335	<0.01	0.5	0.047	0.17
0.62	0.290	56	0.12	0.164	<0.01	0.5	0.047	0.09
0.57	0.260	85	0.09	0.230	<0.01	1.4	0.034	0.11
0.88	0.290	40	0.05	0.270	<0.01	0.3	0.034	0.09
0.35	0.238	29	0.06	0.197	0.01	1.2	0.044	0.16
1.45	0.159	55	0.05	0.219	<0.01	0.8	0.032	0.08
0.28	0.328	32	0.15	0.302	<0.01	0.4	0.033	0.09
0.37	0.308	35	0.19	0.369	<0.01	0.8	0.051	0.39
0.33	0.343	33	0.06	0.208	<0.01	0.5	0.036	0.09
1.40	0.396	70	0.11	0.172	<0.01	0.7	0.050	0.13
0.94	0.310	20	0.09	0.341	<0.01	0.5	0.047	0.20
0.78	0.298	39	0.09	0.268	<0.01	0.5	0.045	0.07
0.55	0.301	33	0.11	0.230	<0.01	0.2	0.062	0.09
0.79	0.407	71	0.02	0.076	<0.01	0.3	0.029	0.39
0.59	0.314	52	0.11	0.382	<0.01	0.3	0.044	0.15
1.17	0.423	68	0.16	0.368	<0.01	0.6	0.061	0.46
1.17	0.319	40	0.06	0.172	<0.01	0.3	0.040	0.12
0.36	0.194	61	0.03	0.171	<0.01	0.8	0.041	0.16
0.23	0.193	35	0.10	0.246	<0.01	0.3	0.040	0.28
0.92	0.358	45	0.06	0.119	<0.01	0.5	0.043	0.12
0.39	0.265	33	0.09	0.374	<0.01	0.3	0.046	0.16
0.75	0.289	46	0.01	0.203	<0.01	0.6	0.035	0.12

Li (0.01 ppm)	Mg (0.001 %)	Mn (1 ppm)	Mo (0.01 ppm)	Na (0.001 %)	Nb (0.01 ppm)	Ni (0.01 ppm)	P (0.001 %)	Pb (0.01 ppm)
0.27	0.323	29	0.03	0.221	<0.01	0.6	0.054	0.11
0.76	0.265	43	0.07	0.332	<0.01	0.3	0.049	0.14
0.83	0.401	51	0.05	0.159	<0.01	0.3	0.047	0.14
0.34	0.284	27	0.17	0.165	<0.01	0.5	0.049	0.08
0.52	0.396	35	0.10	0.123	<0.01	0.6	0.047	0.10
0.43	0.326	35	0.07	0.175	<0.01	0.4	0.041	0.04
0.64	0.358	50	0.12	0.115	<0.01	0.4	0.043	0.17
1.05	0.356	55	0.06	0.132	<0.01	0.7	0.039	0.18
0.31	0.297	89	0.04	0.117	<0.01	1.3	0.048	0.15
0.54	0.312	36	0.06	0.208	<0.01	0.5	0.043	0.04
0.49	0.282	41	0.26	0.272	0.01	0.2	0.040	0.09
0.76	0.316	81	0.03	0.291	<0.01	0.5	0.049	0.12
1.64	0.408	45	0.19	0.232	<0.01	0.6	0.059	0.13
0.70	0.193	62	0.04	0.129	<0.01	0.3	0.029	0.09
0.47	0.323	65	0.22	0.149	<0.01	1.4	0.040	0.05
1.12	0.342	52	0.07	0.279	<0.01	0.4	0.043	<0.01
1.05	0.371	29	0.07	0.310	<0.01	0.5	0.043	0.06
0.39	0.425	52	0.13	0.090	<0.01	0.6	0.032	0.15
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
1.11	0.328	46	0.60	0.139	<0.01	1.2	0.041	0.09
0.34	0.250	18	0.10	0.110	<0.01	0.2	0.034	0.14
0.66	0.294	20	0.17	0.202	<0.01	1.1	0.053	0.09
0.71	0.443	49	0.08	0.122	<0.01	0.5	0.067	0.12
0.50	0.281	26	0.12	0.318	<0.01	0.5	0.044	0.11
1.13	0.441	46	0.08	0.195	<0.01	0.4	0.045	0.10
0.45	0.292	46	0.16	0.338	<0.01	1.1	0.048	0.14
0.57	0.276	48	0.04	0.210	<0.01	1.0	0.036	0.11
0.72	0.294	38	0.13	0.399	<0.01	0.9	0.040	0.12

Pd (2 ppb)	Pt (1 ppb)	Rb (0.1 ppm)	Re (1 ppb)	S (0.01 %)	Sb (0.02 ppm)	Sc (0.1 ppm)	Se (0.1 ppm)	Sn (0.02 ppm)	Sr (0.5 ppm)
<2	<1	0.9	2	0.14	<0.02	0.3	0.2	0.03	42.2
<2	<1	0.7	<1	0.16	0.03	0.2	0.6	0.02	31.4
<2	1	0.4	1	0.16	0.03	0.2	0.4	0.04	46.7
<2	<1	1.6	<1	0.13	0.03	0.2	0.4	0.03	93.7
<2	<1	1.0	<1	0.16	0.04	0.1	0.3	0.04	72.9
<2	<1	0.8	4	0.13	0.03	0.2	0.3	0.03	79.7
<2	<1	0.8	<1	0.14	0.02	0.2	0.3	0.03	46.8
<2	<1	0.8	<1	0.12	<0.02	0.2	0.4	0.03	48.6
<2	<1	0.7	<1	0.14	0.03	0.2	0.2	0.03	55.5
<2	<1	0.9	3	0.15	0.03	0.2	0.2	0.03	87.1
<2	<1	1.1	<1	0.16	<0.02	0.1	0.7	0.02	38.7
<2	<1	0.9	<1	0.16	0.04	0.2	0.4	0.04	25.2
<2	<1	0.9	<1	0.17	<0.02	0.2	0.7	0.03	36.8
<2	<1	1.8	<1	0.13	0.02	0.2	0.5	0.03	38.0
<2	<1	0.9	1	0.19	<0.02	0.1	0.5	0.04	52.5
<2	<1	1.8	<1	0.17	<0.02	0.2	0.4	0.04	68.9
<2	<1	1.8	<1	0.16	<0.02	0.2	0.4	0.04	51.8
<2	<1	1.5	<1	0.22	<0.02	0.1	0.3	0.03	132.6
<2	<1	2.1	1	0.20	<0.02	0.2	0.6	0.04	69.2
<2	<1	1.6	<1	0.15	<0.02	0.2	0.3	0.03	78.8
<2	<1	0.7	4	0.14	<0.02	0.2	0.4	<0.02	99.5
<2	<1	0.5	3	0.16	<0.02	0.2	0.2	<0.02	68.8
<2	<1	1.5	2	0.15	<0.02	0.1	0.3	<0.02	69.1
<2	<1	1.3	1	0.17	<0.02	0.1	0.6	<0.02	111.7
<2	<1	1.7	<1	0.20	<0.02	0.2	0.5	<0.02	54.7
<2	<1	1.4	1	0.17	<0.02	0.2	0.3	0.03	64.2
<2	<1	2.4	<1	0.16	<0.02	0.2	0.3	<0.02	57.7
<2	<1	1.7	2	0.19	0.03	0.2	0.6	0.02	63.8
<2	<1	1.1	<1	0.13	<0.02	0.2	0.2	<0.02	43.9
<2	<1	0.4	3	0.17	<0.02	0.2	0.3	<0.02	70.6
<2	<1	1.2	2	0.15	<0.02	0.2	0.3	<0.02	93.3
<2	<1	0.4	4	0.20	<0.02	0.3	0.4	<0.02	43.3
<2	<1	1.2	<1	0.15	<0.02	0.2	0.3	0.02	41.0
<2	<1	1.2	<1	0.19	<0.02	0.2	0.5	<0.02	42.3
<2	<1	1.5	<1	0.13	<0.02	0.2	0.3	0.03	41.1
<2	<1	1.6	<1	0.20	<0.02	0.2	0.6	0.03	32.3
<2	<1	1.1	<1	0.23	<0.02	0.1	0.4	0.03	56.3
<2	<1	0.6	<1	0.12	<0.02	0.2	0.3	0.03	45.2
<2	<1	1.9	<1	0.19	<0.02	0.2	0.3	<0.02	84.4
<2	<1	1.6	<1	0.16	<0.02	0.2	0.5	0.02	33.4
<2	<1	1.0	<1	0.19	<0.02	0.2	0.6	0.03	40.9
<2	<1	0.8	<1	0.18	<0.02	0.2	0.6	<0.02	107.7
<2	<1	1.2	1	0.20	<0.02	0.2	0.6	<0.02	83.8
<2	<1	1.3	<1	0.17	<0.02	0.3	0.7	0.03	52.5
<2	<1	2.5	<1	0.15	<0.02	0.4	0.6	0.02	75.4

Pd (2 ppb)	Pt (1 ppb)	Rb (0.1 ppm)	Re (1 ppb)	S (0.01 %)	Sb (0.02 ppm)	Sc (0.1 ppm)	Se (0.1 ppm)	Sn (0.02 ppm)	Sr (0.5 ppm)
<2	<1	1.7	<1	0.18	<0.02	0.2	0.6	<0.02	85.6
<2	<1	1.7	<1	0.20	<0.02	0.2	1.1	0.03	68.6
<2	<1	1.0	<1	0.18	<0.02	0.2	0.6	0.02	97.9
<2	<1	2.1	<1	0.19	<0.02	0.2	0.7	0.03	101.1
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
<2	<1	1.0	<1	0.11	0.02	0.2	0.7	0.04	42.9
<2	<1	1.1	<1	0.11	0.03	0.3	0.5	0.03	59.0
<2	<1	1.7	<1	0.12	0.03	0.1	0.7	0.03	48.3
<2	<1	1.1	<1	0.16	0.03	0.2	1.0	0.03	64.3
<2	<1	0.4	3	0.12	<0.02	0.3	0.3	0.04	58.6
<2	<1	0.6	1	0.12	<0.02	0.2	0.3	0.03	149.5
<2	<1	1.5	<1	0.14	<0.02	0.2	0.4	0.02	66.8
<2	<1	1.6	1	0.15	<0.02	0.2	0.4	0.03	29.6
<2	<1	1.1	<1	0.14	0.03	0.2	0.4	0.03	49.6
<2	<1	1.3	<1	0.16	<0.02	0.1	0.5	0.02	86.1
<2	<1	1.1	<1	0.14	0.03	0.2	0.5	0.04	48.6
<2	<1	1.6	<1	0.13	<0.02	0.2	0.4	0.03	69.5
<2	<1	1.9	<1	0.14	<0.02	0.2	0.4	0.03	39.0
<2	<1	1.2	<1	0.14	<0.02	0.3	0.4	0.02	38.3
<2	<1	0.9	<1	0.10	<0.02	0.2	0.6	0.02	51.6
<2	<1	1.4	1	0.12	<0.02	0.2	0.5	0.03	54.9
<2	<1	1.2	<1	0.12	<0.02	0.3	0.3	<0.02	36.6
<2	<1	1.1	<1	0.13	<0.02	0.1	0.4	<0.02	65.8
<2	<1	1.4	2	0.14	<0.02	0.2	0.5	0.03	48.0
<2	<1	2.3	<1	0.12	<0.02	0.1	0.3	0.03	28.1
<2	<1	1.0	<1	0.11	<0.02	0.2	0.5	<0.02	33.7
<2	<1	0.9	<1	0.13	0.02	0.2	0.3	0.04	60.7
<2	<1	2.7	<1	0.11	<0.02	0.2	0.2	0.03	99.0
<2	<1	1.7	2	0.10	<0.02	0.2	0.4	0.04	58.1
<2	<1	0.6	<1	0.11	0.02	0.2	0.3	0.03	35.9
<2	<1	1.3	<1	0.10	<0.02	0.2	0.2	0.03	39.3
<2	<1	1.1	<1	0.13	<0.02	0.3	0.3	0.02	55.3
<2	<1	1.8	2	0.21	0.02	0.2	0.4	0.03	77.5
<2	<1	1.8	1	0.13	0.03	0.3	0.4	0.06	36.3
<2	<1	1.3	2	0.13	<0.02	0.3	0.2	0.03	49.8
<2	<1	1.1	<1	0.14	0.03	0.2	0.5	0.03	63.6
<2	<1	0.9	<1	0.17	0.03	0.2	0.5	0.03	103.5
<2	<1	1.2	3	0.13	<0.02	0.3	0.4	0.03	119.7
<2	<1	0.8	2	0.12	<0.02	0.2	0.4	<0.02	47.3
<2	<1	1.6	<1	0.16	0.03	0.2	0.4	0.03	95.9
<2	<1	2.2	<1	0.15	<0.02	0.1	0.4	<0.02	73.5
<2	<1	1.6	<1	0.11	<0.02	0.3	0.4	0.02	90.5
<2	<1	1.5	<1	0.13	0.02	0.2	0.2	<0.02	39.8
<2	<1	2.0	<1	0.14	<0.02	0.1	0.3	0.02	113.5
<2	<1	2.0	<1	0.15	0.02	0.2	0.4	<0.02	61.7
<2	<1	1.3	<1	0.12	<0.02	0.1	0.3	<0.02	60.4
<2	<1	1.0	<1	0.09	<0.02	0.2	0.3	<0.02	113.3

Pd (2 ppb)	Pt (1 ppb)	Rb (0.1 ppm)	Re (1 ppb)	S (0.01 %)	Sb (0.02 ppm)	Sc (0.1 ppm)	Se (0.1 ppm)	Sn (0.02 ppm)	Sr (0.5 ppm)
<2	<1	1.6	<1	0.13	<0.02	0.2	0.5	0.02	54.0
<2	<1	1.7	<1	0.13	0.02	0.2	0.4	0.03	52.9
<2	<1	0.7	<1	0.11	<0.02	<0.1	0.2	0.02	129.7
<2	<1	1.2	<1	0.12	<0.02	0.2	0.4	0.03	47.6
<2	<1	1.3	<1	0.12	<0.02	0.1	0.4	0.02	38.3
<2	<1	0.8	<1	0.15	<0.02	0.2	0.4	<0.02	107.6
<2	<1	1.0	<1	0.15	<0.02	0.2	0.4	<0.02	87.8
<2	<1	1.1	<1	0.13	<0.02	0.2	0.9	0.02	46.1
<2	<1	1.6	<1	0.13	<0.02	0.1	0.5	0.04	41.8
<2	<1	1.9	<1	0.16	0.03	0.2	0.5	0.03	54.0
<2	1	1.4	<1	0.14	<0.02	0.2	0.4	<0.02	89.8
<2	<1	0.6	4	0.15	<0.02	0.2	0.3	<0.02	145.2
<2	<1	1.0	2	0.17	<0.02	0.3	0.4	<0.02	95.0
<2	<1	3.5	<1	0.17	<0.02	0.2	0.5	<0.02	107.7
<2	<1	1.5	<1	0.13	<0.02	0.2	0.3	0.03	100.9
<2	<1	1.9	<1	0.18	<0.02	0.2	0.3	<0.02	67.6
<2	<1	0.9	<1	0.13	<0.02	0.2	0.3	0.03	28.0
<2	<1	1.2	<1	0.17	<0.02	0.1	0.7	<0.02	72.7
<2	<1	1.3	<1	0.15	<0.02	0.2	0.6	<0.02	92.9
<2	<1	2.1	<1	0.19	<0.02	0.1	0.5	<0.02	70.2
<2	<1	0.8	<1	0.18	<0.02	0.2	0.7	0.04	55.8
<2	<1	1.7	<1	0.21	<0.02	0.2	0.3	<0.02	71.2
<2	<1	1.6	<1	0.19	<0.02	0.2	0.3	0.03	85.1
<2	<1	1.0	<1	0.20	0.02	0.2	0.3	0.02	60.2
<2	<1	1.8	1	0.19	<0.02	0.2	0.6	<0.02	112.7
<2	<1	1.2	<1	0.22	<0.02	0.3	0.2	0.02	54.5
<2	<1	2.1	<1	0.15	<0.02	0.3	0.4	<0.02	64.7
<2	<1	0.8	<1	0.17	<0.02	0.1	0.4	0.03	65.3
<2	<1	1.4	<1	0.18	<0.02	0.3	0.4	0.05	56.0
<2	<1	1.4	<1	0.15	<0.02	0.2	0.3	<0.02	40.7
<2	<1	0.5	1	0.19	<0.02	0.5	0.5	<0.02	56.9
<2	<1	1.1	<1	0.13	<0.02	0.3	0.3	<0.02	40.8
<2	<1	1.3	<1	0.19	<0.02	0.3	0.6	<0.02	60.6
<2	<1	0.9	<1	0.15	0.03	0.3	0.4	0.03	61.5
<2	<1	1.5	<1	0.16	<0.02	0.2	0.5	<0.02	57.7
<2	<1	1.9	<1	0.13	0.02	0.2	0.4	<0.02	58.6
<2	<1	1.5	<1	0.18	<0.02	0.2	0.2	0.02	41.5
<2	<1	2.7	<1	0.16	<0.02	0.2	0.5	<0.02	44.8
<2	<1	1.1	<1	0.15	<0.02	0.2	0.7	<0.02	89.5
<2	<1	1.3	<1	0.16	<0.02	0.3	0.5	<0.02	42.0
<2	<1	2.2	<1	0.21	<0.02	0.2	0.5	<0.02	66.5
<2	<1	0.9	<1	0.15	<0.02	0.3	0.5	<0.02	60.7
<2	<1	1.9	1	0.17	<0.02	0.2	0.4	<0.02	50.5
<2	<1	1.3	<1	0.16	<0.02	0.3	0.4	<0.02	31.5
<2	<1	1.5	<1	0.20	<0.02	0.4	0.6	<0.02	93.0
<2	<1	2.2	<1	0.18	<0.02	0.2	0.6	0.02	55.1
<2	<1	1.4	<1	0.15	<0.02	0.3	0.3	<0.02	42.6

Pd (2 ppb)	Pt (1 ppb)	Rb (0.1 ppm)	Re (1 ppb)	S (0.01 %)	Sb (0.02 ppm)	Sc (0.1 ppm)	Se (0.1 ppm)	Sn (0.02 ppm)	Sr (0.5 ppm)
<2	<1	0.8	<1	0.20	<0.02	0.4	0.5	<0.02	38.8
<2	<1	1.0	2	0.23	<0.02	0.3	0.6	0.03	75.1
<2	<1	1.0	2	0.22	<0.02	0.3	0.5	<0.02	42.4
<2	<1	1.1	<1	0.24	0.02	0.4	0.5	<0.02	73.2
<2	<1	1.1	1	0.24	<0.02	0.3	0.4	<0.02	89.8
<2	<1	1.3	<1	0.17	0.02	0.2	0.5	0.04	51.7
<2	<1	0.8	<1	0.21	<0.02	0.3	0.6	<0.02	80.9
<2	<1	1.2	<1	0.19	<0.02	0.2	0.5	<0.02	78.7
<2	<1	2.4	<1	0.22	<0.02	0.2	0.2	<0.02	51.5
<2	<1	1.7	<1	0.18	<0.02	0.2	0.8	0.02	90.3
<2	<1	1.7	2	0.22	<0.02	0.3	0.5	<0.02	55.6
<2	<1	2.2	<1	0.22	<0.02	0.2	0.6	<0.02	79.4
<2	<1	1.4	1	0.23	<0.02	0.3	0.7	0.02	74.1
<2	<1	1.1	<1	0.16	<0.02	0.3	0.9	<0.02	25.5
<2	<1	0.7	<1	0.22	<0.02	0.3	0.4	0.03	58.2
<2	<1	1.5	<1	0.22	<0.02	0.3	0.4	<0.02	55.6
<2	<1	1.7	<1	0.13	0.03	0.2	0.4	0.03	53.1
<2	<1	0.6	<1	0.15	<0.02	0.2	0.4	0.03	66.7
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
<2	<1	0.9	<1	0.16	<0.02	0.3	0.4	0.02	47.3
<2	<1	1.6	<1	0.13	0.02	0.2	0.5	0.03	55.4
<2	<1	1.5	<1	0.12	<0.02	0.2	0.4	0.05	38.1
<2	<1	1.5	<1	0.19	0.02	0.2	0.4	0.03	100.3
<2	<1	1.6	<1	0.14	0.02	0.3	0.4	0.03	31.9
<2	<1	0.9	2	0.16	<0.02	0.1	0.4	0.02	89.8
<2	<1	1.6	<1	0.13	<0.02	0.2	0.4	0.03	93.5
<2	<1	1.0	2	0.17	<0.02	0.1	0.3	0.02	84.7
<2	<1	1.0	<1	0.20	<0.02	0.2	0.3	<0.02	53.9

Ta (0.001 ppm)	Te (0.02 ppm)	Th (0.01 ppm)	Ti (1 ppm)	Tl (0.02 ppm)	U (0.01 ppm)	V (2 ppm)	W (0.1 ppm)
<0.001	<0.02	<0.01	3	<0.02	0.04	<2	<0.1
<0.001	<0.02	0.03	3	<0.02	0.02	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.12	<2	<0.1
<0.001	<0.02	0.03	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.05	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.04	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	8	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.11	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.03	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.02	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	0.02	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.03	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.03	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.10	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	4	<0.02	0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.05	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.05	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1

Ta (0.001 ppm)	Te (0.02 ppm)	Th (0.01 ppm)	Ti (1 ppm)	Tl (0.02 ppm)	U (0.01 ppm)	V (2 ppm)	W (0.1 ppm)
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
<0.001	<0.02	0.02	3	<0.02	0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.06	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.06	<2	<0.1
<0.001	<0.02	0.01	4	<0.02	0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	4	<0.02	0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	4	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.01	<2	<0.1
<0.001	<0.02	0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.03	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.02	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	0.04	<2	<0.1
<0.001	<0.02	0.02	4	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1

Ta (0.001 ppm)	Te (0.02 ppm)	Th (0.01 ppm)	Ti (1 ppm)	Tl (0.02 ppm)	U (0.01 ppm)	V (2 ppm)	W (0.1 ppm)
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.02	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.17	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	4	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.10	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	0.06	<2	<0.1
<0.001	<0.02	0.01	4	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	2	<0.02	0.02	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.04	0.02	4	<0.02	<0.01	<2	<0.1
<0.001	0.03	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.01	4	<0.02	<0.01	<2	<0.1
0.001	0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	0.04	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.02	<0.01	4	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	2	<0.1
0.001	0.04	<0.01	4	<0.02	<0.01	<2	<0.1
<0.001	0.04	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	2	<0.1

Ta (0.001 ppm)	Te (0.02 ppm)	Th (0.01 ppm)	Ti (1 ppm)	Tl (0.02 ppm)	U (0.01 ppm)	V (2 ppm)	W (0.1 ppm)
<0.001	<0.02	<0.01	3	<0.02	<0.01	2	<0.1
<0.001	0.03	0.01	4	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.02	4	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	0.04	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.04	0.01	4	<0.02	<0.01	<2	<0.1
<0.001	0.02	<0.01	2	<0.02	<0.01	<2	<0.1
<0.001	0.03	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	0.03	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	2	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	<0.01	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.03	4	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1
<0.001	<0.02	0.02	3	<0.02	<0.01	<2	<0.1

Y (0.001 ppm)	Zn (0.1 ppm)	Zr (0.01 ppm)
0.045	9.9	0.03
0.073	8.1	0.12
0.080	12.7	0.05
0.061	10.1	0.13
0.056	9.8	0.10
0.108	17.6	0.04
0.032	8.3	0.03
0.038	5.5	0.05
0.053	7.9	0.07
0.104	8.9	0.03
0.114	13.4	0.06
0.058	9.0	0.14
0.064	13.9	0.10
0.039	10.7	0.09
0.056	6.0	0.04
0.042	7.0	0.08
0.049	12.8	0.08
0.071	10.4	0.07
0.053	16.4	0.07
0.087	15.7	0.09
0.055	19.4	0.03
0.126	13.5	0.04
0.076	17.6	0.03
0.050	10.1	0.08
0.071	15.7	0.08
0.043	10.1	0.06
0.045	12.5	0.05
0.032	12.4	0.04
0.046	10.6	0.08
0.084	15.6	0.04
0.047	14.0	0.02
0.048	13.9	0.03
0.030	8.7	0.04
0.020	14.4	0.03
0.040	11.5	0.09
0.048	7.9	0.12
0.052	17.2	0.08
0.026	8.7	0.02
0.036	10.5	0.04
0.040	22.4	0.04
0.034	10.6	0.06
0.067	7.2	0.06
0.138	13.4	0.02
0.051	9.1	0.07
0.034	10.3	0.05

Y (0.001 ppm)	**Zn (0.1 ppm)**	**Zr (0.01 ppm)**
0.055	10.3	0.06
0.061	14.8	0.08
0.043	13.2	0.07
0.044	15.5	0.06
L.N.R.	L.N.R.	L.N.R.
0.061	20.1	0.06
0.025	12.4	0.04
0.035	12.5	0.05
0.031	10.5	0.05
0.091	16.3	0.03
0.206	14.9	0.03
0.072	18.7	0.07
0.044	14.8	0.05
0.056	12.9	0.07
0.067	14.8	0.08
0.056	7.8	0.07
0.066	15.4	0.02
0.044	7.8	0.07
0.061	14.3	0.06
0.059	23.6	0.08
0.052	11.6	0.08
0.038	20.1	0.04
0.046	11.4	0.05
0.057	9.5	0.06
0.050	25.5	0.06
0.063	14.6	0.10
0.056	9.1	0.08
0.047	13.2	0.03
0.026	15.6	0.02
0.042	13.4	0.05
0.023	9.9	0.02
0.028	16.2	0.02
0.069	11.6	0.05
0.068	9.7	0.03
0.028	15.2	0.03
0.058	17.8	0.06
0.041	14.8	0.06
0.121	17.4	0.03
0.039	13.9	0.03
0.084	9.6	0.10
0.051	15.8	0.05
0.092	7.5	0.10
0.037	8.4	0.06
0.045	10.7	0.05
0.064	22.6	0.08
0.062	10.0	0.10
0.085	9.0	0.04

Y (0.001 ppm)	Zn (0.1 ppm)	Zr (0.01 ppm)
0.047	11.2	0.07
0.034	14.3	0.05
0.020	17.1	0.02
0.071	16.4	0.09
0.038	10.4	0.05
0.136	10.9	0.04
0.048	10.2	0.07
0.056	11.5	0.07
0.037	14.1	0.06
0.058	23.7	0.07
0.035	15.5	0.06
0.203	17.2	0.03
0.312	15.8	0.04
0.060	19.4	0.07
0.079	29.6	0.04
0.087	18.6	0.05
0.148	13.6	0.05
0.065	20.4	0.06
0.158	8.5	0.04
0.060	14.4	0.04
0.057	13.6	0.08
0.124	28.3	0.07
0.060	19.3	0.07
0.071	12.1	0.05
0.043	23.6	0.04
0.058	18.9	0.10
0.048	12.6	0.07
0.082	14.8	0.04
0.047	20.4	0.05
0.043	18.3	0.08
0.071	10.2	0.04
0.035	8.2	0.06
0.074	9.6	0.08
0.038	9.9	0.05
0.047	9.7	0.05
0.066	9.3	0.08
0.028	12.1	0.04
0.034	15.5	0.05
0.098	15.7	0.07
0.039	20.8	0.07
0.059	12.5	0.04
0.053	6.3	0.06
0.049	8.7	0.05
0.047	23.5	0.06
0.042	16.7	0.05
0.034	8.0	0.05
0.033	19.0	0.06

Y (0.001 ppm)	Zn (0.1 ppm)	Zr (0.01 ppm)
0.025	10.7	0.03
0.042	11.4	0.09
0.040	11.3	0.07
0.039	8.7	0.05
0.062	13.8	0.08
0.025	13.2	0.04
0.036	8.0	0.06
0.058	11.5	0.09
0.088	24.9	0.07
0.032	7.8	0.05
0.051	11.7	0.07
0.083	16.5	0.07
0.064	11.9	0.07
0.034	22.0	0.03
0.034	7.1	0.06
0.029	12.6	0.06
0.040	10.1	0.05
0.048	17.7	0.07
L.N.R.	L.N.R.	L.N.R.
0.029	10.0	0.04
0.056	11.2	0.08
0.049	12.1	0.06
0.052	19.7	0.06
0.059	11.6	0.10
0.034	11.3	0.05
0.067	12.8	0.11
0.056	11.7	0.07
0.063	16.3	0.10

APPENDIX 12.2

	Au (0.2 ppm	*Ag (2 ppb)*	*b (0.01 ppm*	*n (0.1 ppm*	*b (0.02 ppm*	*e (0.01 ppm*	*s (0.1 ppm*	*Hg (1 ppb)*
Au (0.2 pp	1							
Ag (2 ppb)	0.066038	1						
Pb (0.01 p	0.042558	-0.01586	1					
Zn (0.1 pp	-0.02099	-0.01786	0.018882	1				
Sb (0.02 p	0.040569	0.010901	-0.04581	-0.15901	1			
Ce (0.01 p	0.227104	0.043375	0.217697	0.157056	-0.08458	1		
As (0.1 pp	0.004804	0.037054	-0.05917	-0.11172	0.190014	-0.0296	1	
Hg (1 ppb)	0.18075	0.013609	0.094076	0.066821	0.067372	0.448983	-0.03231	1
Cu (0.01 p	-0.03415	-0.06707	-0.13413	0.132141	0.021921	-0.03564	-0.02717	-0.15165
Ca (0.01 %)	-0.10583	0.127961	0.193223	0.015049	0.008861	0.241367	0.122587	0.128545
U (0.01 pp	0.23718	-0.03607	-0.22705	-0.01657	0.050739	0.230201	0.034218	0.407246
Fe (0.001	-0.04837	0.076624	0.452398	-0.0429	0.044304	0.120682	-0.00767	0.135058
Al (0.1 %)	-0.0228	0.062677	0.284882	-0.00781	0.087066	0.335351	0.057671	0.463124

u (0.01 ppm	*Ca (0.01 %)*	*(0.01 ppm*	*e (0.001 %*	*Al (0.1 %)*
1				
-0.07634	1			
0.31875	-0.1765	1		
-0.33881	0.248089	-0.41365	1	
-0.12695	0.130114	0.093945	0.60981	1