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PROGRESS STATEMENT FOR THE KALGOORLIE STUDY AREA - ARGO DEPOSIT, WESTERN AUSTRALIA

M.J. Lintern and D.J. Gray

CRC LEME OPEN FILE REPORT 98

May 2001

(CSIRO Division of Exploration and Mining Report 96R, 1995.
2nd Impression 2001.)

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RESEARCH ARISING FROM CSIRO/AMIRA YILGARN REGOLITH GEOCHEMISTRY PROJECTS 1987-1996

In 1987, CSIRO commenced a series of multi-client research projects in regolith geology and geochemistry which were sponsored by companies in the Australian mining industry, through the Australian Mineral Industries Research Association Limited (AMIRA). The initial research program, "Exploration for concealed gold deposits, Yilgarn Block, Western Australia" had the aim of developing improved geological, geochemical and geophysical methods for mineral exploration that would facilitate the location of blind, buried or deeply weathered gold deposits. The program commenced with the following projects:

P240: Laterite geochemistry for detecting concealed mineral deposits (1987-1991). Leader: Dr R.E. Smith.
Its scope was development of methods for sampling and interpretation of multi-element laterite geochemistry data and application of multi-element techniques to gold and polymetallic mineral exploration in weathered terrain. The project emphasised viewing laterite geochemical dispersion patterns in their regolith-landform context at local and district scales. It was supported by 30 companies.

P241: Gold and associated elements in the regolith - dispersion processes and implications for exploration (1987-1991). Leader: Dr C.R.M. Butt.

The project investigated the distribution of ore and indicator elements in the regolith. It included studies of the mineralogical and geochemical characteristics of weathered ore deposits and wall rocks, and the chemical controls on element dispersion and concentration during regolith evolution. This was to increase the effectiveness of geochemical exploration in weathered terrain through improved understanding of weathering processes. It was supported by 26 companies.

These projects represented 'an opportunity for the mineral industry to participate in a multi-disciplinary program of geoscience research aimed at developing new geological, geochemical and geophysical methods for exploration in deeply weathered Archaean terrains'. This initiative recognised the unique opportunities, created by exploration and open-cut mining, to conduct detailed studies of the weathered zone, with particular emphasis on the near-surface expression of gold mineralisation. The skills of existing and specially recruited research staff from the Floreat Park and North Ryde laboratories (of the then Divisions of Minerals and Geochemistry, and Mineral Physics and Mineralogy, subsequently Exploration Geoscience and later Exploration and Mining) were integrated to form a task force with expertise in geology, mineralogy, geochemistry and geophysics. Several staff participated in more than one project. Following completion of the original projects, two continuation projects were developed.

P240A: Geochemical exploration in complex lateritic environments of the Yilgarn Craton, Western Australia (1991-1993). Leaders: Drs R.E. Smith and R.R. Anand.

The approach of viewing geochemical dispersion within a well-controlled and well-understood regolith-landform and bedrock framework at detailed and district scales continued. In this extension, focus was particularly on areas of transported cover and on more complex lateritic environments typified by the Kalgoorlie regional study. This was supported by 17 companies.

P241A: Gold and associated elements in the regolith - dispersion processes and implications for exploration (1991-1993). Leader: Dr. C.R.M. Butt.

The significance of gold mobilisation under present-day conditions, particularly the important relationship with pedogenic carbonate, was investigated further. In addition, attention was focussed on the recognition of primary lithologies from their weathered equivalents. This project was supported by 14 companies.

Most reports related to the above research projects were published as CRC LEME Open File Reports Series (Nos 1-74), with an index (Report 75), by June 1999. Publication now continues with release of reports from further projects.

P252: Geochemical exploration for platinum group elements in weathered terrain. Leader: Dr C.R.M. Butt.

This project was designed to gather information on the geochemical behaviour of the platinum group elements under weathering conditions using both laboratory and field studies, to determine their dispersion in the regolith and to apply this to concepts for use in exploration. The research was commenced in 1988 by CSIRO Exploration Geoscience and the University of Wales (Cardiff). The Final Report was completed in December 1992. It was supported by 9 companies.

P409: Geochemical exploration in areas of transported overburden, Yilgarn Craton and environs, WA.

Leaders: Drs C.R.M. Butt and R.E. Smith.

About 50% or more of prospective terrain in the Yilgarn is obscured by substantial thicknesses of transported overburden that varies in age from Permian to Recent. Some of this cover has undergone substantial weathering. Exploration problems in these covered areas were the focus of Project 409. The research was commenced in June 1993 by CSIRO Exploration and Mining but was subsequently incorporated into the activities of CRC LEME in July 1995 and was concluded in July 1996. It was supported by 22 companies.

Although the confidentiality periods of Projects P252 and P409 expired in 1994 and 1998, respectively, the reports have not been released previously. CRC LEME acknowledges the Australian Mineral Industries Research Association and CSIRO Division of Exploration and Mining for authority to publish these reports. It is intended that publication of the reports will be a substantial additional factor in transferring technology to aid the Australian mineral industry.

This report (CRC LEME Open File Report 98) is a second impression (second printing) of CSIRO, Division of Exploration and Mining Restricted Report 96R, first issued in 1995, which formed part of the CSIRO/AMIRA Project P409.

Copies of this publication can be obtained from:

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PREFACE

The CSIRO-AMIRA Project "Exploration in Areas of Transported Overburden, Yilgarn Craton and Environs" (Project 409) has, as its principal objective, development of geochemical methods for mineral exploration in areas with substantial transported overburden, through investigations of the processes of geochemical dispersion from concealed mineralization. The Project has two main themes. One of these, '*Surface and subsurface expression of concealed mineral deposits*' is addressed by this report, which focuses on the hydrogeochemistry, biogeochemistry, soil and regolith geochemistry of the Argo district.

This progress statement summarizes the recent investigations undertaken at the Argo deposit. There were many reasons for selecting Argo for further study, these include: high grade Au mineralization, the variation in the depth of cover from about 10 m to several tens of metres, the remoteness of the deposit from potential contributing upstream sources and the future exposure of the mining pit, allowing sampling from, and examination of, the pit wall.

This is one of a number of similar studies in the Kalgoorlie-Kambalda region investigating whether there is a surface geochemical expression to gold mineralization concealed within or beneath sediments in palaeodrainages. Other sites that are, or have been, studied are Zuleika Sands (Ora Banda), Mulgarrie, Panglo (southern extension), Baseline, Lady Bountiful Extension, Kanowna QED, Kurnalpi, Enigma (Wollubar) and Steinway.

C.R.M. Butt
R.E. Smith

Project Leaders

January 1995

PROGRESS STATEMENT FOR THE KALGOORLIE STUDY AREA - ARGO DEPOSIT, WESTERN AUSTRALIA.

M.J. Lintern and D.J. Gray

SUMMARY

Investigations from previous AMIRA Projects have indicated that Au deposits may have geochemical expression throughout the regolith. In Project 409, knowledge gained from these earlier projects, dominantly in areas of erosional and relict landforms, is being extended to determine whether previously developed methods can be applied or adapted to depositional regimes. In the Kalgoorlie area, the work programme has been to investigate potential sample media in the transported regolith above mineralization at a number of dominantly palaeochannel environments. Specifically, the study has investigated the presence of:

- (i) Gold in surficial horizons;
- (ii) Sub-surface gold in transported overburden;
- (iii) Pathfinder elements in transported and relict regolith and bedrock.

This progress statement summarizes the recent investigations undertaken at the Argo gold deposit (Western Mining Company Ltd) located 25 km south of Kambalda. The Argo site was chosen for further study for many reasons including the high grade Au mineralization, the variation in the depth of cover from about 10 m to several tens of metres, the remoteness of the deposit from potential contributing upstream sources and the future exposure of the mining pit, allowing sampling from, and examination of, the pit wall.

The results indicate:

1. Soil gold values are generally low (mean <10 ppb) with anomalous gold contents (>15 ppb) located 200m from mineralization.
2. Total, water- and iodide-soluble gold values are not anomalous over mineralization.
3. Gold is associated with the distribution of soil moisture in the top metre of the profile.
4. Gold is associated with calcium in the top metre of the soil profile.
5. Gold in vegetation does not locate mineralization.
6. Gold is present in groundwaters over mineralization.
7. Tungsten, in a variety of sample media (samples from the transported overburden, saprolite, bedrock) appears to be a pathfinder for gold mineralization.
8. Lignitic material appears to scavenge gold and is a useful sample medium in the transported overburden.

More information needs to be gathered from the Argo area. Specifically, there is a need:

1. to extend the auger line(s) to the west and east to establish true background concentrations. Soil pits may be required to examine the gold distribution in detail. Furthermore, by extending to the east, the high proportion of water extractable gold (relative to total gold) can be investigated.
2. to construct a regolith map to put the study site in the context of the surrounding landforms. The results suggest that there may be anomalous gold concentrations in a clay pan adjacent to the Argo deposit.
3. to determine the significance of the anomalous total gold results from the auger traverse on 525800N by examining and sampling a soil profile(s).
4. to analyse lignite from the transported overburden for gold to determine its significance as a sample medium for gold exploration in this district.
5. to examine the potential of tungsten as a pathfinder for gold mineralization.

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PROGRESS STATEMENT FOR THE KALGOORLIE STUDY AREA - ARGO DEPOSIT, WESTERN AUSTRALIA.

M.J. Lintern and D.J. Gray

1 Introduction

Previous AMIRA Projects (P240, P240A, P241, P241A) investigated the geochemical expression of primary and supergene Au mineralization in the regolith. These studies demonstrated that in relict and erosional landform regimes, carefully directed shallow sampling is usually more cost and technically effective than routine drilling to deep saprolite in regional- and prospect-scale exploration. In some locations, it was found that there was a surface expression and mineralization concealed by up to 20m of barren sediments and/or leached saprolite. In this project (P409), outcome of the previous projects are being further tested to determine whether similar procedures can be routinely applied in depositional regimes. This particular study is one of a series from the Kalgoorlie area, selected because of its high resource potential and the ubiquitous nature of near-surface carbonate and ferruginous material, that specifically examines sample media from the transported regolith to assess their potential for exploration. A multi-site approach has been adopted in order to examine (i) the effects of regolith types, and (ii) the potential to use similar sample media at different sites.

Two groups of sample media have particular value for Au exploration in the Yilgarn Craton:

- (i) calcareous soil horizons, which are widespread in the semi-arid parts of the southern Yilgarn. Gold concentrations are often much greater in pedogenic carbonate, compared with immediately adjacent horizons. Failure to sample this horizon in an exploration programme will result in ineffective soil surveys;
- (ii) ferruginous materials, particularly lateritic residuum.

In the Kalgoorlie area, the work programme has been to investigate potential sample media in the transported regolith above mineralization. Specifically the study analysed for:

- (i) gold in surface horizons;
- (ii) gold below surface in transported overburden;
- (iii) pathfinder elements in transported and residual regolith and bedrock.

Several sites were offered by P409 sponsor companies for pilot studies (Table 1). All sites were visited and a preliminary set of samples was taken at most locations. Sites were assessed using various criteria (see Table 1) and the four most suitable sites, namely Argo, Steinway, Kurnalpi and Wollubar, were selected for more detailed investigations of the geochemistry of regolith materials, vegetation and groundwater (Figure 1). Some investigations of transported environments that were undertaken in previous studies (*e.g.*, at the Panglo and Zuleika Au deposits) will be also be discussed.

There were several reasons for selecting Argo for further study, these include: high grade Au mineralization, the variation in the depth of cover from about 10 m to several tens of metres, the remoteness of the deposit from potential contributing upstream sources and the future exposure of the pit, allowing sampling from, and examination of, the pit wall.

This progress statement summarizes investigations of groundwaters, vegetation, regolith and bedrock material. In addition funds were provided to assist studies of the stratigraphy and Au mineralization of the palaeochannel south of the Argo pit by Nicola Woolrich as part of an Honours thesis at Curtin University, December, 1994. The results of that work will be issued separately.

Table 1: Advantages and disadvantages of study sites examined during the P409 pilot study and previous AMIRA projects.

Site	Type of mineralization	Advantages	Disadvantages
Sites chosen			
Argo	At interface and saprolite, beneath 20 m or more of lacustrine sediments.	Extensive drilling available. Strong mineralization. Exposed pit. Distant from upslope Au deposit.	Surficial sampling not completed, due to pit excavation. Poor condition of drill material in top 10 m.
Steinway	In saprolite, 5 m beneath 30 m of transported sediments.	Known surficial anomaly. Extensive drilling available. Distant from known Au min.	Not scheduled to be mined. Weak mineralization.
Kurnalpi	At interface and saprolite, beneath 60 m of transported sediments.	Moderate drilling available. Distant from known Au min.	Not scheduled to be mined. Weak mineralization.
Wollubar (Enigma)	At interface and saprolite, beneath 55 m of transported sediments.	Moderate drilling available. Distant from upslope Au deposit.	Not scheduled to be mined. Weak mineralization.
Sites not chosen			
Kurrawang	Little information available.	Known surficial anomaly. Exposed pit (at a later stage).	Surface regolith mostly residual. Little drill spoil.
Lake Cowan	Various deposits associated with palaeochannel and underlying saprolite.	Known surficial anomaly. Extensive drilling available.	Known upslope mineralization.
Kat Gap (Forrestania)	Little information available.	Moderate drilling available. Distant from upslope Au min.	Depth of transported material not determined - may be thin.
Gindalbie	With sulphides at interface, beneath 60 m of transported sediments.	Moderate drilling available. Distant from upslope Au deposit.	Poorly mineralized. Not scheduled to be mined.
Mt Celia	Beneath 5 to 15 m of transported deposits.	Extensive drilling available. Distant from upslope Au min.	Not scheduled to be mined. Not typical of regolith in Kal. area.
Lady Bountiful Extended	At interface beneath 25 m of transported deposits, and also in underlying quartz veins.	Moderate drilling available. Distant from upslope Au deposit. Exposed pit (at a later stage). Strong mineralization.	Severe surficial disturbance.
Samphire	Little information available.	Exposed pit.	Surface regolith mostly residual.
Previous studies			
Zuleika	At interface and saprolite, beneath 20 m of transported sediments.	Exposed pit. Extensively investigated in earlier project.	Known upslope mineralization. No further surface samples available.
Matt Dam	At interface and saprolite, 15m beneath 10m of transported sediments.	Extensively studied in earlier project. Known surficial anomaly.	This part of deposit not scheduled to be mined.
Baseline	Beneath 20 m of transported sediments.	Exposed pit. Known surficial anomaly.	Samples not available.
Panglo	Located in saprolite 20 m beneath base of 15 m of transported sediments.	Extensively studied in earlier project. Known surficial anomaly.	This part of deposit not scheduled to be mined.

2 Site Description

Argo is a large Au deposit located 25 km south of Kambalda. The landscape is typical of the floodplains bordering the salt lake regions to the south and east of the Kalgoorlie area. Vegetation is sparse and is composed of eucalypt open woodland with occasional casuarina, eremophila, bluebush and other small shrubs. A broad colluvial plain, with occasional clay pans and windblown dunes, drains the entire study area to the south-west towards Lake Lefroy, located about 5 km to the east.

The regolith consists of:

- (i) 0-0.2m thin sand-rich topsoil (possibly aeolian),
- (ii) 0.2-2m clay-rich red subsoil. Carbonate infusions as coatings of clays and partially weathered lithorelics (principally basalt; Appendix 6), and as nodules. A narrow, dark, manganiferous horizon occurs at about 1.5 m,
- (iii) 2-7m hard red and grey clays with variable mottling to 7 m, containing zones of indurated ferruginous and siliceous material (see also Appendix 6, Table 6).

Below 7m, the regolith is variable, depending on location. In the central and northern parts of the study area, the regolith below 5 - 10 m mainly consists of saprolitic clays. In the southern part of the study area, the thickness of the transported material increases and consists of puggy lacustrine clays with lenses and horizons of spongolite and lignite. Palaeotopography (Woolrich, 1994, in prep.) indicates that the transported material lies unconformably on the southern and eastern flanks of a valley. A palaeochannel, with up to 70 m of transported sediments, is located at the base valley and is orientated approximately east-west (Figure 2). The underlying geology for the study area consists of high-Mg basalts with minor interflow sediments, and well-differentiated dolerite (Figure 3).

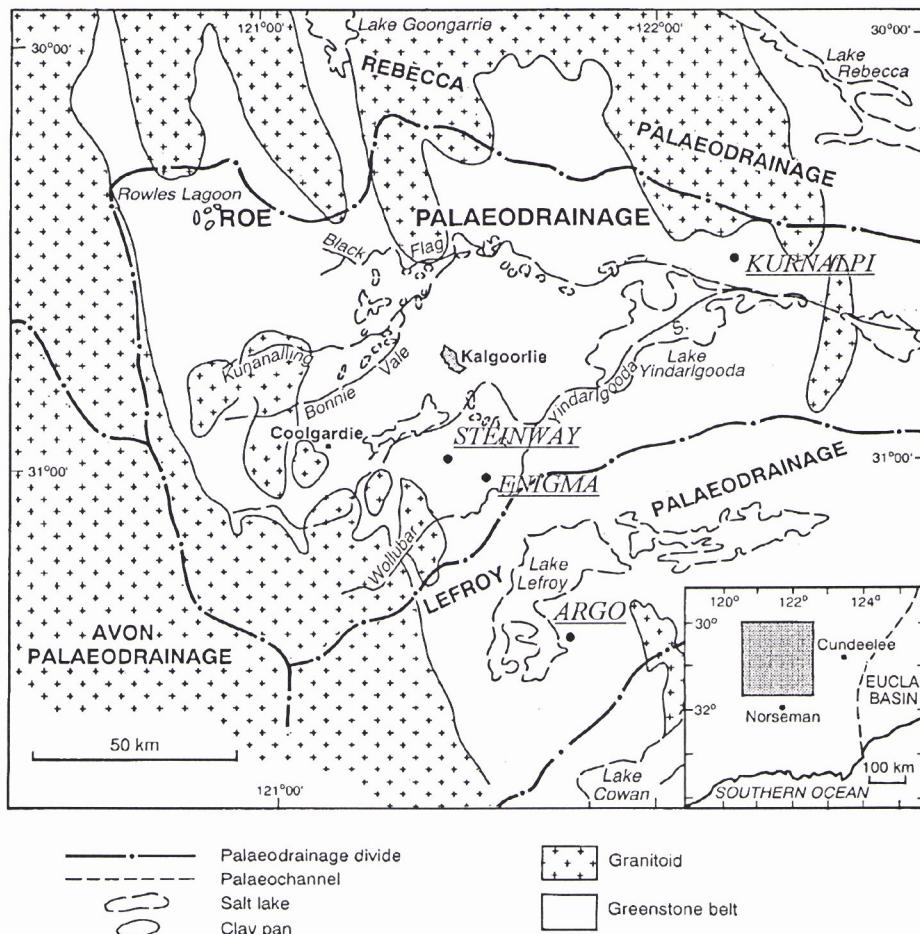
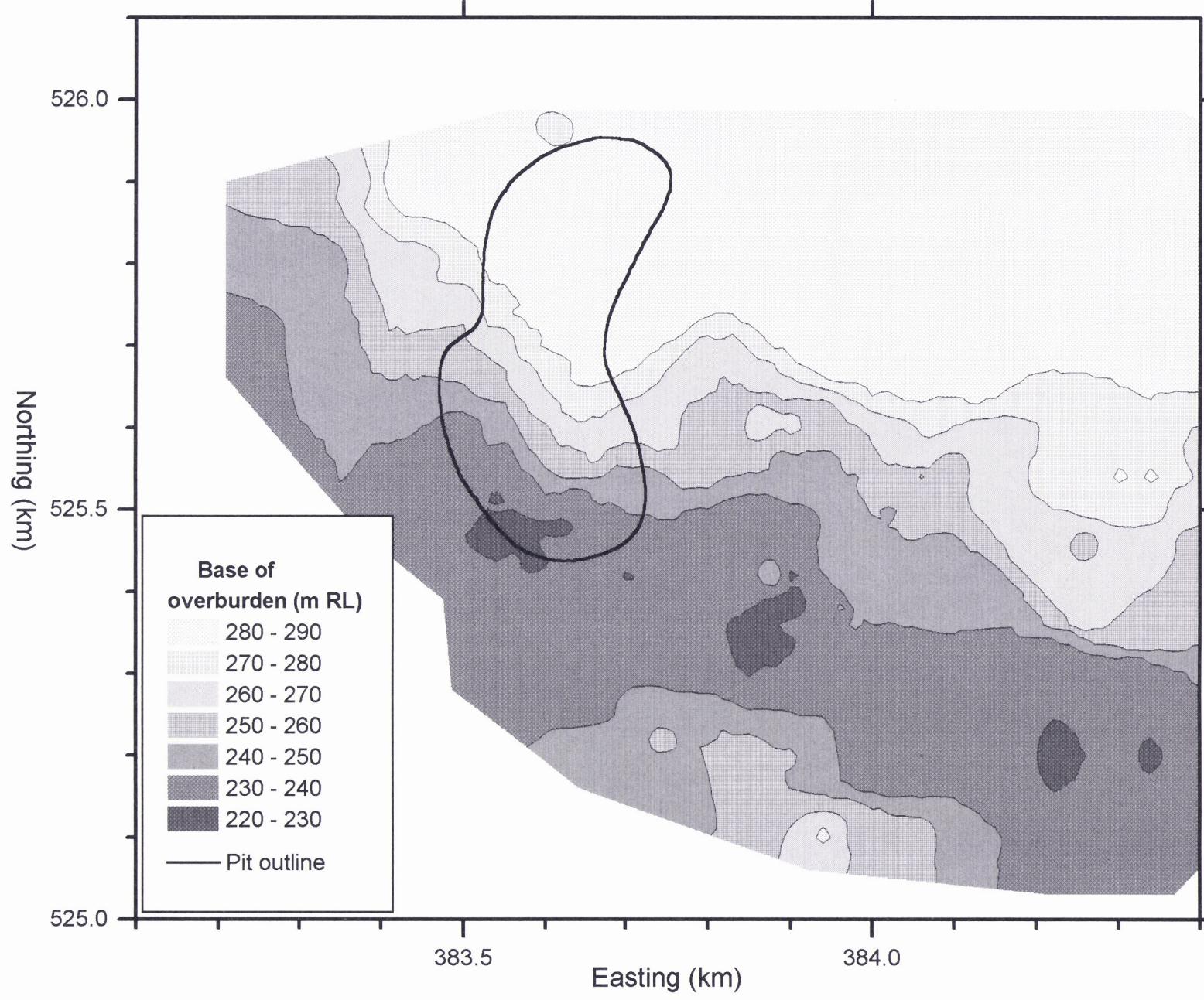


Figure 1: Location map (after Kern and Commander, 1993).

Figure 2: Plan of Argo area showing palaeotopography and location of Argo pit (after Woolrich, 1994)

4



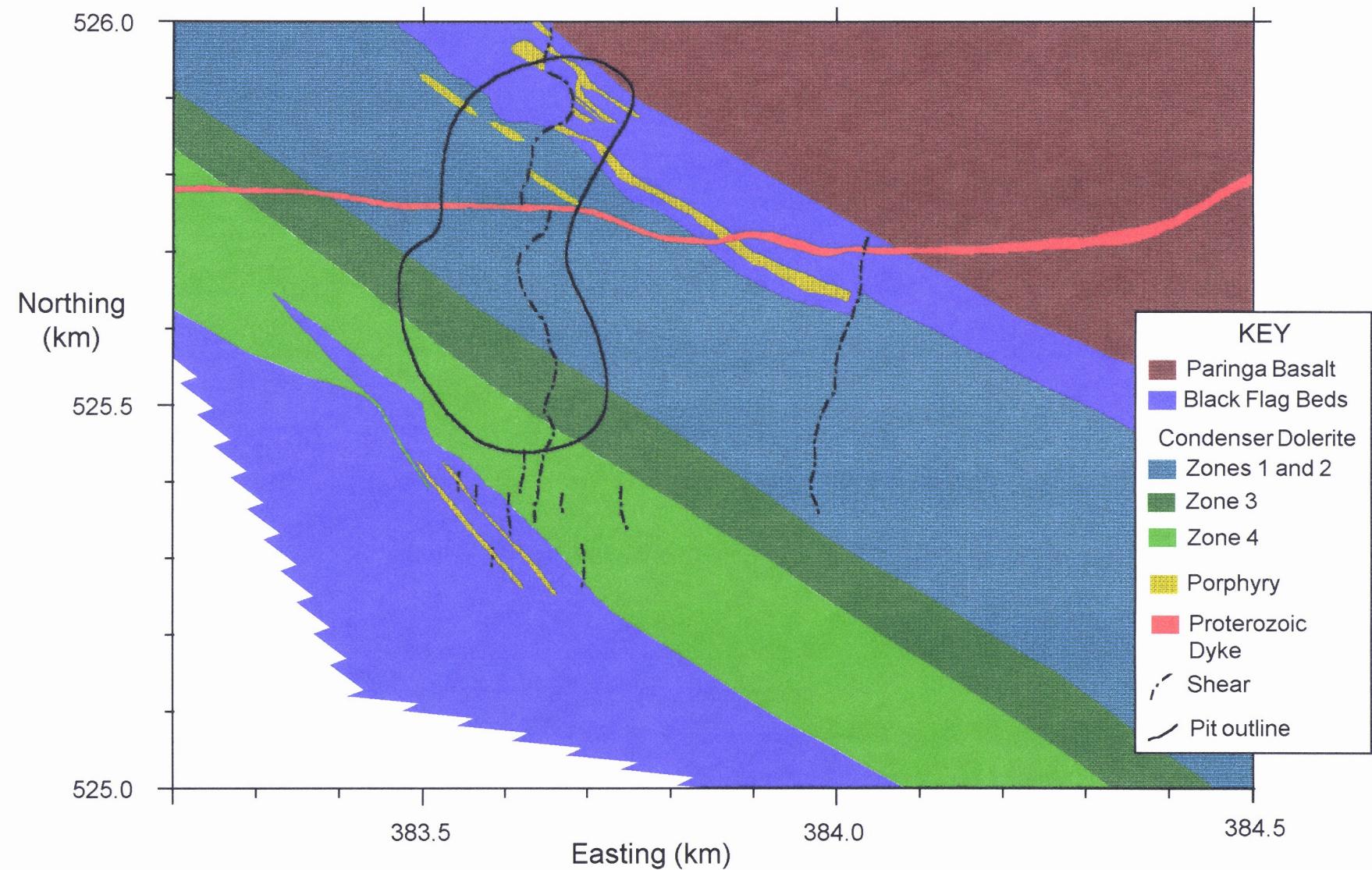


Figure 3: Plan of Argo area showing geology (modified from Western Mining Corporation Limited plans).

Mineralization is confined to bedrock, saprolite and the interface with the transported material, where it appears to follow the palaeosurface downslope. Patchy but spectacular grades of mineralization (with carbonate alteration) occur in the saprolite, associated with favourable contacts (possibly Fe-rich) between basalts and dolerites (B. Watchhorn, Western Mining Corporation (WMC) Limited, pers. comm., 1994). The St Ives gold processing plant is located about 3 km to the north east and is a potential source of contamination.

3 Methods

A large selection of sample materials were collected at Argo. These included groundwater, vegetation, soils, Fe- and lignite-rich material separated from within the transported material, saprolite and bedrock. These samples have been analysed for a variety of elements and a synthesis of the results are presented below. All samples were analysed by CSIRO unless otherwise stated. The rationale for collecting these samples are as follows:

- (i) groundwaters: may mobilize Au and be important in the formation of mineralized horizons and other anomalies in the soils and sediments. Elements may be mobilized via capillarity, vapours, gases or other means from the groundwater through the transported overburden to the surface. Redox fronts are known as important sites for the accumulation of Fe, Au and other elements;
- (ii) vegetation: implicated in the mobilization of Au in erosional and relict landscapes; vegetation that made up the bulk of the above ground biomass was collected from above, adjacent and distant to mineralization;
- (iii) soils: soil is a complex body of mineral and organic constituents, differentiated into horizons of variable thickness. Examination and analysis of different soil horizons provides detailed information on the preferential siting (if any) of elements and minerals. Knowledge of specific soil horizons allows better definition of anomalies that may be otherwise smothered or diluted by soil of lower element concentration *e.g.*, the depth of soil sampling (such as 0 - 0.1 m or 0.1 - 0.2 m) may be critically important. Deeper composites (*i.e.*, 0 - 1 m) can be readily collected by augering; this technique is being extensively used for Au exploration in erosional and relict landforms. The carbonate horizon is an important sample medium for Au and is nearly always present in the top 1 or 2 metres. Various soil samples were used for partial extraction studies to determine whether different reagents extract Au at concentrations and proportions depending on the soil type, horizon, geomorphology or proximity to mineralization. The partial extraction concentrations, rather than total content, may provide a better target anomaly;
- (iv) ferruginous (and other) separations: Fe oxides are important scavengers of many elements, including Au. They occur as segregations, granules, mottles, pisoliths, buried laterite, lag and coatings throughout the transported regolith;
- (v) saprolite, saprock and bedrock: weathered and fresh material from beneath the transported overburden material was sampled and analysed for a suite of elements. Other elements associated with mineralization may present a better target for exploration than Au itself.

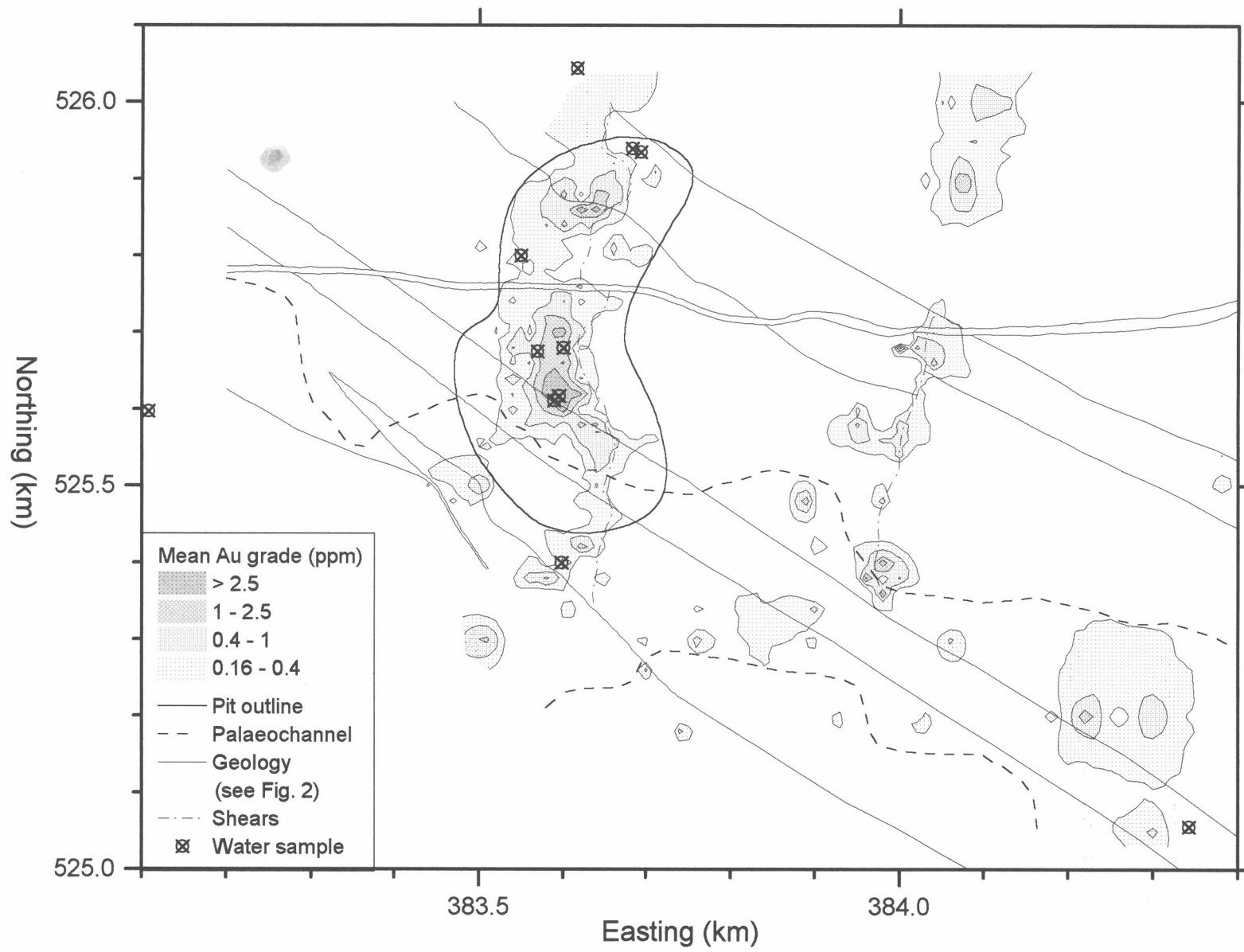
3.1 Groundwater

Eleven groundwater samples were collected (by a variety of methods; Appendix 1) and analysed in early 1994 (Figure 4). On the basis of the observed chemistry, samples were distinguished as deep, intermediate or shallow. Waters were analysed for pH, temperature, conductivity and oxidation potential (Eh) at the time of sampling. A 125 mL aliquot was collected in a polyethylene bottle (with overfilling to remove all air) for later HCO_3^- analysis by alkalinity titration in the laboratory. About 1.5 L of water was filtered through a 0.2 μm membrane filter in the field. About 100 mL of the filtered solution was acidified [0.1 mL 15 moles/litre (M) nitric acid (HNO_3)], and analysed for:

- (i) Cu, Pb and Cd by Anodic Stripping Voltammetry;
- (ii) Al, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P/I (distinction between P and I is difficult due to spectral overlap), SO₄ (measured as S), Si, Sr, Ti, V, and Zn by Inductively Coupled Plasma - Atomic Emission Spectroscopy;
- (iii) Ag, Bi, Cd, Ce, Dy, Er, Eu, Ga, Gd, Ge, Ho, La, Mo, Nd, Pb, Pr, Rb, Sb, Sc, Sm, Sn, Tb, Th Tl, Tm, U, W, Y, Yb and Zr by Inductively Coupled Plasma - Mass Spectroscopy;
- (iv) total phosphate (as P) by the molybdenum blue colorimetric method (Murphy and Riley, 1962);
- (v) I by subtraction of P from P/I concentration.

About 50 mL of the filtered water was collected separately, without acidification, and analysed for Cl by the Technicon Industrial method (Zall *et al.*, 1956).

Figure 4: Locations of groundwater samples at Argo, in relation to bedrock geology, Au grade and the palaeochannel (after data supplied by WMC Ltd.).



One litre sub-sample of the filtered water was acidified with 1 mL 15 M HNO₃ and one gram sachet of activated carbon added. The bottle was rolled for eight days in the laboratory and the water discarded. The carbon was then analysed for Au by Instrumental Neutron Activation Analysis (INAA) at Becquerel Laboratories, Lucas Heights. The method was tested by shaking Au standards of varying concentrations, and in varying salinities, with activated carbon (Gray, unpublished data).

The solution species and degree of mineral saturation were computed from the solution compositions using the program PHREEQE (Parkhurst *et al.*, 1980; described in detail in Gray, 1990 and Gray, 1991), which determines the chemical speciation of many of the major and trace elements. To obtain highly accurate speciation data on a limited suite of the major elements (Na, K, Mg, Ca, Cl, HCO₃, SO₄, Sr and Ba) for highly saline solutions, such as observed at this site, the specific ion interaction model known as the Pitzer equations was applied, using the program PHRQPITZ (courtesy USGS).

These programs are used to calculate the solubility indices (SI) for a number of mineral phases for each water sample. If the SI for a mineral equals zero (empirically from -0.2 to 0.2 for the major elements, and -1 to 1 for the minor elements which did not have Pitzer corrections), the water is in equilibrium with that particular solid phase, under the conditions specified. Where the SI is less than zero, the solution is under-saturated with respect to the phase, so that, if present, the phase may dissolve. If the SI is greater than zero the solution is over-saturated with respect to this phase and the phase can precipitate. Note that this analysis only specifies possible reactions, as kinetic constraints may rule out reactions that are thermodynamically allowed. Thus, for example, waters are commonly in equilibrium with calcite, but may become over-saturated with respect to dolomite, due to the slow rate of solution equilibration and precipitation of this mineral (Drever, 1982).

The determinations are important in understanding solution processes at a site. They have particular value in determining whether the spatial distribution of an element is correlated with geological phenomena such as lithology or mineralization, or whether they are related to weathering or environmental effects. Thus, if Ca distribution is controlled by equilibrium with gypsum in all samples, then the spatial distribution of dissolved Ca will reflect SO₄ concentration alone and have no direct exploration significance.

3.2 Vegetation

Vegetation samples were collected using secateurs. New growth was sampled where possible and leaves were collected from large eucalypt trees. Mull was collected from around the base of the eucalypt trees. Samples were washed with copious amounts of hot water and then rinsed with deionised water, before being dried in an oven at approximately 70°C. The samples were macerated to a moderately fine powder in a cross-beater mill. Samples were analysed for the INAA element suite (see below).

3.3 Regolith and Bedrock

3.3.1 Sample preparation and analysis

One to two kilos of sample were collected using a vehicle-mounted power auger. These were dried at 70°C, split and jaw-crushed (as required) before a 100-200 g sub-sample was pulverized in a K1045-steel ring mill to nominal <75µm. The varying analyses used for the different sample types were:

- (i) Gold only by INAA;
- (ii) Antimony, As, Ba, Br, Ce, Cs, Cr, Co, Eu, Hf, Ir, Fe, Au, La, Lu, Mo, K, Rb, Sm, Sc, Se, Ag, Na, Ta, Th, W, U, Yb and Zn by INAA;
- (iii) Bismuth, Cu, Fe, Mn, Ni, Pb, Sr, Ti, Zn and Zr by X-ray fluorescence (XRF; pressed powders);

- (iv) Calcium and Mg by atomic adsorption spectrophotometry (AAS) after digesting in 5M HCl for 15 minutes and then diluting to 1M HCl;
- (v) Carbonate by the method of Piper (1947).
- (vi) Organic C by a modification of the Walkley and Black (Walkley, 1935) method using a UV-Vis spectrometer.
- (vii) Salinity of soil slurry (1 part soil to 2 parts deionised water) using a conductivity meter.

3.3.2 *Soil Profiles*

Samples (1 - 2 kg) were collected at 10 to 30 cm intervals from the surface to the base of pits (2m deep). The face of the trench was first cleaned by removing loose material using a brush and geological pick. Samples were analysed by INAA and for Ca and Mg and organic C.

3.3.3 *Composite soil samples (0 - 1 m)*

For traverses 6030N and 5380N, samples (1 - 2 kg) were collected using a vehicle-mounted, power auger and analysed by INAA, XRF and for Ca, Mg, carbonate and organic C. For traverses 5800N and 5600N, samples were collected and analyzed by WMC for Au, Ca, Cu, Fe, Mn, Mo, Ni, Pb, Sb, Sr and Zn by ICP-MS after HF digestion; results for elements other than Au are found in Brand and Wilkinson, 1992.

3.3.4 *Material separated from the transported overburden*

Samples were wet sieved from drill cuttings through a 0.8 mm (approximately) screen, hand sorted, and the ferruginous fraction analysed by INAA and XRF. Some samples were analysed for additional elements by XRF (fusion and pressed powders) and details of these are found in Appendix 14.

3.3.5 *Material separated from saprolite and bedrock*

Samples were analysed by INAA and XRF. Some samples were analysed for additional elements by XRF (fusion and pressed powders) and details of these are found in Appendix 14.

3.4 Partial extractions

Three in-house partial extraction solutions, discussed in detail in Gray and Lintern (1993), were used to test the solubility of Au. In all cases, a 25 g portion of un-pulverized sample material was mixed with 50 mL of extractant in a screw-cap polyethylene plastic bottle, and then gently agitated for one week, after which the total Au extracted is measured. The three solutions are:

- (i) deionised water: dissolves the most soluble Au.
- (ii) iodide: a 0.1M KI solution is adjusted to pH 7.4 with HCl whilst CO₂ is bubbled through. This extraction dissolves more Au than water alone. Another form of this test did not involve pH adjustment; there is little difference in Au recovery between the two extraction variants when carbonate-rich soils are being analysed.
- (iii) cyanide: 0.2% KCN solution saturated with CaO dissolves all but the most refractory Au such as large particles of Au and Au encapsulated within resistant material such as quartz.

The partial extraction tests were performed either on separate portions of the same sample or as a sequential extraction starting with water and finishing with cyanide. Batch effects have previously been noted with deionised water extraction and so all partial extraction tests were performed under identical conditions and at the same time; the reason for the batch effects has not been determined but does NOT occur with iodide or cyanide soluble Au.

4 Results

4.1 Groundwater

Eleven groundwater samples, designated deep, intermediate or shallow were sampled (Appendix 1; Figure 4). Analytical results are compiled in Appendix 1. Groundwaters varied from moderately acid (pH 5.6) to highly acid (pH 3.5). The total dissolved solids (TDS), a measure of groundwater salinity, were calculated from the major element contents. The concentrations of various ions at Steinway and at other sites are plotted versus TDS or pH in Appendix 2, Figures A2.1 - A2.47. The sea water data (Weast, 1983) are used to derive the line of possible values (denoted as the sea water line) if sea water were diluted with freshwater or concentrated by evaporation; the line is shown on each figure except when the concentration in sea water is too low, relative to the concentration of the element in groundwaters. Nine other gold deposits with saline groundwater were used for comparison:

- (i) Wollubar: a palaeochannel crossing mineralized rocks about 40 km southeast of Kalgoorlie (south Yilgarn; Gray, 1993b);
- (ii) Baseline: a Au deposit beneath a palaeochannel, some 30 km north of Kalgoorlie, with extensive transported material (up to 20m deep; south Yilgarn);
- (iii) Panglo: a Au deposit 30 km north of Kalgoorlie, with mineralization concealed beneath 40 m of leached saprolite (south Yilgarn; Gray, 1990);
- (iv) Yalanbee: a non-mineralized site 70 km east of Perth (west Yilgarn);
- (v) Mulgarrie: a palaeochannel overlying mineralized rocks about 40 km north of Kalgoorlie (south Yilgarn; Gray 1992b);
- (vi) Granny Smith: a Au deposit about 25 km south of Laverton (central Yilgarn; Gray 1993a);
- (vii) Golden Hope: a Au deposit at New Celebration, some 40 km southeast of Kalgoorlie (south Yilgarn; Gray, 1993b);
- (viii) Mt Gibson: a Au deposit about 100 km north-east of Dalwallinu (central-west Yilgarn; Gray, 1991);
- (ix) Boags: a deposit at Bottle Creek, located 210 km north north-west of Kalgoorlie (central Yilgarn; Gray, 1992a);

Wollubar, Baseline, Panglo and Yalanbee are acid groundwater systems, whereas the other sites have dominantly neutral groundwater. Panglo, Yalanbee, Golden Hope, Mt Gibson and Boags are in dominantly relict or erosional landscapes, whereas the other sites have significant transported material. Comparisons with other sites may be useful in indicating the significance of any particular element anomaly, and whether the groundwater composition is affected by particular lithological interactions. Specific descriptions of the varying sites can be found in the referenced reports, with a generalized description of the hydrogeochemistry of the Yilgarn Craton given in Butt *et al.* (1993).

SI values for varying minerals (Section 3.1) are tabulated in Appendix 3, and plotted in Figures A3.1 - A3.35. The equilibrium point is shown as the dashed line. Samples within one SI unit are at or near equilibrium with respect to that mineral; those above the line are oversaturated; and those below are undersaturated.

The Argo groundwaters are highly saline, with a major increase in salinity with depth (*i.e.*, about 2 times sea water for shallow samples, 3 times sea water for intermediate samples and 6 times sea water for deep samples). They show major element abundances consistent with a playa origin (with varying degrees of mixing with fresher waters), being:

- (i) depleted in Na and Ca (precipitated as halite and gypsum; Figures A2.1 and A2.4). Groundwaters are saturated with respect to gypsum, and, in the highest salinity samples, approach halite saturation (Figures A3.1 and A3.2);

- (ii) enriched in Mg and SO_4 (which remain in solution when other salts precipitate; Figures A2.3 and A2.6). Note that gypsum precipitation has little effect on dissolved SO_4 concentration, because of the proportionally lower Ca concentration;

In addition, groundwaters are depleted in K (Figure A2.2). This is commonly observed in groundwaters throughout the Yilgarn Craton, and may be due to adsorption of K by smectites, or precipitation of alunite (Gray, 1990).

Groundwaters vary from slightly acid (pH 4.5 - 5.5) for deep groundwaters to highly acid (pH 3.5 - 4) for shallow samples (Figure 5) and, as expected, have similar chemistry to Wollubar, Baseline and Panglo (Appendix 2). Thus, they are enriched in Al and Si (Figures A2.15 and A2.16), the transition metals Mn, Fe, Co, Ni, Cu and Zn (Figures A2.21 - A2.26) Y and the rare earth elements (REE; Figures A2.29 and A2.31 - A2.43), Pb and (weakly) U (Figures A2.46 and A2.47). These enrichments will commonly occur where acid groundwaters contact mafic rocks (Gray, 1990), as is demonstrated by the fact that these acid groundwaters are undersaturated with respect to the corresponding secondary minerals (Appendix 3), and therefore may not have any direct exploration significance, aside from indicating mafic lithologies. The Cr concentrations are below detection for the Argo groundwaters (Figure A2.20), consistent with previous observations that Cr is only enriched in groundwaters contacting ultramafic lithologies.

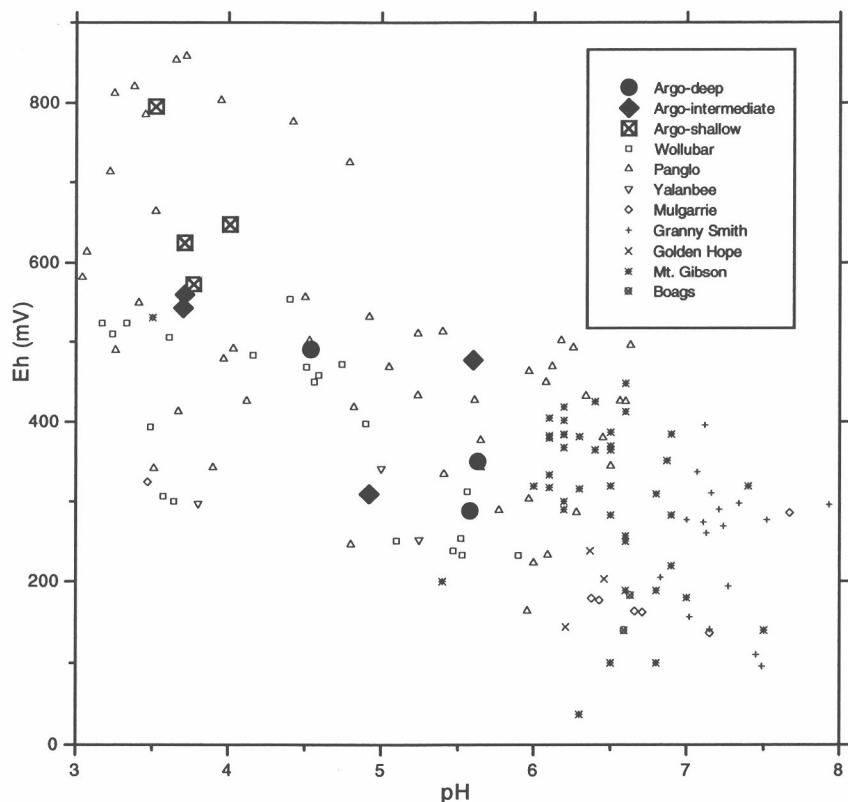


Figure 5: Eh vs. pH for groundwaters from Argo and other sites.

Chalcophile elements that are enriched in *neutral* groundwaters in contact with weathering sulphides [e.g., Ga¹, Mo, W (Figures A2.27, A2.30 and A2.44), Ag, Sb and Tl (Appendix 1)] have very low concentrations in the Argo groundwaters, as expected. Iodine, however, has a high concentration in

¹ Though generally considered an Al analogue, Ga can occur in sulphide minerals (Gottardi *et al.*, 1978), and appears to be enriched in some mineralized groundwaters in the Yilgarn (Gray, 1993b).

these groundwaters (Figure A2.10), as is also observed in other mineralized sites in the Yilgarn Craton.

In neutral groundwaters, the most likely mechanism for the dissolution of Au is as the thiosulphate complex, whereas in acid saline groundwater, such as at Argo, Au chloride is expected to be important (Gray *et al.*, 1992). High redox potentials (Eh) are required for the dissolution of Au as Au chloride, and all of the shallow and most of the intermediate Argo groundwaters are sufficiently oxidising for significant Au dissolution (Figure 6). Despite this, the Argo groundwaters tend to have low to moderate Au concentrations, and in most instances are undersaturated with respect to Au metal (Figure A3.19). This suggests that the Au in the regolith is less accessible to the groundwater than at other sites, such as Panglo; this is possibly due to differing mineralogy (*e.g.*, larger Ag-poor Au grains), or to obstructions to flow (*e.g.*, compact clay impeding groundwater), leading to preferential flow in channels avoiding most of the Au.

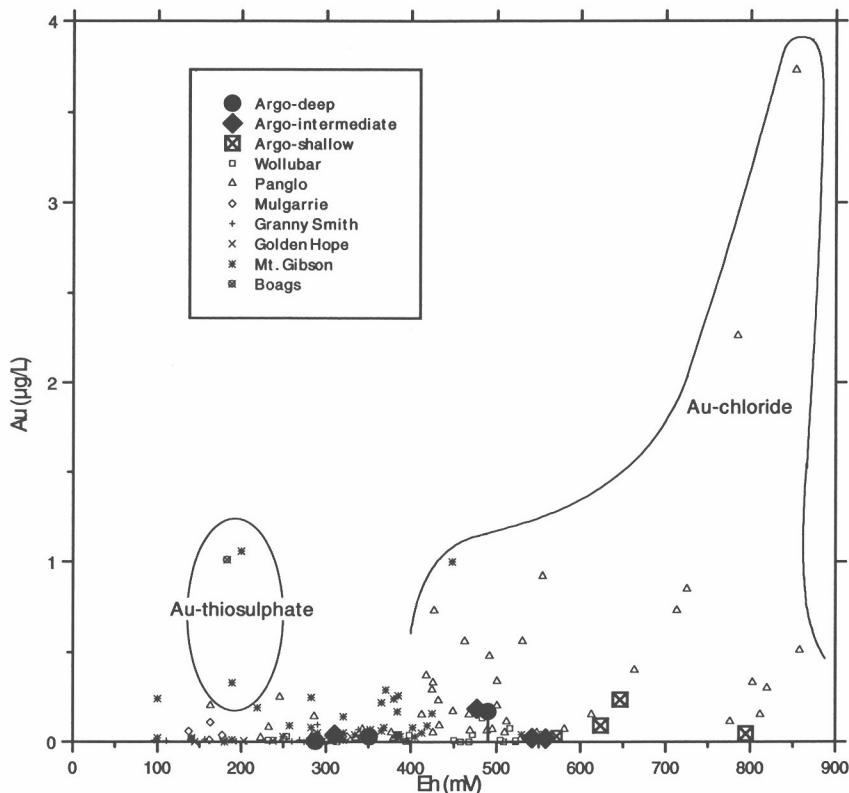


Figure 6: Au vs. Eh for groundwaters from Argo and other sites, with Au dissolution zones marked.

The spatial distribution of the elemental abundances was mapped (Appendix 4), along with the pit outline, an outline of the geology, the mineralization and the position of the palaeochannel. Interpretation of the plots should be done for each depth. Results suggest that groundwater enrichments in Co, Ni, Mo and Au appear to be associated with mineralization, similar to those observed at other sites (Butt *et al.*, 1993). However, this observation would be considerably strengthened by a more extensive database of samples at this site.

4.2 Vegetation

The Au contents of vegetation (eucalypt leaves, eremophila or mull) do not appear to indicate the presence of mineralization (Table 2). The concentrations of Au are lower than those found in comparable sites at Zuleika where up to 0.6 ppb in eucalyptus and 5.8 ppb in mull was reported (Lintern and Butt, 1992). The maximum Au concentration for eucalyptus leaves and eremophila over the palaeochannel mineralization at Panglo (Lintern and Scott, 1990) was 0.1 and 1.4 ppb, respectively. Maximum reported Au values for vegetation from erosional and relict areas at Bounty (Lintern, 1989), and erosional areas at Zuleika and Panglo are an order of magnitude greater than these data.

Table 2: Results of Au analyses (in ppb) of dried vegetation.

Sample Type	Over mineralization	Over background
Eucalypt leaves	<0.5	<0.5
	<0.5	<0.5
	<0.5	<0.5
Eremophila	<0.5	<0.5
	<0.5	<0.5
	0.5	0.5
Mull	1.9	1.6
	2.3	2.2
	4.9	3.4

Some samples of mull taken from over mineralized areas have slightly higher concentrations of Ba, Ce, Co, Hf, La, Sc, Th and Yb. Similarly, some samples of eucalypts have slightly higher concentrations of Br and W. However, more samples need to be taken over a broader area to support these findings and establish their significance.

4.3 Profiles

Seven soil profiles were sampled in detail (Figure 9). These included six profiles (A to F) that were sampled at 0.1 - 0.2 m intervals and one profile (J) sampled at 0.5 m intervals from the southern end of the pit wall prior to expansion of the pit. Profiles were situated over mineralization (*e.g.*, E and J) and in background areas (*e.g.*, B). The total Au results indicate an association with Ca, with both elements largely confined to within 2m of the surface (Figure 7; Appendix 6, 14). Gold values are low (mean < 10 ppb) with two maxima (0.3m to 0.5 m and 1.3 to 1.8 m) in each profile (A to F) sampled in detail; this is similar to the result found by WMC Ltd for a profile to the east (Brand and Wilkinson, 1992). The relationship between Au and Ca is not as strong as that found at other sites (*e.g.*, Lintern, 1989; Lintern and Scott, 1990; Lintern and Butt, 1991, 1992); nevertheless, augering the top metre is still an effective sampling technique to locate Au in the soil profile. Importantly however, there are no significant differences in the distribution characteristics or content of Au found in the soil between either the mineralized or background areas.

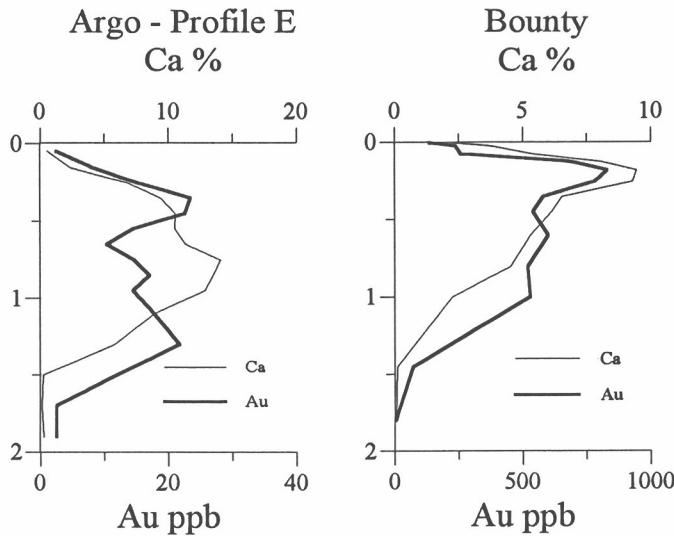


Figure 7: Gold and Ca results for soil profile E at Argo and a typical soil profile from the Bounty deposit at Mt Hope (Lintern, 1989).

Multi-element analyses suggests there may be an association between Fe and Cr, Sc and Th but, as Ca concentration tends to dominate most of the profile, this correlation may merely reflect dilution by carbonate (Appendix 6, Figure A6.3). The highest Mn content (1M HCl extractable) is observed in the lower part of the profile, where the clays are stained dark brown to black. Several elements, including Au, As, Co, Mo, Sb, W and REE (Ce, Eu, La, Lu, Sm and Yb), also have maxima at this depth (Appendix 6, Figure A6.3) reflecting the commonly observed scavenging characteristics of Mn oxides. The Mn-rich horizon is widespread throughout the Argo area.

The moisture content of the soil (measured using weight loss at approximately 70°C over one week) increases with depth and is approximately correlated with Au content, particularly in the top part of the profiles (Appendix 6, Figure A6.2). This relationship has also been noted at Zuleika (Lintern and Butt, 1992) and Steinway (Figure 8). The significance of this association is not known, although it may be an indication of the mobility of Au in the soil environment. In contrast, however, partial extraction experiments indicate that the amount and proportion of water soluble Au decreases with increasing depth (Appendix 6, Figure A6.1).

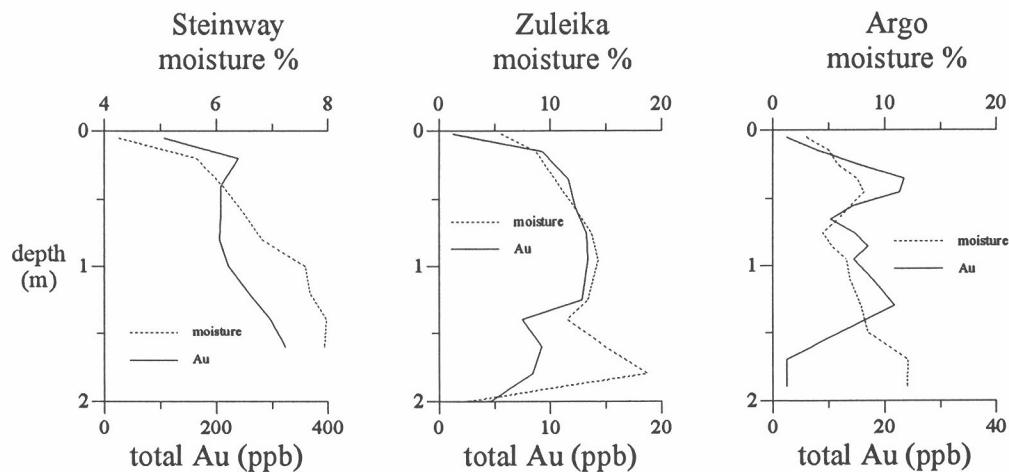


Figure 8: Examples of Au and moisture results for soil profiles at Steinway, Zuleika (Lintern and Butt, 1992) and Argo. Other moisture-Au profiles for Argo are found in the Appendix 6.

Carbonate nodules (> 0.8 mm) were sieved from the calcareous horizon at 0.8 m from Profile B and analysed for Au content. The bulk Au content of the sample prior to being sieved was 12 ppb. Four nodule types were identified:

- 1) L37-1: A cutan of carbonate (< 0.5 mm) over an internal structure of a piece of partially weathered rock (probably basalt). The rock is grey and sub-rounded. The carbonate is heavily impregnated with Mn oxides. The Au content was < 5 ppb.
- 2) L37-2: A cutan of carbonate (< 0.5 mm) over an internal structure of a piece of partially weathered rock that has been infused itself with carbonate. The rock is pale in colour and similar to the carbonate. The veneer is heavily impregnated with Mn oxides. The Au content was 7 ppb.
- 3) L37-3: As with L37-2 but with only moderately impregnated with Mn oxides. The Au content was 5.3 ppb.
- 4) L37-4: Nodules consist of concretions of carbonate containing rounded quartz sands. Few or no Mn oxides present. The Au content was 9.7 ppb.

These data suggest that there is slightly more Au in the < 0.8 mm size fraction, and that the Au concentration does not appear to be due to the partially weathered rock since Au contents are lowest for those nodule types with rock within them (*i.e.* L37-1, -2 and -3).

Three profiles were selected for extraction studies (Section 3.4). Two are located over mineralization (E and J) and one in a background area to the west (B; Figure 9). Three separate, non-sequential extractions procedures were performed, namely (i) deionised water, (ii) iodide and (iii) cyanide. For Profiles B and E, the results indicate that the proportion of water soluble Au found in the profiles generally decreases with depth, while iodide soluble Au increases (Appendix 6). Maxima of iodide and cyanide extractable Au are coincident with the total Au maxima (Mn-rich horizon) in the lower part of the profile (Appendix 6, Figure A6.1). For Profile E (over mineralization), two samples at about 0.7 m have much greater proportions of water soluble Au (and to some extent iodide and cyanide soluble Au) than adjacent samples (Appendix 6, Figure A6.1). The reasons for this are unclear. Sample spacing on Profile J (over mineralization) was too great to confirm this result but was not present in Profile B (background). However, in the context of extraction results from all the Profile E samples (8.3% for the two unusual samples compared with 5.8% for all samples) and Profile B (13.6% for all samples), this result may not be particularly unusual for all of the Argo site. The concentrations of iodide- and cyanide-extractable Au appear to be proportional to the total Au content in the profiles and, therefore, do not provide additional information as to the location of buried mineralization. The association between iodide or total and water soluble Au is weak.

4.4 Composite soil samples

Samples from 526030N and 525380N (0 - 1 m, 1 - 2 m) were collected by augering and a selection analysed for Au and other elements. Additionally, two traverses (525800N, 525600N) were previously collected by WMC Ltd prior to ground disturbance associated with pit development. The distribution of Au does not appear to be related to the underlying mineralization (Figure 9). Gold values are generally low (Table 3).

Table 3: Summary statistics for total Au (ppb) for 4 auger traverses at Argo.

Traverse	Mean Au	Maximum Au
6030N	11.2	14.5
5800N	7.7	24
5600N	4.6	8
5380N	8.9	16.6

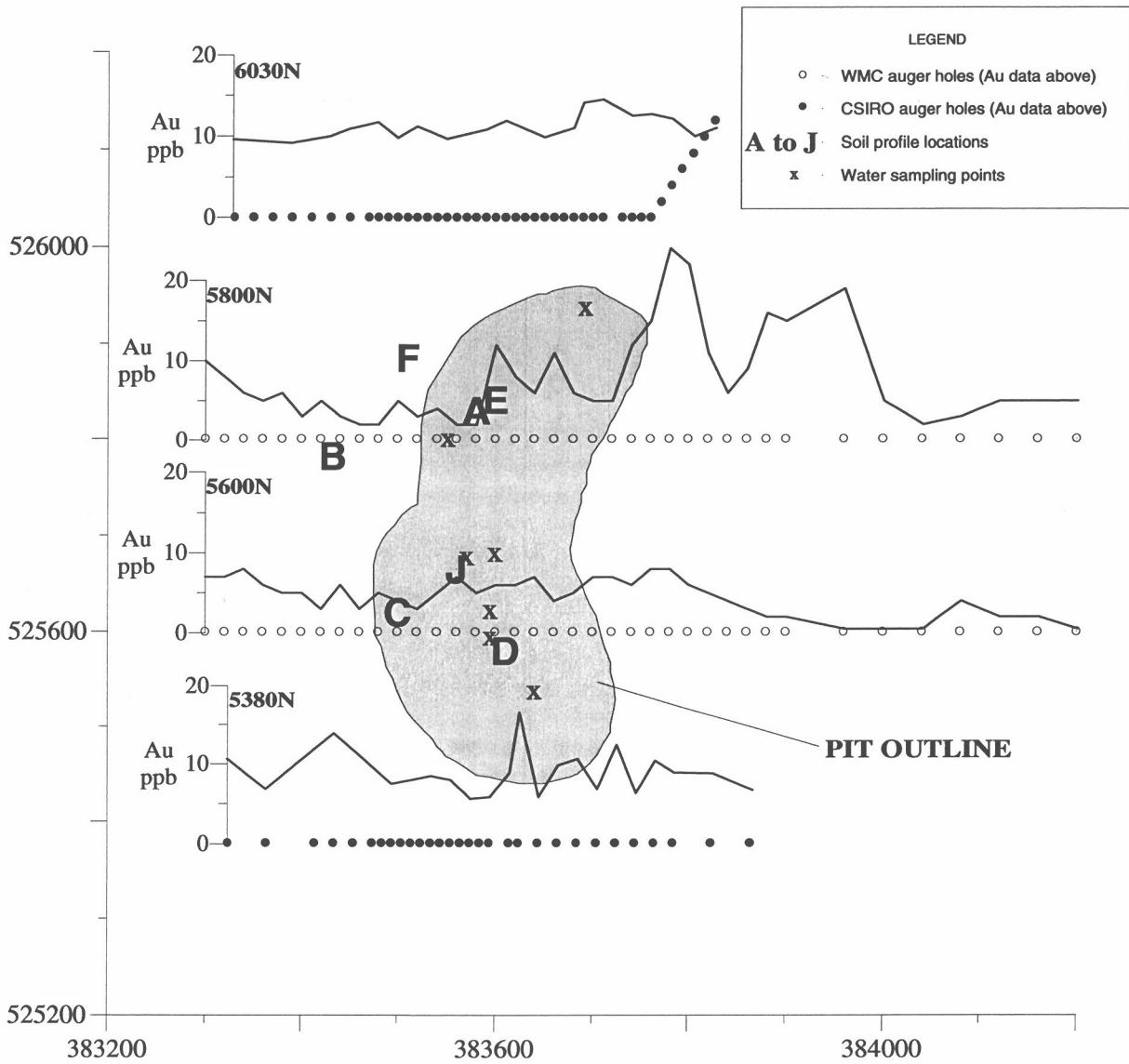


Figure 9: Total Au contents for soil traverses. Locations of soil, water and profile sampling points shown. Outline of pit is shaded. Data for 525800N and 525600N supplied by WMC Ltd.

The highest Au concentrations occur in a clay pan on traverse 5800N, east of the pit. Possible reasons for the elevated Au values are that:

- (i) the clay pan acts as a sump for detrital Au from drilling contamination or elsewhere, or
- (ii) the pan is a seepage/evaporative point from an underground water source containing Au, or
- (iii) the Ca horizon is thinner and restricted to the top metre.

Samples from this traverse were not available for further analyses.

Calcium is evenly distributed on 5380N and 6030N, with higher concentrations at 1 - 2 m (8.8%) than 0 - 1 m (5.4%). Magnesium concentrations tend to increase towards the eastern portions of both traverses, as well as having more elevated concentrations at 1 - 2 m. Normalization of Au with respect to Ca and Mg does not produce any significant trends (see Appendix 7, Figures A7.2, A7.3).

The partial extraction of Au from 0 - 1 m samples (5380N) by water, iodide and cyanide similarly did not produce any significant results (Figure 10). The proportion of water soluble Au increases to the east; the significance of this trend is unknown (Figure 11), but may be related to increasing Mg/Ca ratio.

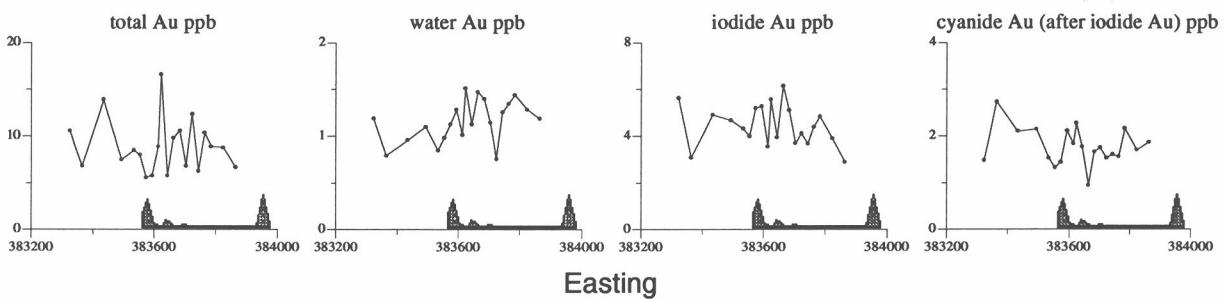


Figure 10: Total, water, iodide and cyanide soluble Au for 0 - 1 m samples on 5380N at Argo. The cyanide results are for Au left after iodide extraction. The hatched area locates mineralization.

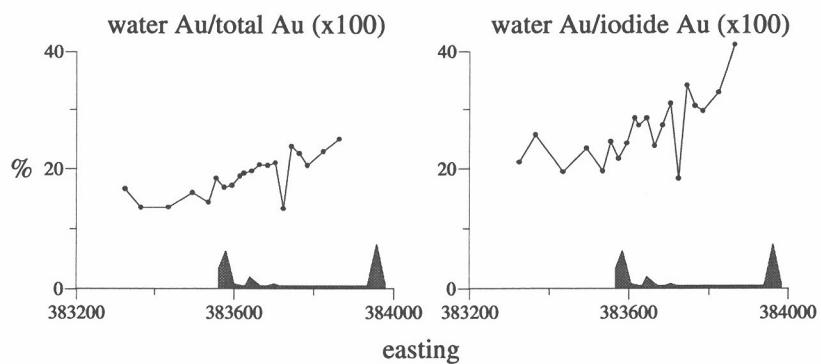


Figure 11: Water soluble Au as percentage of total Au and iodide Au for 0 - 1 m samples on 5380N at Argo. The hatched area locates mineralization.

Mineralization is not detected using the distribution of other elements in these 0 - 1 m composites (Section 3.1.4). Manganese, Ce, Co, La, Ni, Sc, Sm and Yb (and possibly Fe, Sc and Zn) distributions are similar, suggesting that Mn oxides are important here (Appendix 7); maxima for these elements are located about 100 m to the east of underlying mineralization (Appendix 7).

4.5 Material separated from transported overburden

Fifteen ferruginous and lignitic samples separated from the transported overburden were grouped according to location with respect to mineralization (Appendices 11, 12 and 14). Results indicated that:

- (i) samples located directly above mineralization did not contain any detectable Au;
- (ii) samples adjacent to mineralization (*i.e.*, at similar R.L.) contained several tens of ppb Au;
- (iii) samples from the reducing environment containing lignitic material (including samples from background areas) had the highest Au content (over 200 ppb). These samples also had relatively high Na, Br, Hf, La, Pb, Sm, Ta, U, Zn and Zr contents. Organic material is a well known scavenger of trace elements. Strontium and W contents were greatest in samples over mineralization.

4.6 Material separated from saprolite and bedrock

Fourteen samples from saprolite and bedrock were analysed for Au and other elements. Nearly all samples with high concentrations of Au (> 10 ppm) were significantly richer in W, relative to Au-poor samples (Appendices 12 and 14). One sample with high Au contents had slightly more Na, La, Ce, Mo and Sr than other samples.

5 Discussion

The Argo deposit has no surface geochemical expression in total or partially extractable Au or in other elements. Water would be expected to dissolve the most active Au and thus include the most recently mobilized or introduced component. The absence of a response suggests that any introduced component is minimal in comparison with Au mobilized by normal soil processes. It is possible that the latter has led to a widespread homogenization of Au, a possible consequence being a broad lower order soil anomaly. Such an anomaly would only be apparent on a district scale and not with the short traverses examined here.

Gold in soil at Argo is largely confined to the calcareous horizon, which is generally restricted to the top 2m. Augering thus remains an effective sampling procedure. Although the results suggested here do not indicate mineralization, the procedure should not necessarily be abandoned for a first pass evaluation of depositional regimes because in other areas *e.g.*, Steinway, significant surficial anomalies have been found. The reasons for this have not been determined but presumably relate to some specific conditions. Conversely, a negative result should not be taken as conclusive.

The association between Au and pedogenic carbonate is well known. However, at Argo, the association does not appear to be as strong as that found in relict and erosional areas where a strong correlation is found (Figure 7). There are several possible explanations for this, including:

- (i) depositional soils are poorly drained; Ca and Au maybe re-mobilised and re-deposited at different rates with sudden influxes of floodwater as occasionally occurs during summer months. Conversely, during seasons of normal rainfall activity, the association may become stronger;
- (ii) the presence of a Mn-rich horizon may allow the accumulation of Au and other elements here and thus distort the Au-Ca association. Gold in this horizon is less water soluble than in adjacent calcareous horizons;
- (iii) the paucity of vegetation may allow soils to remain wetter longer compared with areas with more biomass and therefore greater evapotranspiration.

6 Recommendations

Future studies at Argo are required. Specifically, there is a need to:

1. extend auger line(s) to the west and east to establish true background concentrations. Soil pits may be required to examine the Au distribution in detail. Furthermore, by extending to the east, the high proportion of water extractable Au (relative to total Au) can be investigated.
2. construct a regolith map to put the study site in the context of the surrounding landforms. The results suggest that there may be anomalous Au results in a clay pan adjacent to the Argo deposit.
3. investigate the anomalous total Au results from the auger traverse on 525800N by further examining and sampling a soil profile(s).
4. investigate further the potential of lignite from the transported overburden as a sample medium for Au exploration in this district.
5. analyse for W since the results indicate that it is associated with Au mineralization and may be a useful pathfinder.

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Appendix 1: Tabulated groundwater data

Table A1.1: Groundwater samples at Argo.

No.	Easting (m)	Northing (m)	Source	Estimated RL (m)	Type
1	383693	525935	Upwelling from northern end of Argo pit	250	Deep
2	383683	525940	Seepage from north wall	283	Shallow
3	383600	525680	Seepage from lower part of the South wall	271	Intermediate
4	383598	525400	Pumped - bore TD4070	227	Deep
5	384342	525056	Bailed - bore TD4071	260	Intermediate
6	383550	525800	Seepage from west wall	285	Shallow
7	383570	525675	Seepage from southwest wall	284	Shallow
8	383108	525597	Bailed - bore TD4072	257	Intermediate
9	383595	525617	Bailed - bore TD4073	282	Shallow
10	383590	525611	Bailed - bore TD4080	257	Intermediate
11	383616	526044	Bailed - bore TD4082	259	Deep

Table A1.2: Groundwater sample positions and elemental abundances at Argo.

No. Source	1 Pit	2 Pit	3 Pit	4 TD4070	5 TD4071	6 Pit	7 Pit	8 TD4072	9 TD4073	10 TD4080	11 TD4082
East North	383693 525935	383683 525940	383600 525680	383598 525400	384342 525056	383550 525800	383570 525675	383108 525597	383595 525617	383590 525611	383616 526044
RL (m) Depth	250 Deep	283 Shallow	271 Inter	227 Deep	260 Inter	285 Shallow	284 Shallow	257 Inter	282 Shallow	257 Inter	259 Deep
pH Eh (mV)	5.63 351	3.71 624	5.6 477	5.58 288	3.71 559	3.52 795	4.01 647	3.7 542	3.77 572	4.92 310	4.54 490
TDS (%)	23.1	6.4	8.6	26.2	14.7	6.7	7.8	11.3	5.6	10.2	18.9
Na	62000	18800	24900	73700	44900	19600	23000	32900	17000	29800	52300
Mg	14800	3565	4855	16100	7355	3600	4320	6680	2835	6235	12500
Ca	490	190	410	285	340	190	200	180	180	190	310
K	1100	256	329	1440	505	256	309	497	232	409	915
Cl	130253	35982	47953	147647	83425	37740	43509	62951	31434	54987	103398
SO ₄	22110	5574	7402	23295	10696	5453	6501	9992	4068	10021	19519
HCO ₃	48	< 1	10	12	< 1	< 1	< 1	< 1	< 1	15	2
P	0.028	0.009	0.010	0.031	0.022	0.010	0.012	0.018	0.009	0.021	0.029
Li	0.41	0.52	0.60	0.41	1.02	0.49	0.66	0.92	0.38	0.51	0.49
Be	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Rb	0.080	0.023	0.055	0.074	0.046	0.034	0.032	0.037	0.047	0.023	0.024
Sr	4.6	2.6	2.8	4.0	2.5	2.5	2.5	2.7	3.1	2.6	3.5
Cs	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ba	<0.01	0.044	0.085	<0.01	0.043	0.06	0.046	0.063	0.123	<0.01	<0.01
B	1.65	5.20	4.14	0.99	2.75	4.79	4.86	3.31	4.02	3.22	1.96
Al	0.04	70	0.14	0.03	35	77	85	52	42	0.64	0.07
Si	5	41	13	3	21	39	35	26	35	5	8
I	11.3	5.1	6.2	10.9	7.4	5.2	5.8	7.5	4.0	7.8	11.1
Sc	0.019	0.037	0.025	<0.005	0.012	0.066	0.039	0.017	0.026	<0.005	<0.005
Ti	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
V	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cr	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mn	3.7	3.1	3.6	2.0	3.5	1.2	2.3	3.2	15	4.8	6.1
Fe	0.106	<0.01	<0.01	5.49	3.41	0.022	0.049	6.32	0.239	215	0.048
Co	0.016	0.163	0.118	0.064	0.127	0.117	0.151	0.085	0.045	0.147	0.062
Ni	0.01	0.34	0.35	0.09	0.26	0.30	0.39	0.29	0.27	0.40	0.10
Cu	0.210	0.052	0.031	0.004	0.036	0.050	0.101	0.076	0.020	0.046	0.035
Zn	0.041	0.096	0.047	0.060	0.220	0.058	0.072	0.140	0.680	1.010	0.156
Ga	0.018	<0.005	0.007	0.006	0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005
Ge	0.040	0.013	0.024	0.041	0.018	0.036	0.014	0.011	0.007	0.025	<0.005
Y	0.007	0.103	0.041	0.026	0.210	0.105	0.131	0.134	0.192	0.098	0.023
Zr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mo	0.008	<0.002	<0.002	<0.002	<0.002	0.006	0.004	0.002	<0.002	<0.002	<0.002
Ag	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0011	<0.001
Cd	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sn	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
La	0.006	0.083	0.054	0.028	0.170	0.089	0.111	0.227	0.404	0.107	0.016
Ce	0.010	0.204	0.117	0.059	0.385	0.214	0.276	0.378	0.606	0.192	0.055
Pr	<0.002	0.025	0.012	0.008	0.050	0.024	0.032	0.047	0.059	0.022	0.005
Nd	0.006	0.106	0.044	0.030	0.200	0.087	0.129	0.187	0.202	0.089	0.025
Sm	<0.002	0.021	0.011	0.005	0.036	0.019	0.026	0.030	0.032	0.013	0.003
Eu	<0.002	0.007	0.002	<0.002	0.011	0.006	0.009	0.010	0.007	0.004	<0.002
Gd	<0.002	0.024	0.009	0.006	0.045	0.022	0.030	0.037	0.038	0.02	0.003
Tb	<0.002	0.004	<0.002	<0.002	0.007	0.003	0.004	0.004	0.004	0.002	<0.002
Dy	<0.002	0.019	0.007	0.003	0.035	0.016	0.025	0.020	0.027	0.013	0.003
Ho	<0.002	0.004	<0.002	<0.002	0.007	0.004	0.005	0.004	0.006	0.003	<0.002
Er	<0.002	0.011	0.003	0.003	0.02	0.009	0.014	0.011	0.015	0.005	0.002
Tm	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Yb	<0.002	0.008	<0.002	<0.002	0.013	0.007	0.011	0.008	0.009	0.004	<0.002
W	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Au (ppb)	0.0282	0.0888	0.186	<0.005	0.0175	0.0457	0.236	0.020	0.0321	0.0405	0.170
Tl	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Pb	0.007	0.011	0.011	0.026	0.111	0.006	0.020	0.126	0.069	0.382	0.200
Bi	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Th	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
U	<0.002	0.015	0.005	0.003	0.026	0.015	0.017	0.017	0.004	<0.002	<0.002

All concentrations in ppm unless otherwise noted

Inter - intermediate depth

**Appendix 2: Element/ion concentration for
groundwaters - graphed**

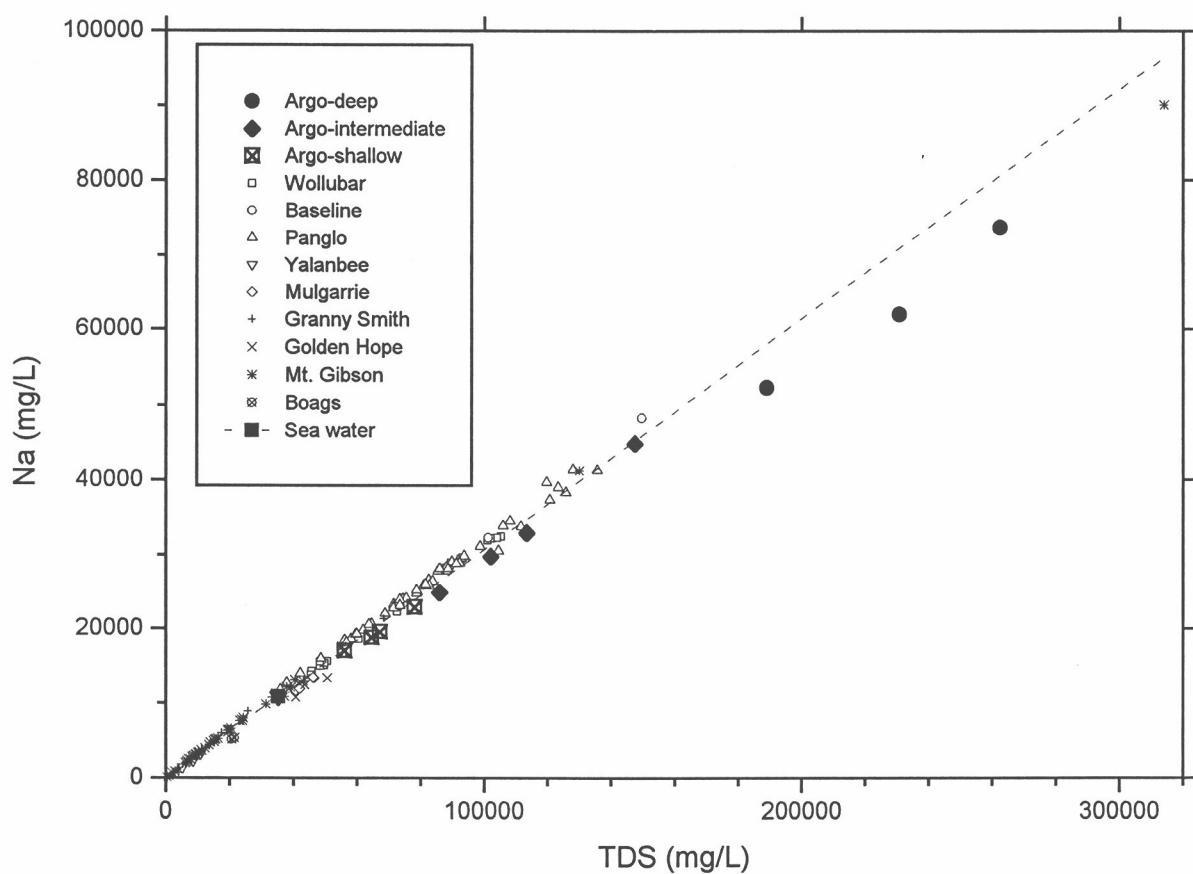


Figure A2.1: Na vs. TDS for groundwaters from Argo and other sites.

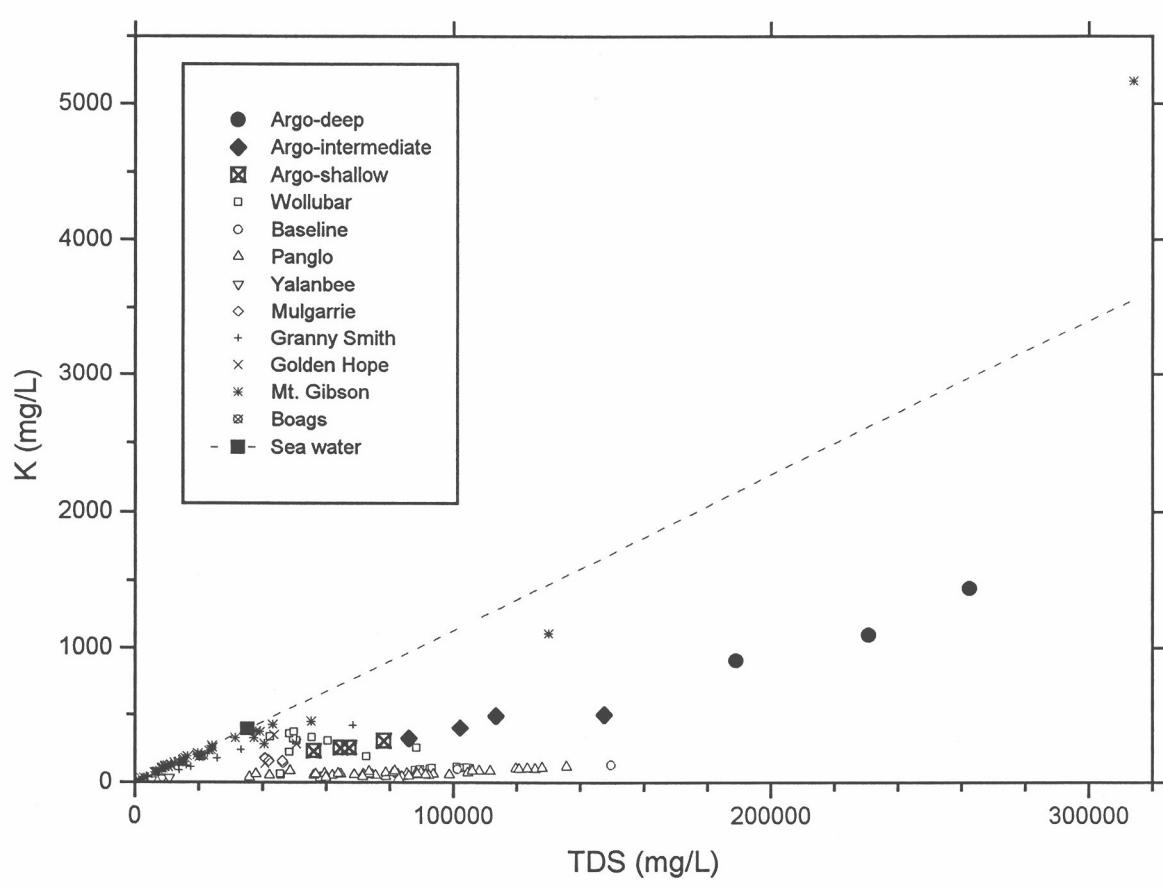


Figure A2.2: K vs. TDS for groundwaters from Argo and other sites.

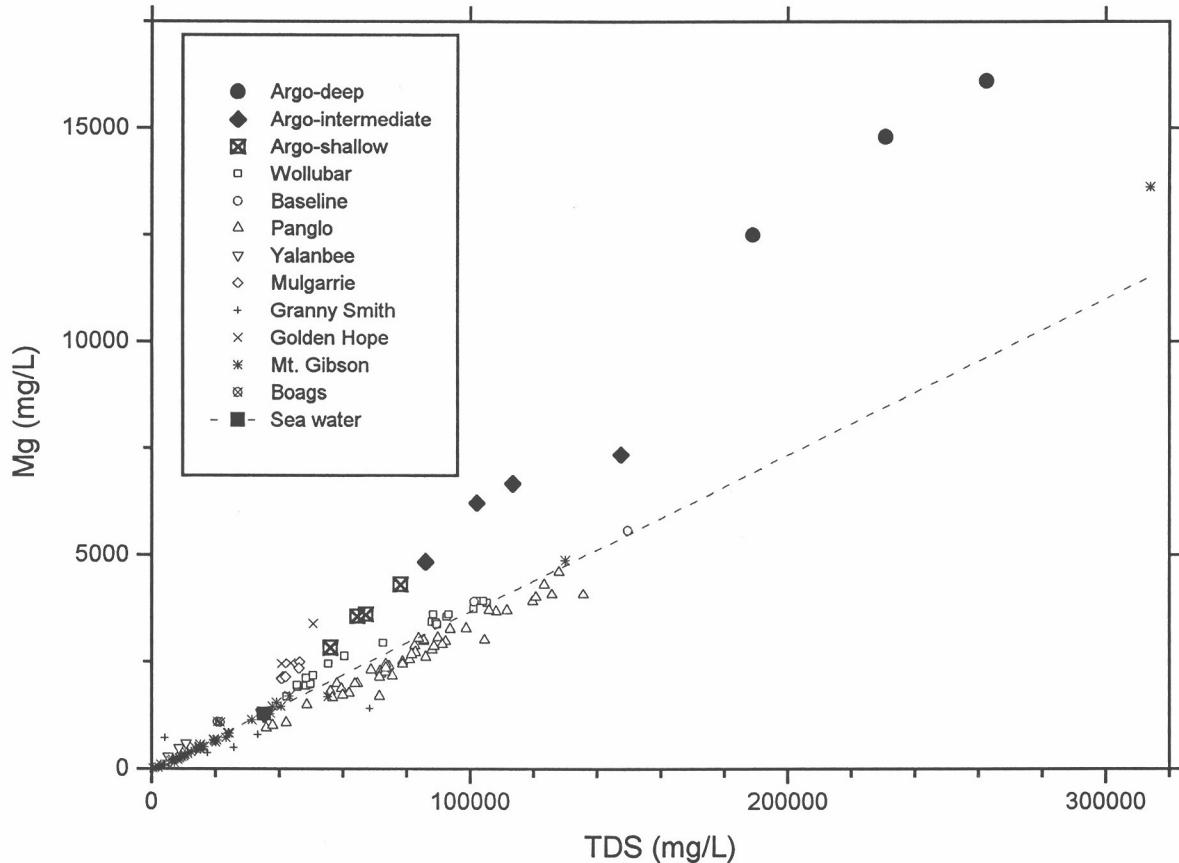


Figure A2.3: Mg vs. TDS for groundwaters from Argo and other sites.

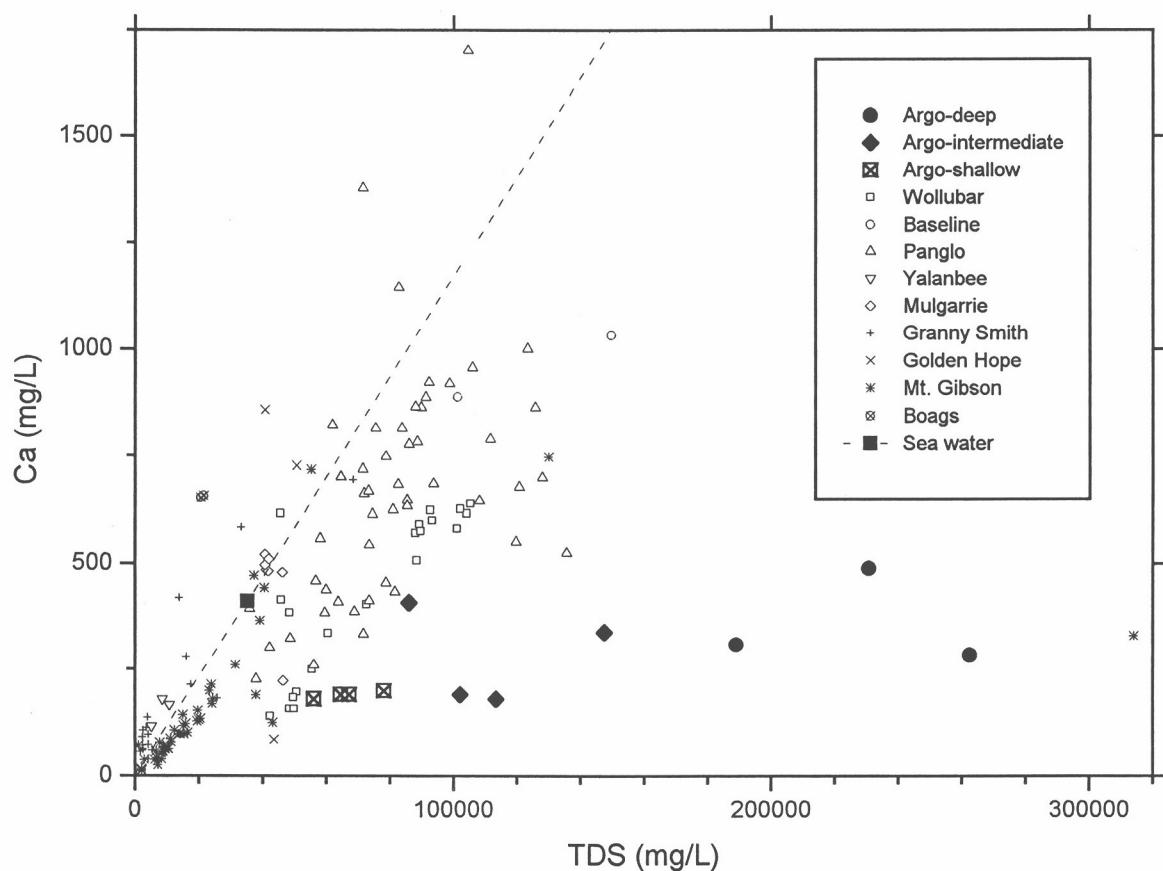


Figure A2.4: Ca vs. TDS for groundwaters from Argo and other sites.

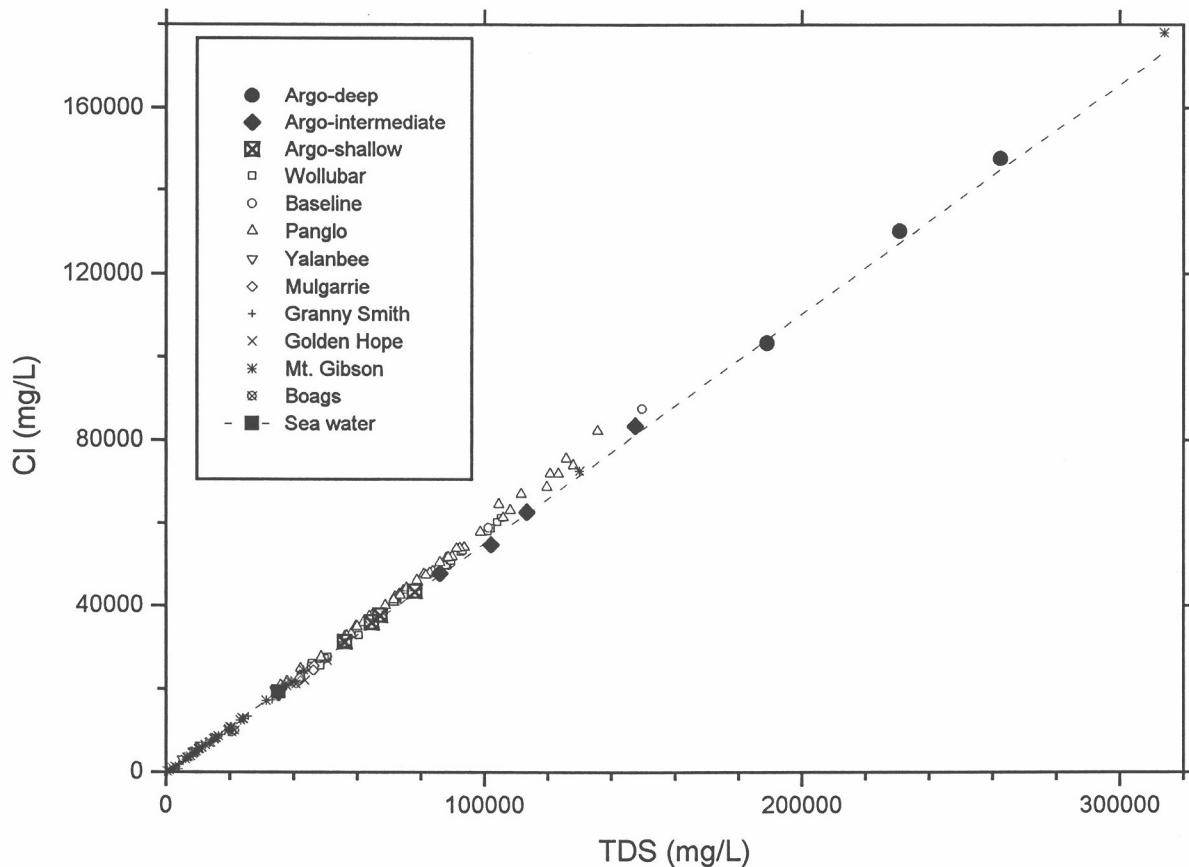


Figure A2.5: Cl vs. TDS for groundwaters from Argo and other sites.

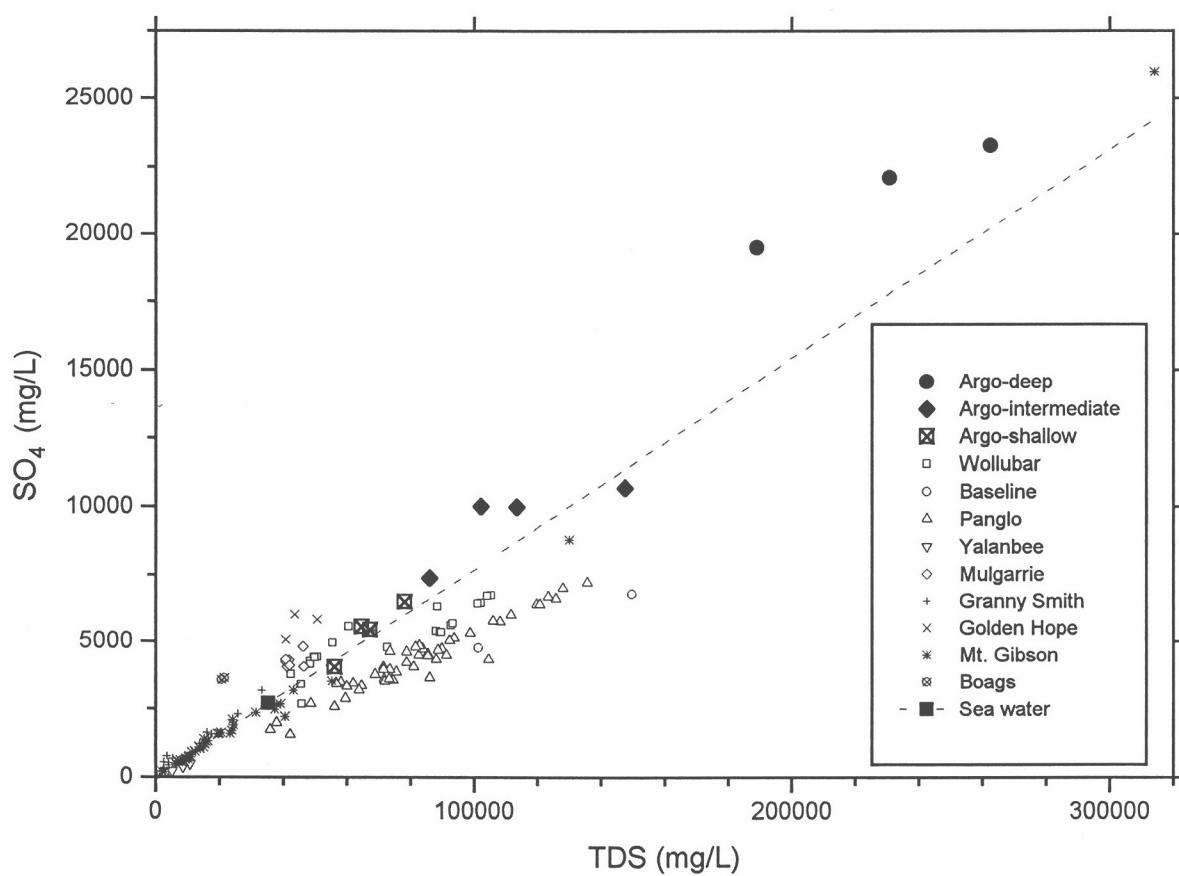


Figure A2.6: SO₄ vs. TDS for groundwaters from Argo and other sites.

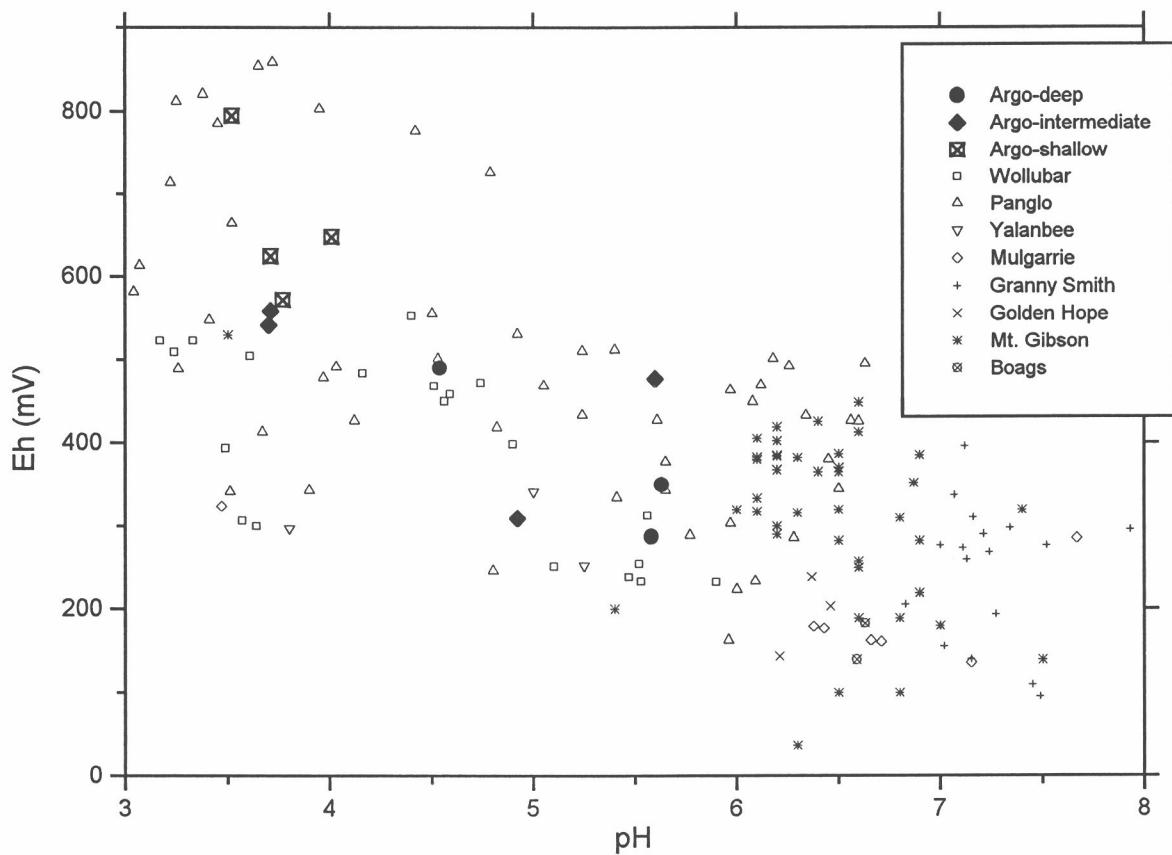


Figure A2.7: Eh vs. pH for groundwaters from Argo and other sites.

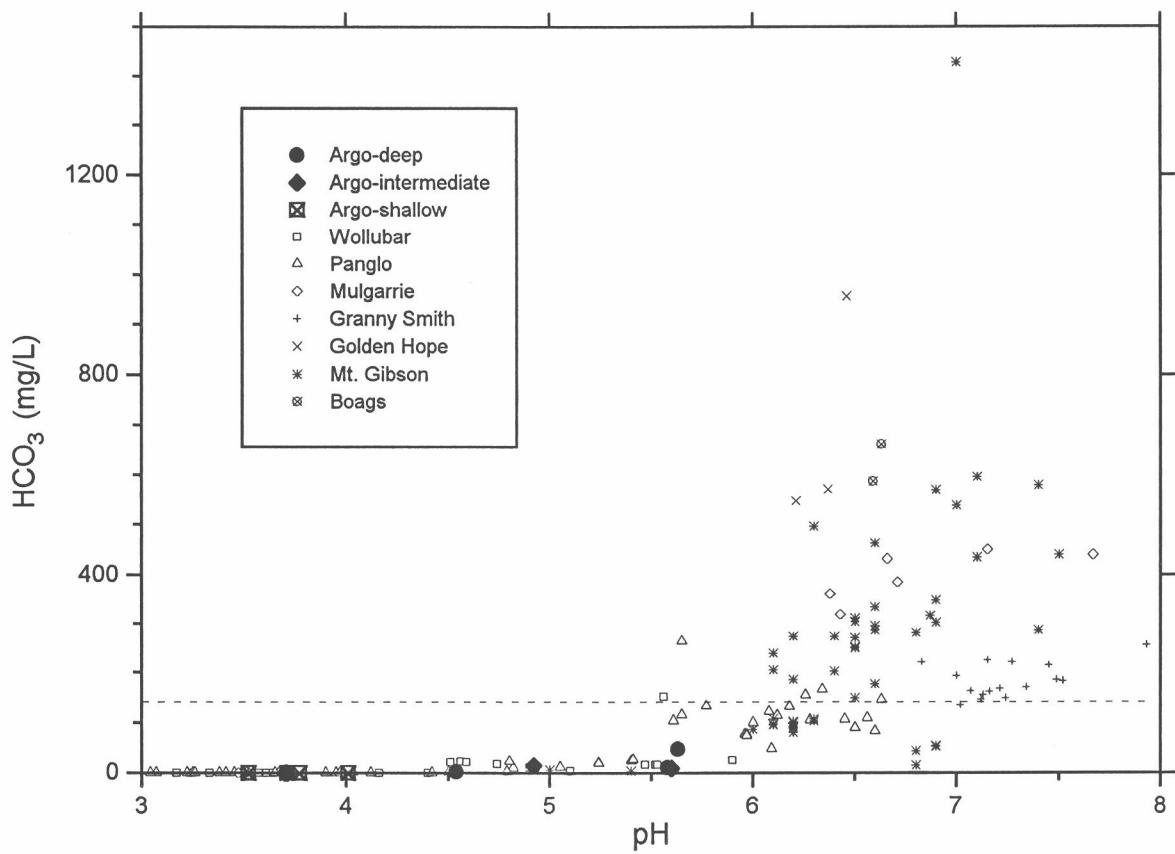


Figure A2.8: HCO₃ vs. pH for groundwaters from Argo and other sites.

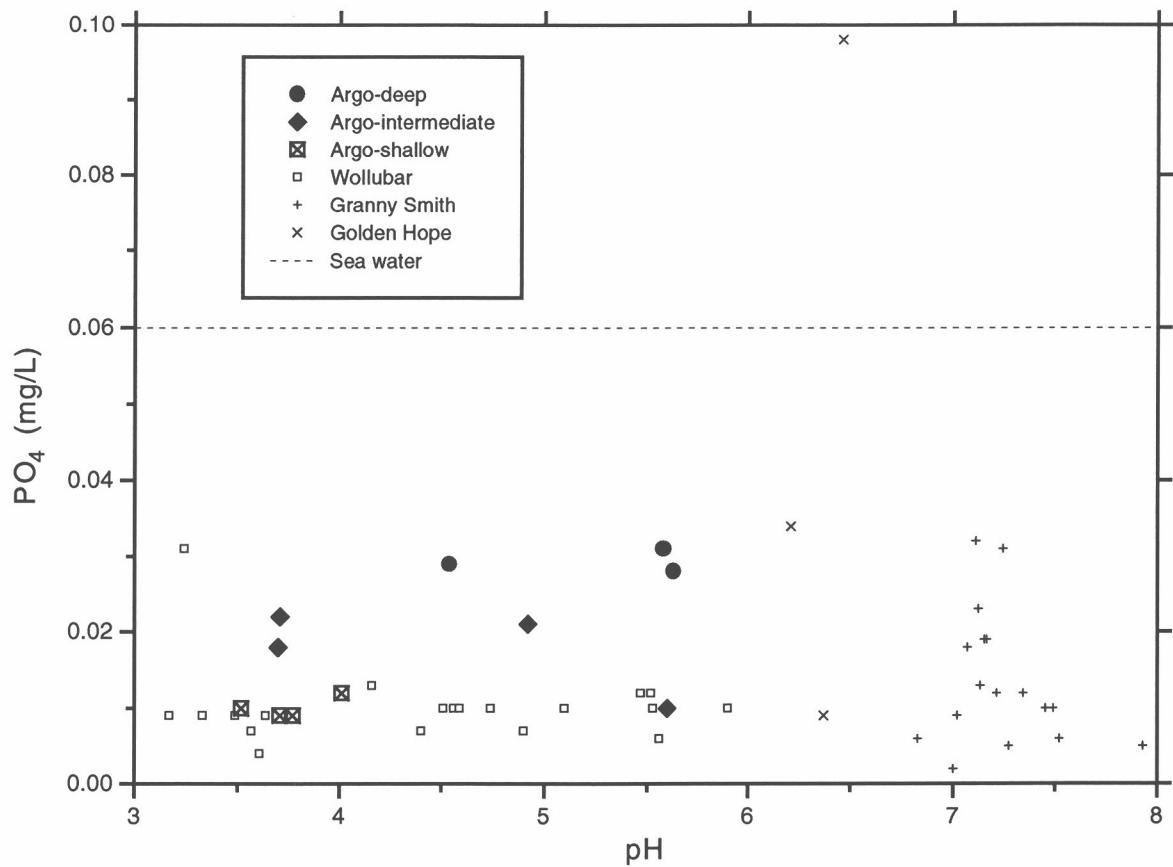


Figure A2.9: PO_4 vs. pH for groundwaters from Argo and other sites.

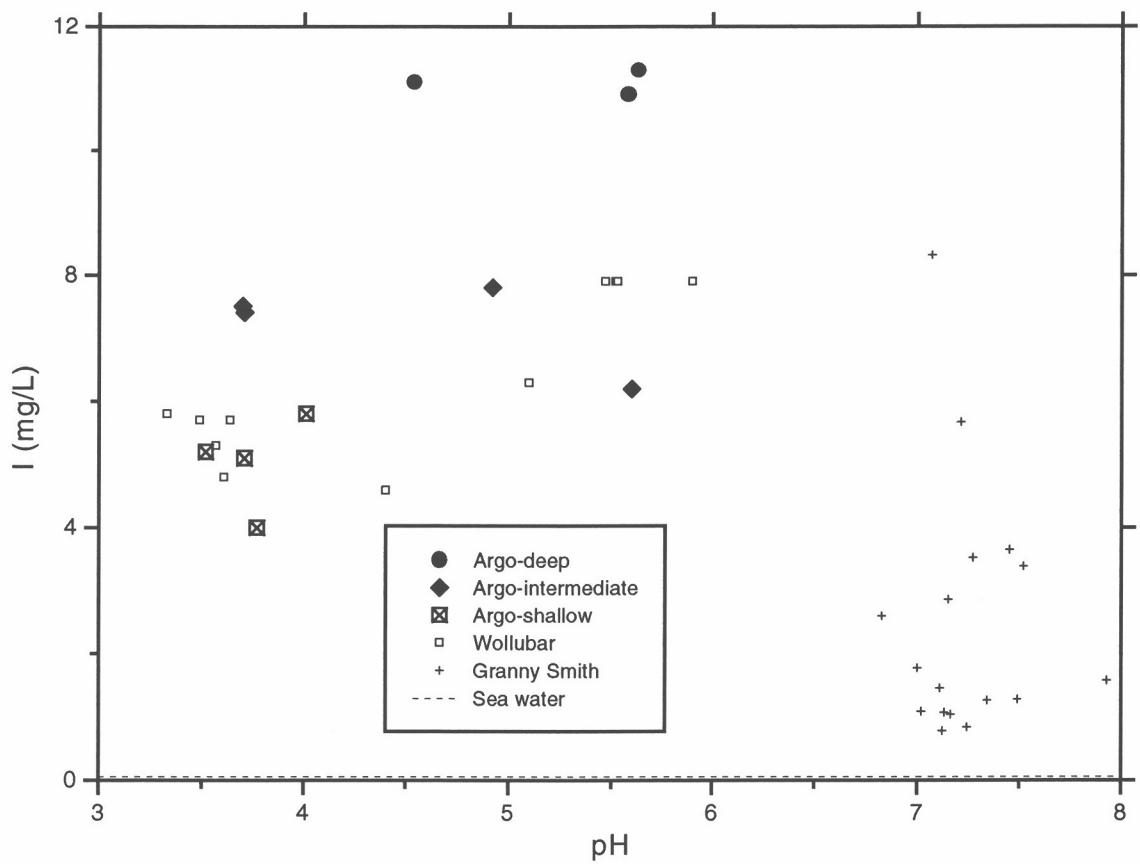


Figure A2.10: I vs. pH for groundwaters from Argo and other sites.

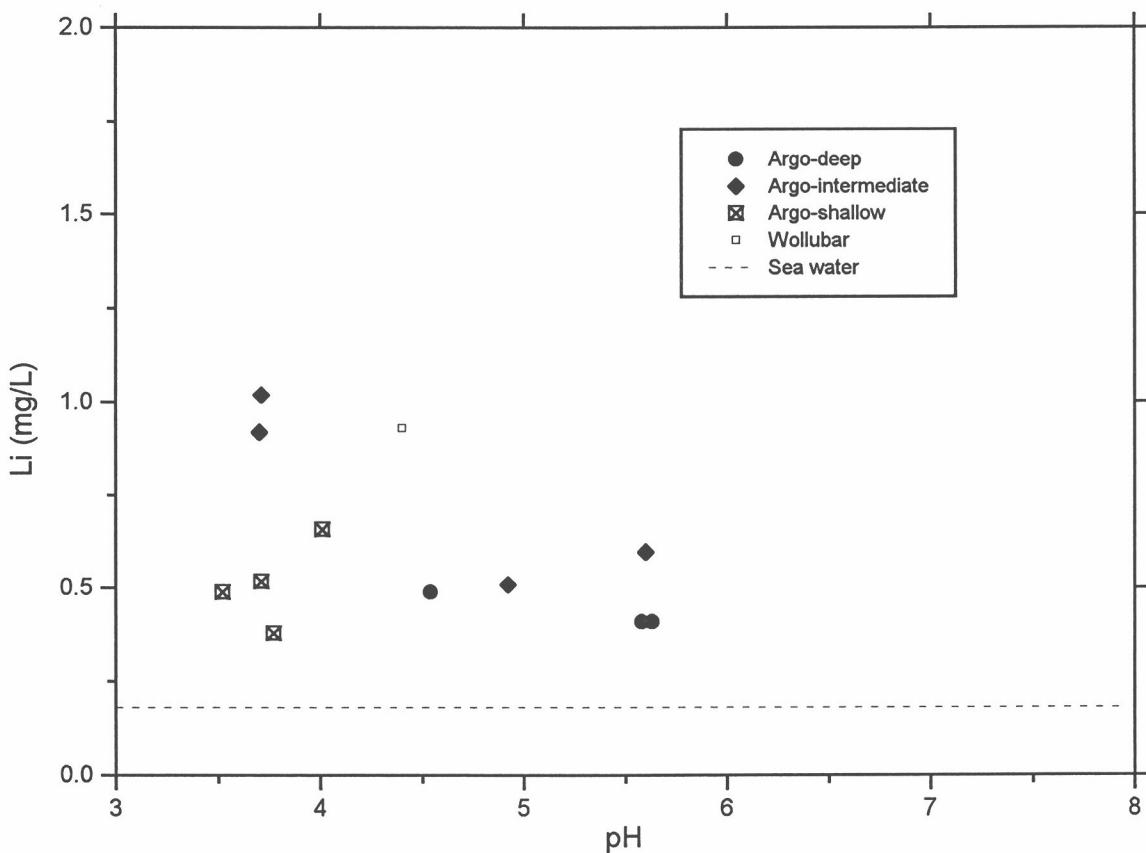


Figure A2.11: Li vs. pH for groundwaters from Argo and other sites.

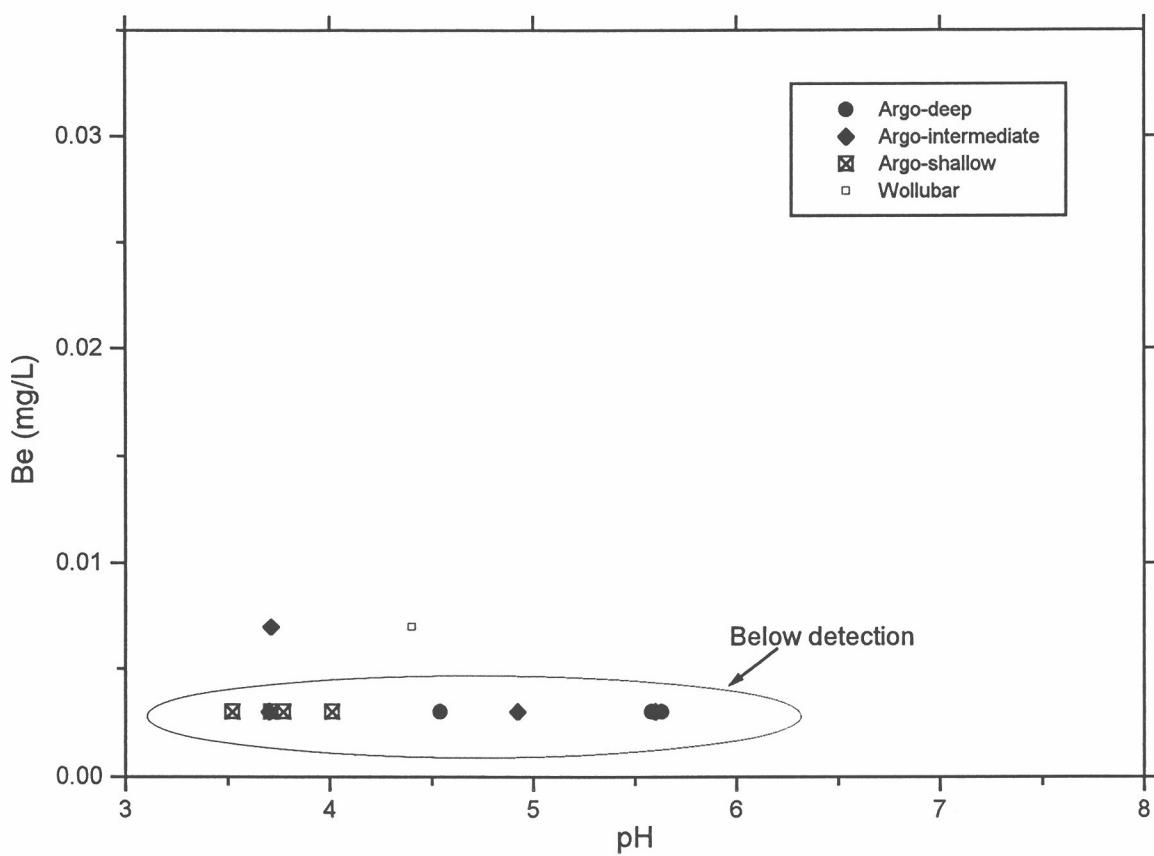


Figure A2.12: Be vs. pH for groundwaters from Argo and other sites.

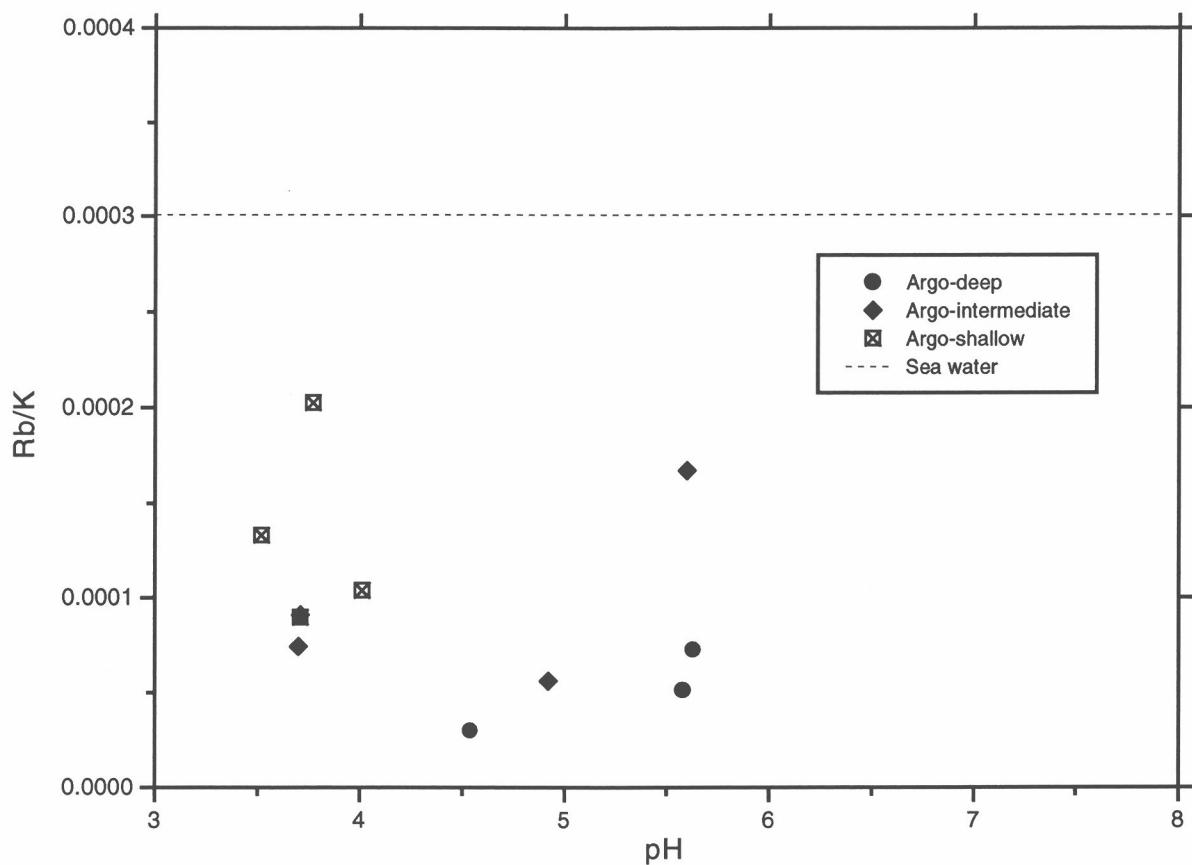


Figure A2.13: Rb/K vs. pH for groundwaters from Argo.

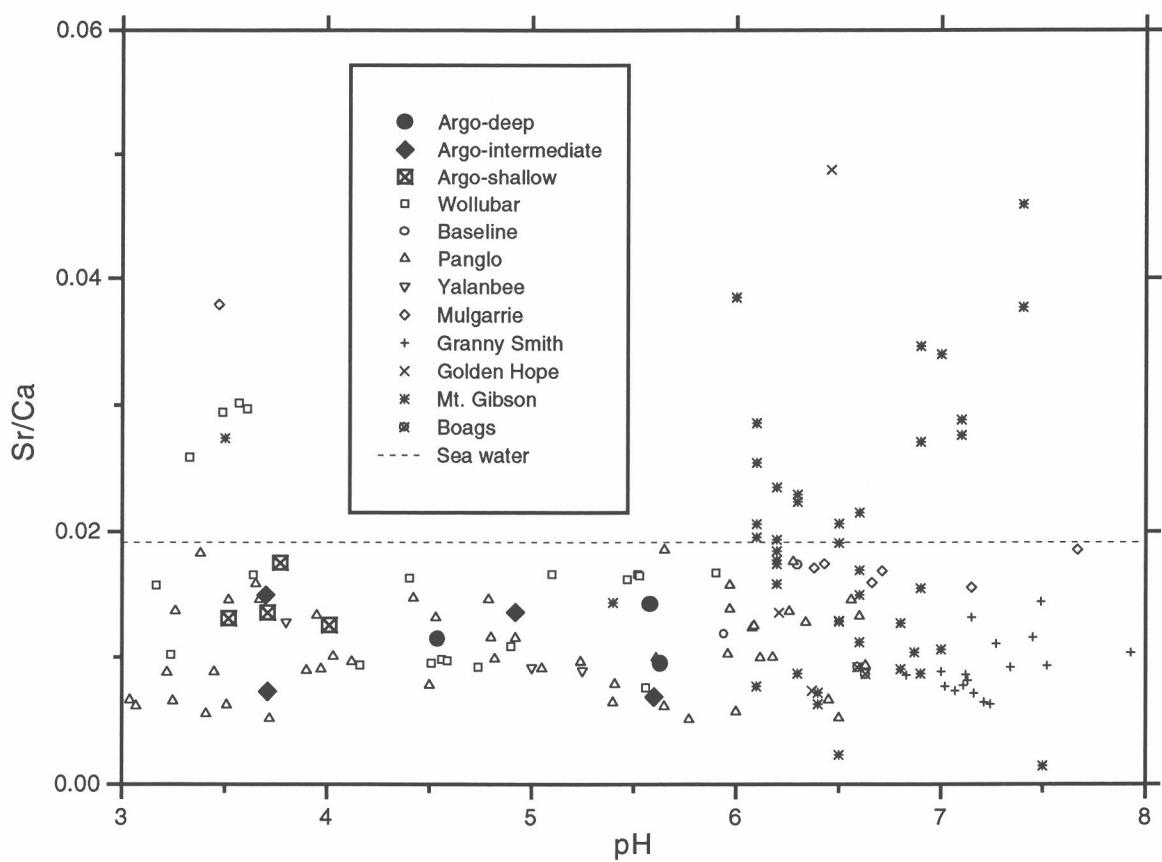


Figure A2.14: Sr/Ca vs. pH for groundwaters from Argo and other sites.

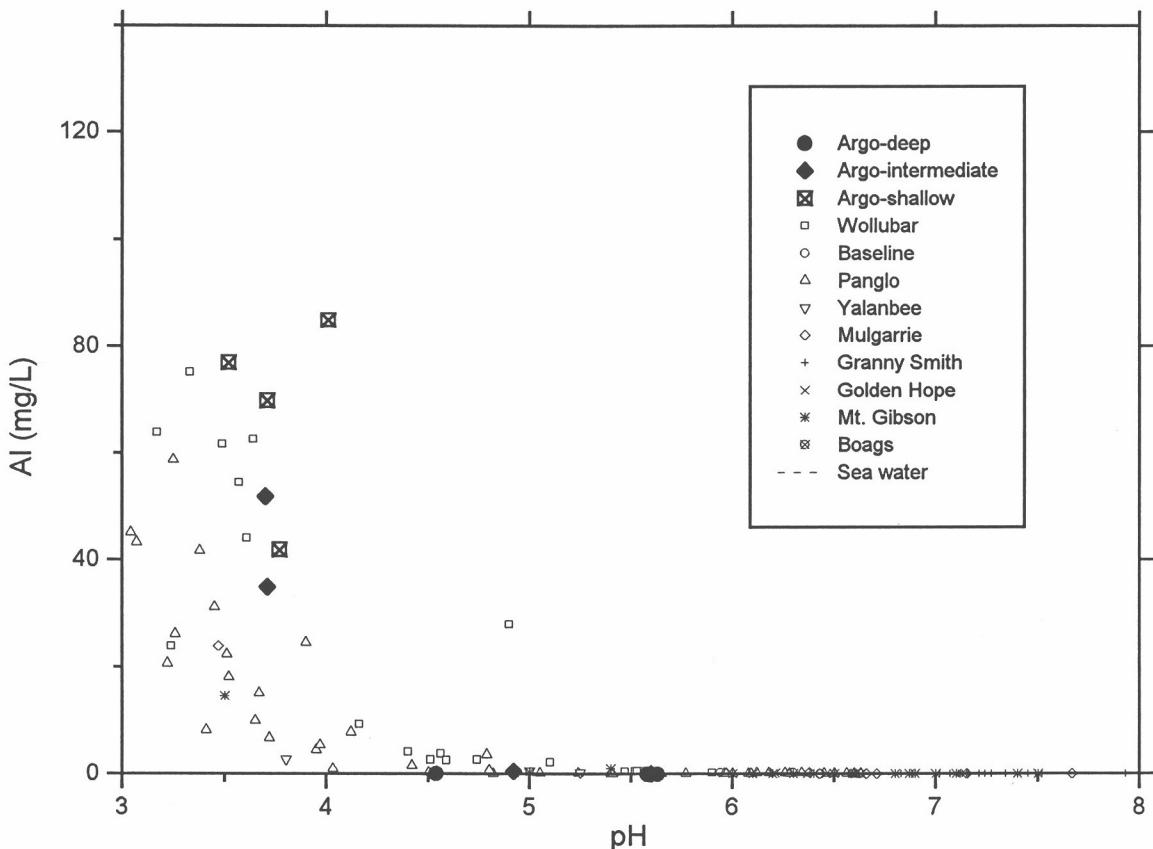


Figure A2.15: Al vs. pH for groundwaters from Argo and other sites.

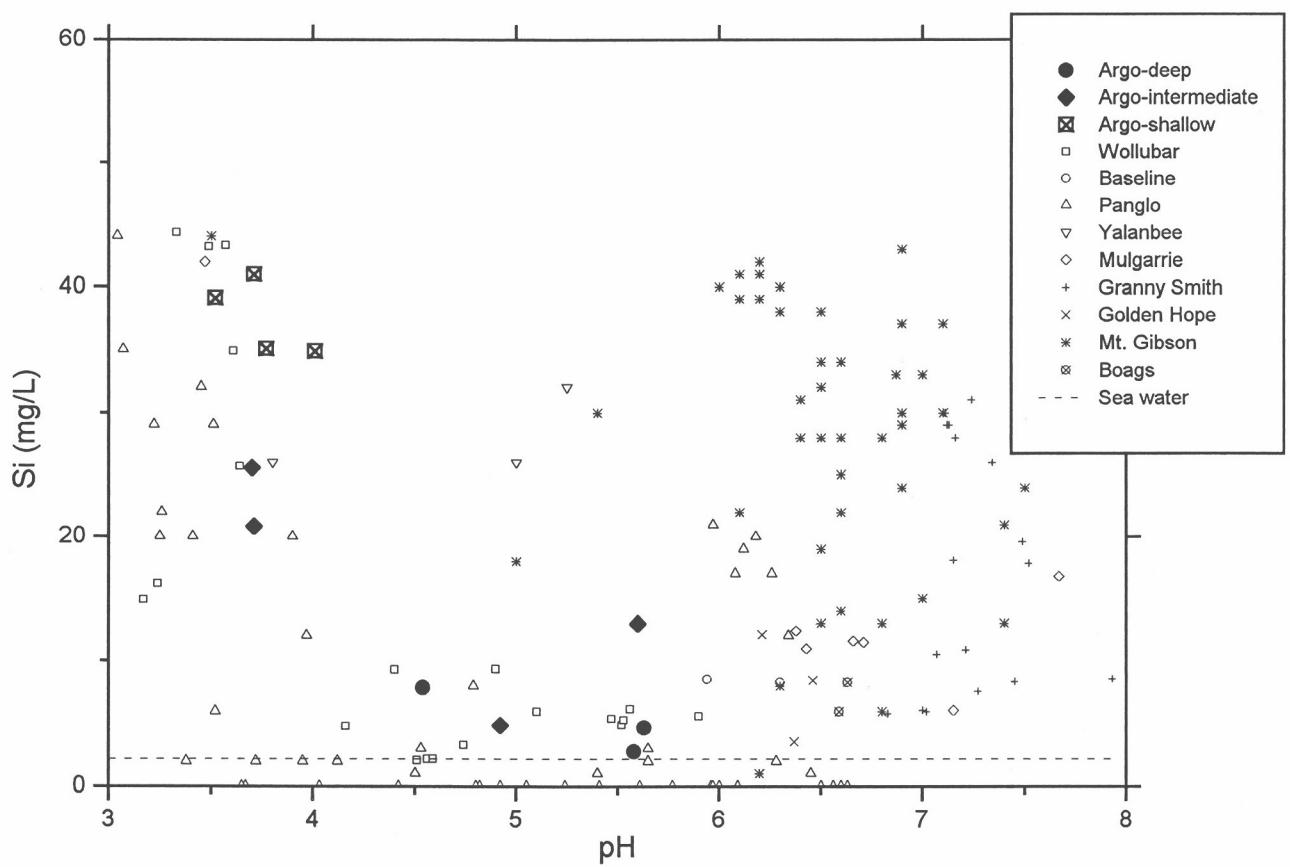


Figure A2.16: Si vs. pH for groundwaters from Argo and other sites.

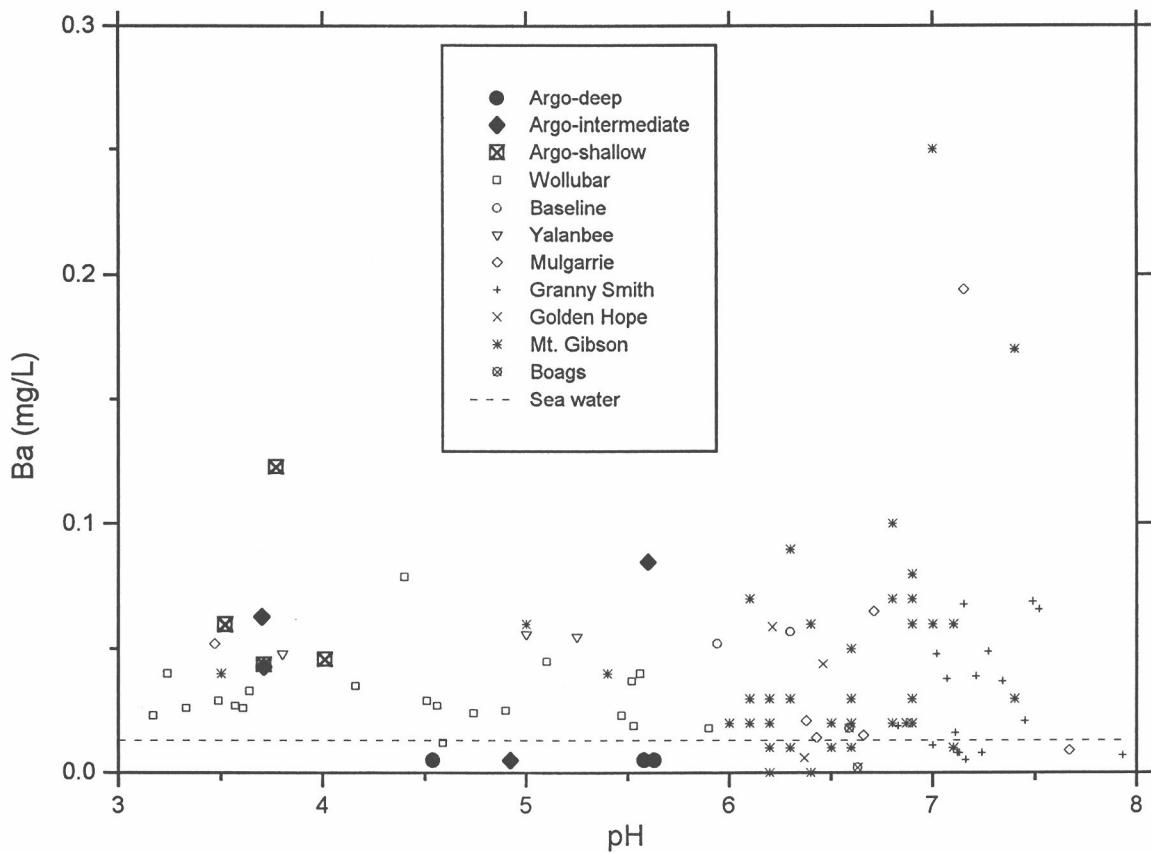


Figure A2.17: Ba vs. pH for groundwaters from Argo and other sites.

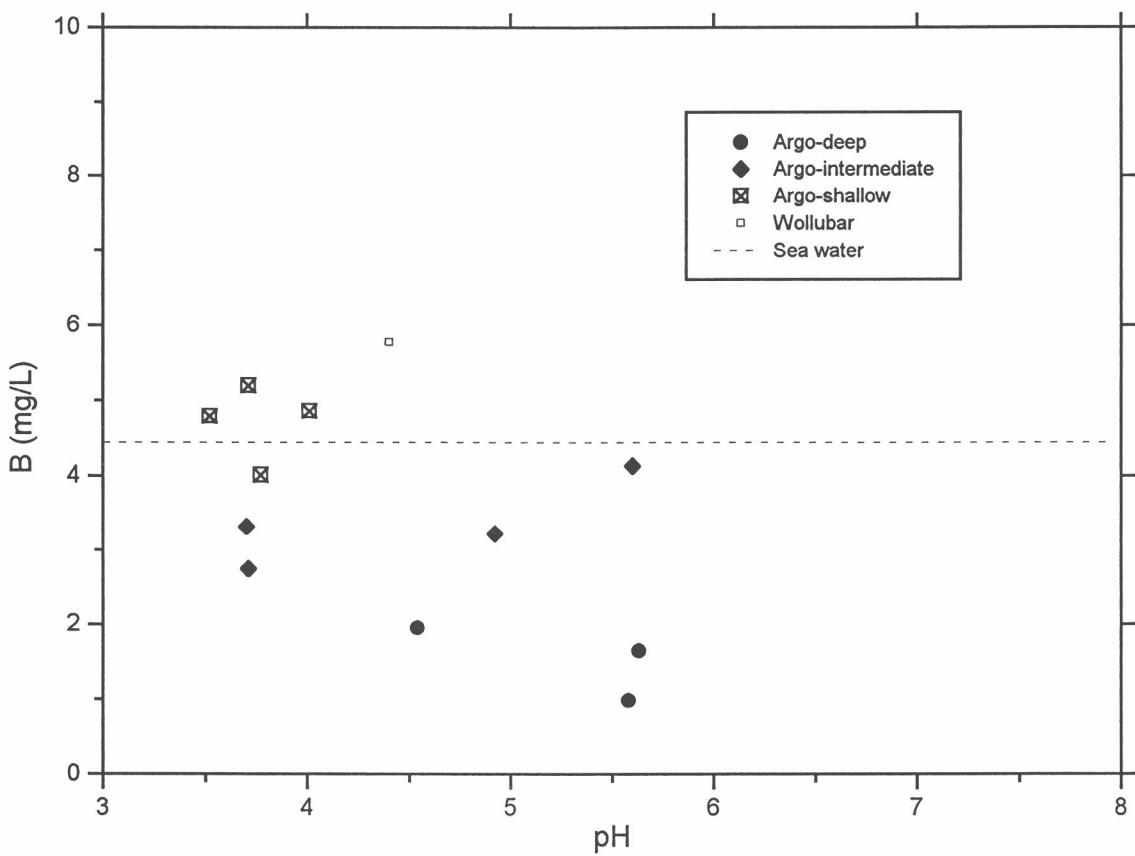


Figure A2.18: B vs. pH for groundwaters from Argo and other sites.

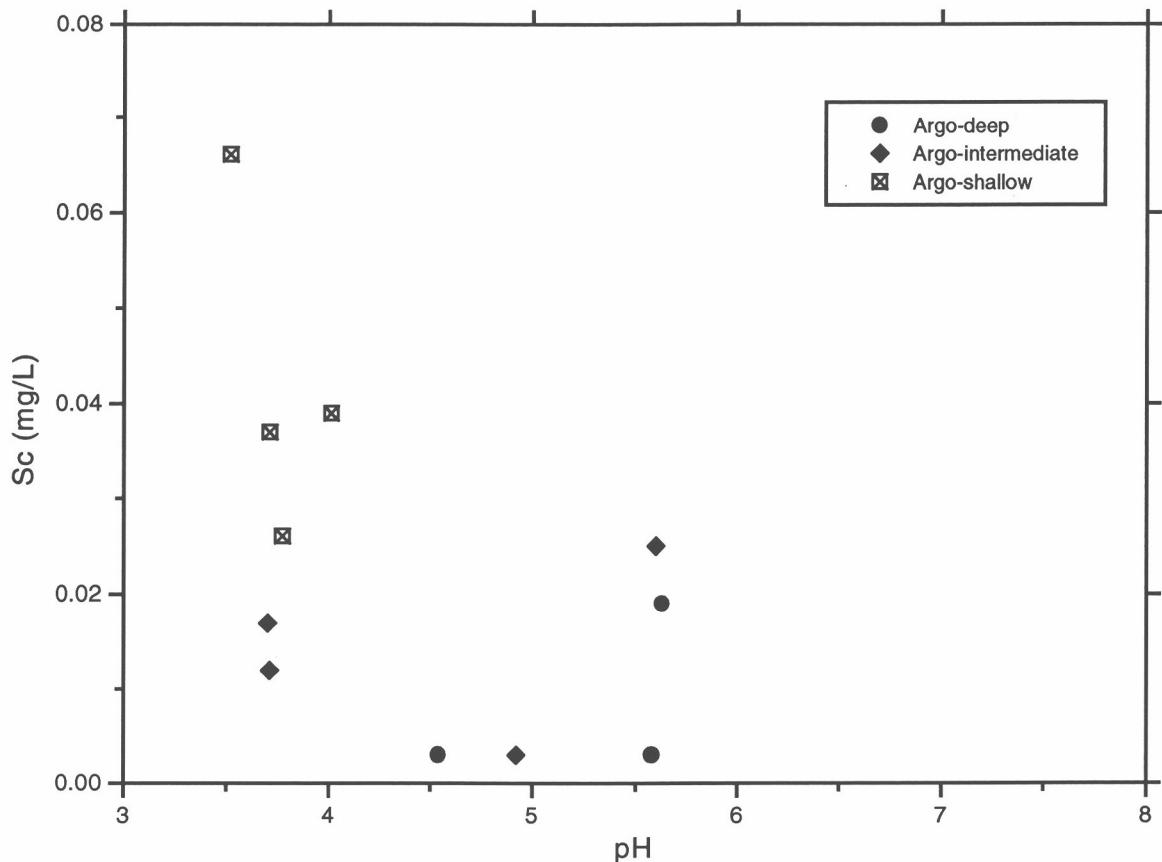


Figure A2.19: Sc vs. pH for groundwaters from Argo.

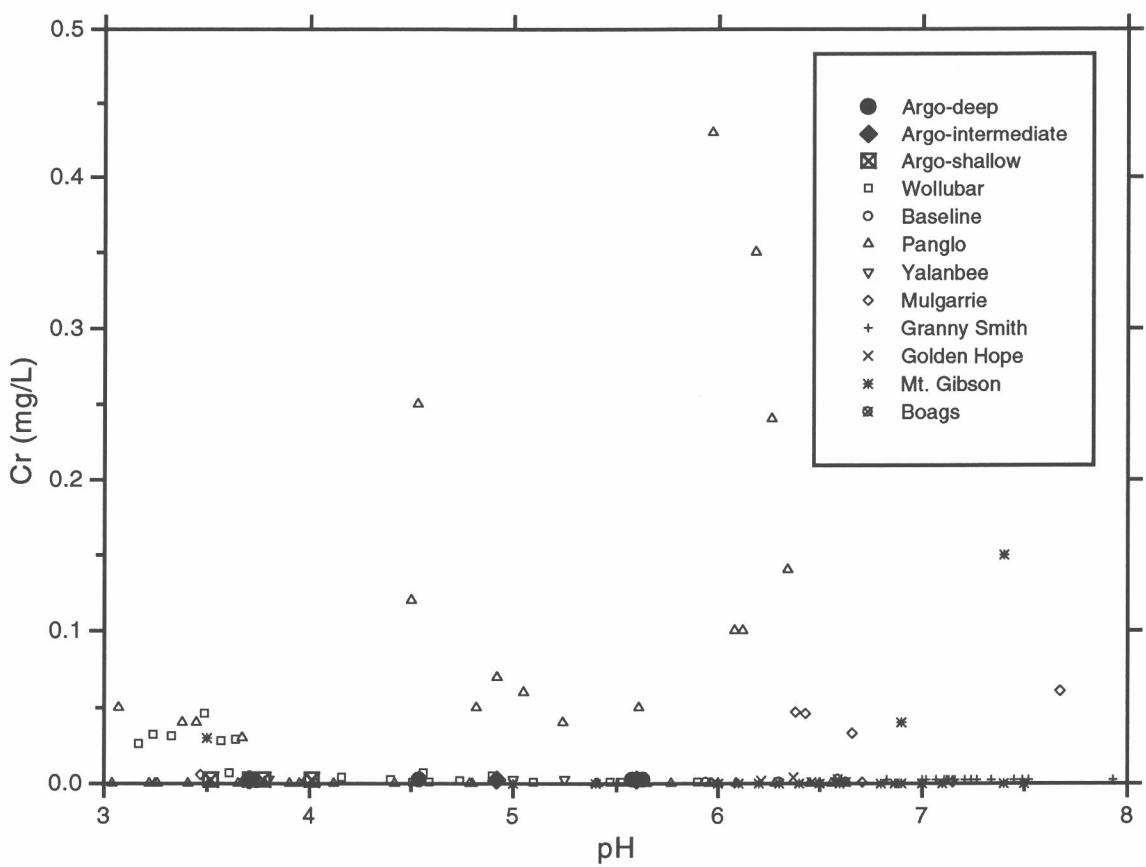


Figure A2.20: Cr vs. pH for groundwaters from Argo and other sites.

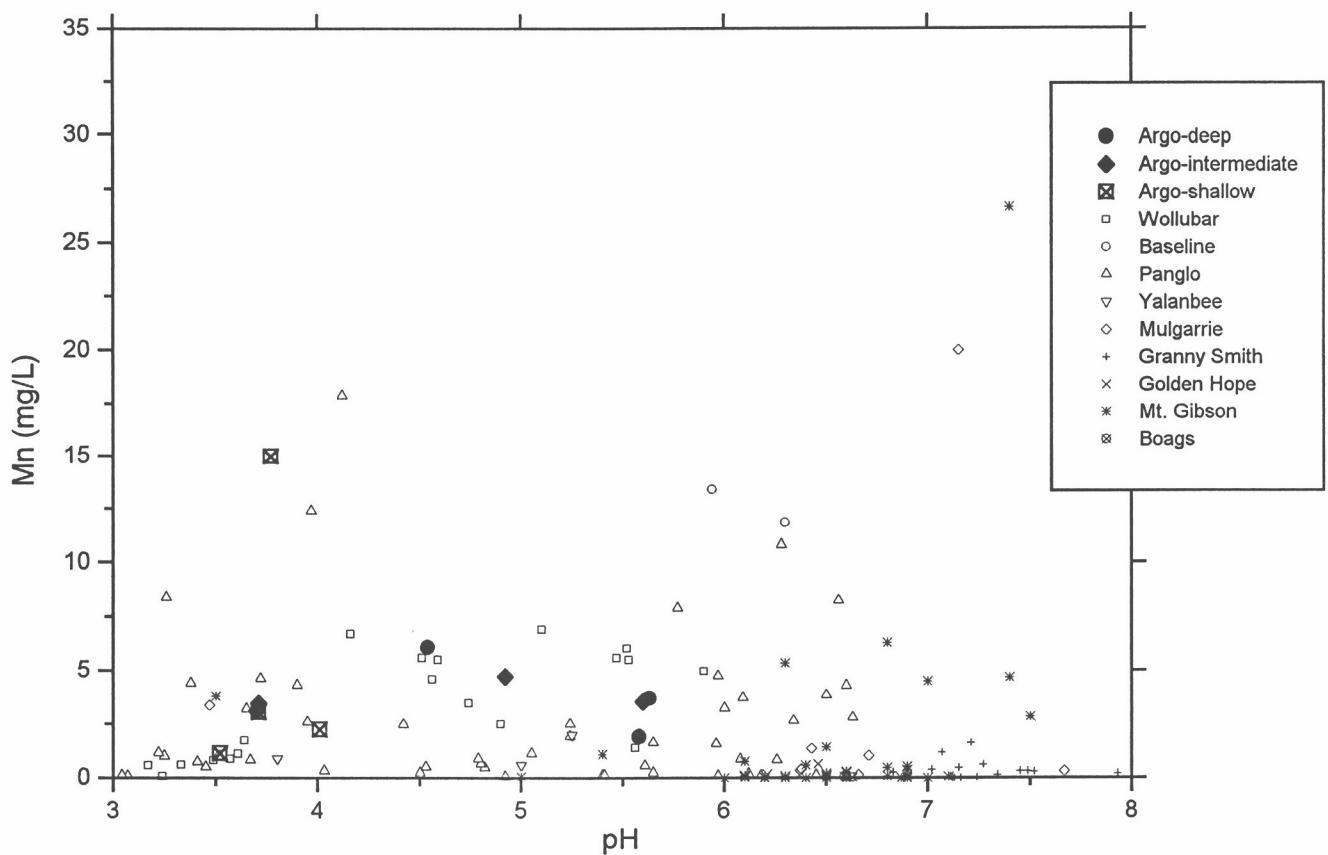


Figure A2.21: Mn vs. pH for groundwaters from Argo and other sites.

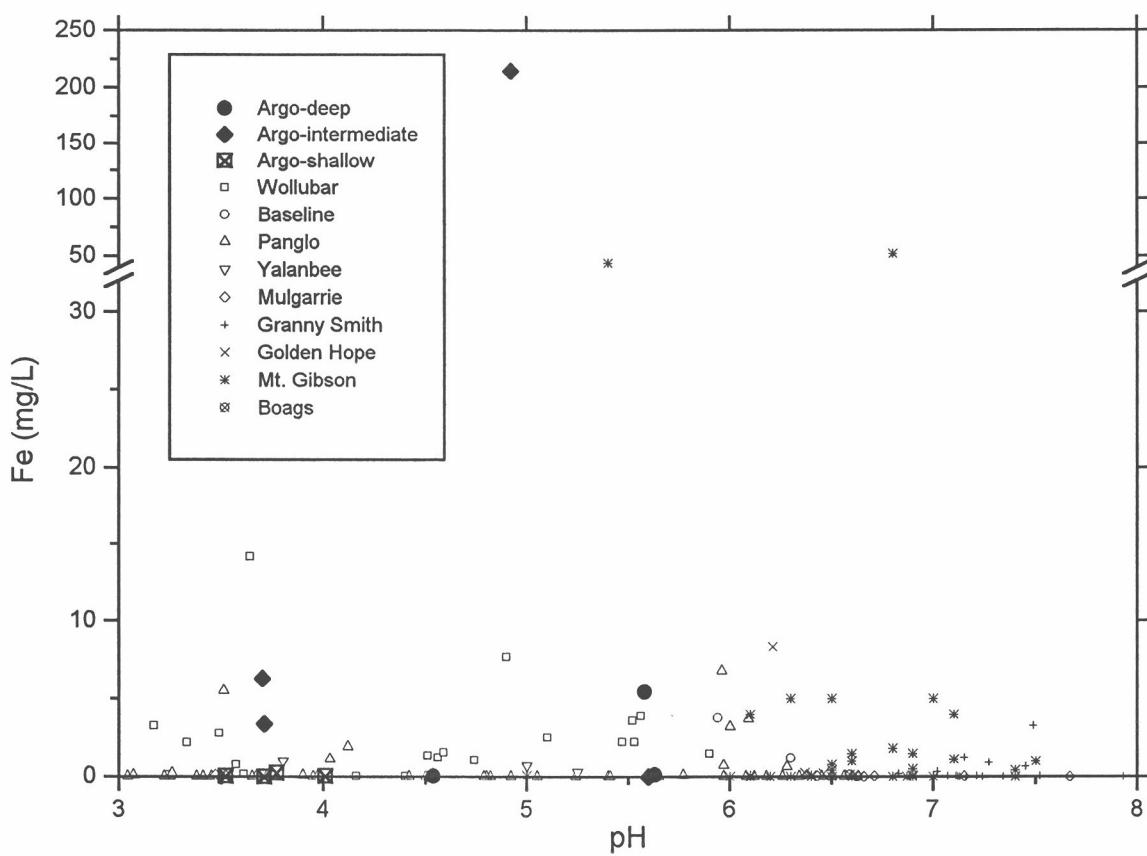


Figure A2.22: Fe vs. pH for groundwaters from Argo and other sites.

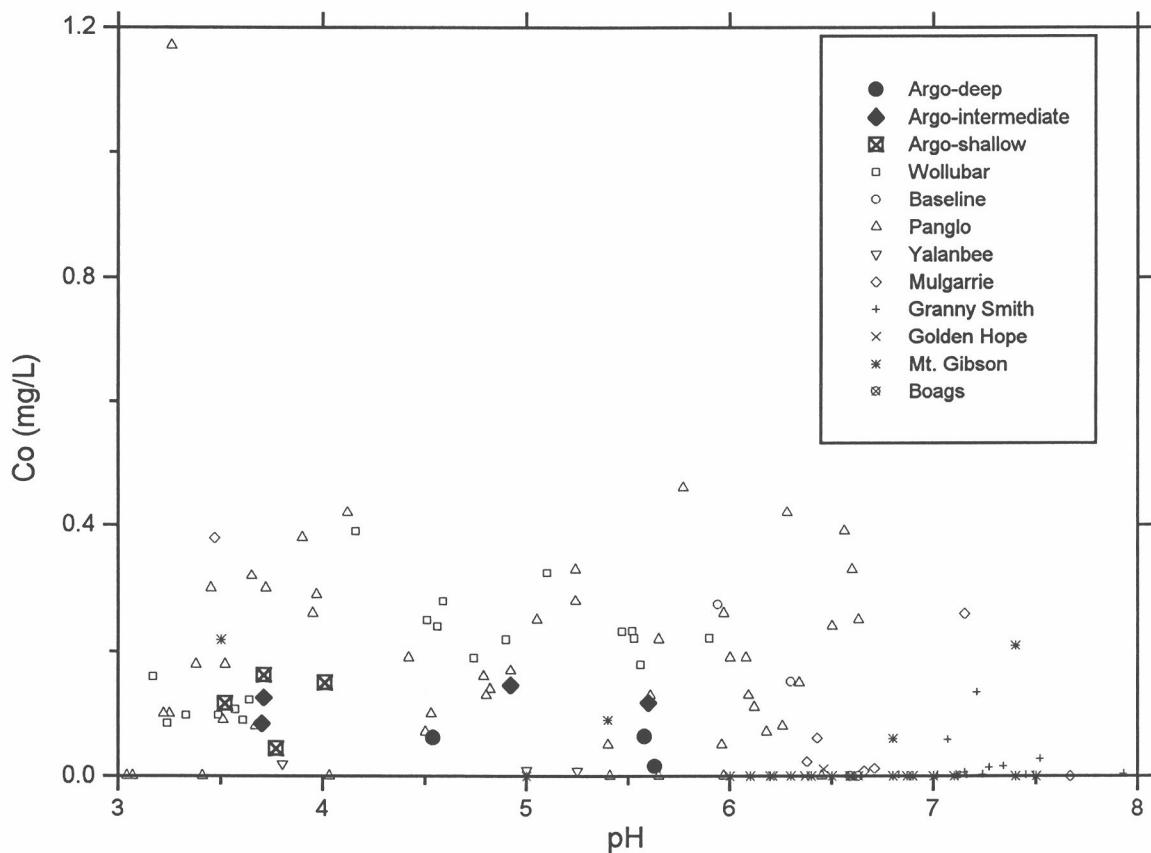


Figure A2.23: Co vs. pH for groundwaters from Argo and other sites.

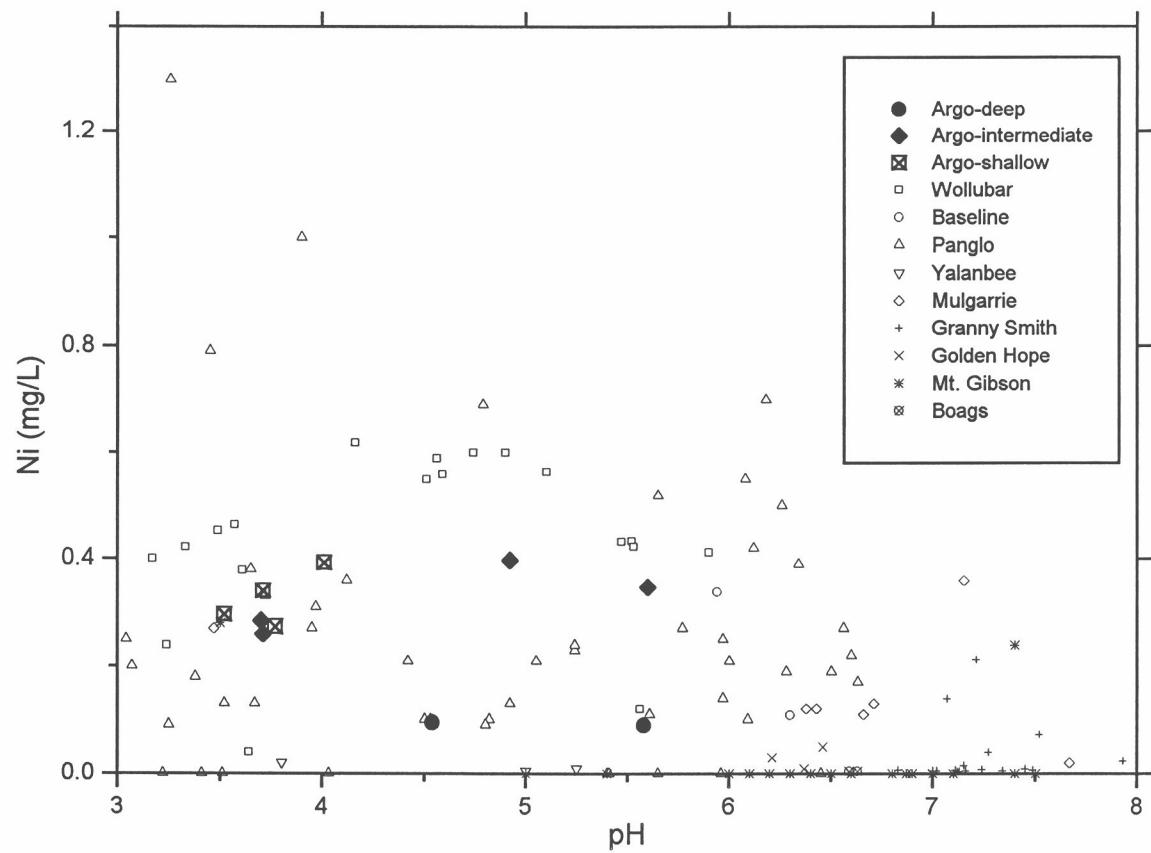


Figure A2.24: Ni vs. pH for groundwaters from Argo and other sites.

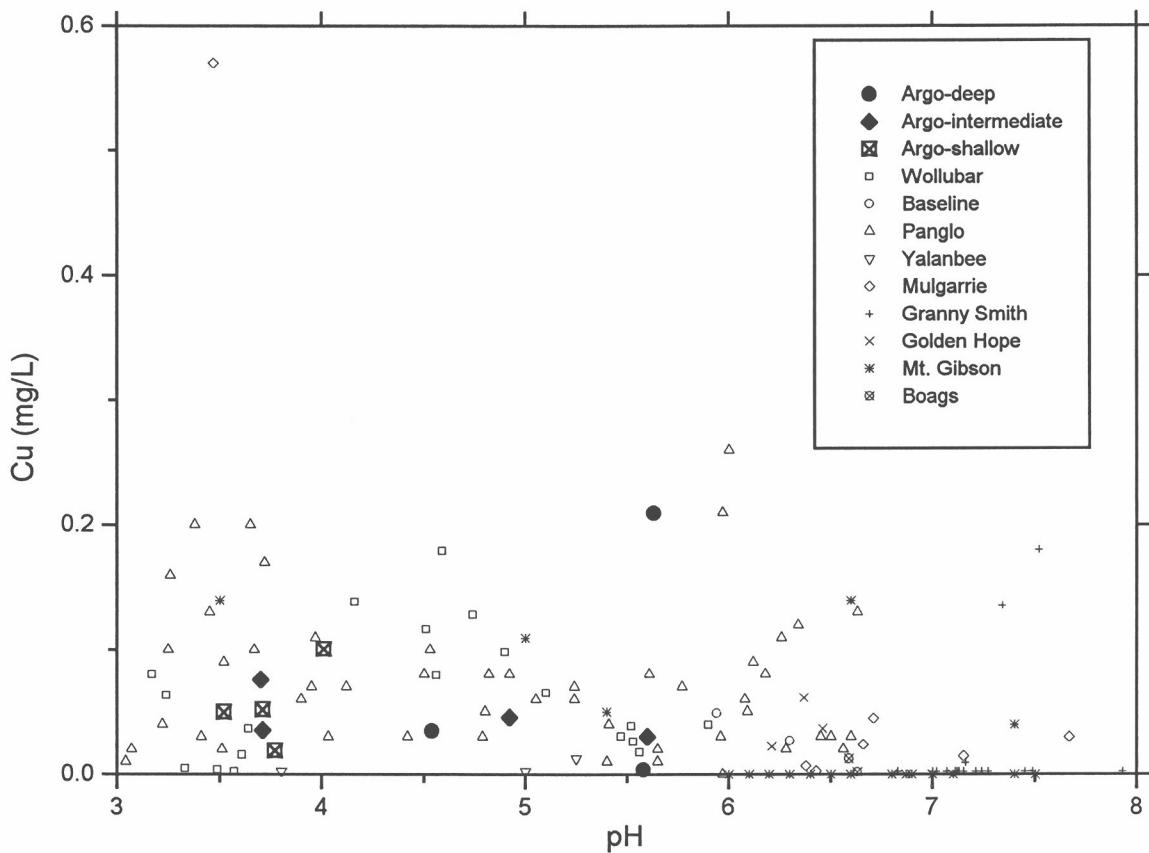


Figure A2.25: Cu vs. pH for groundwaters from Argo and other sites.

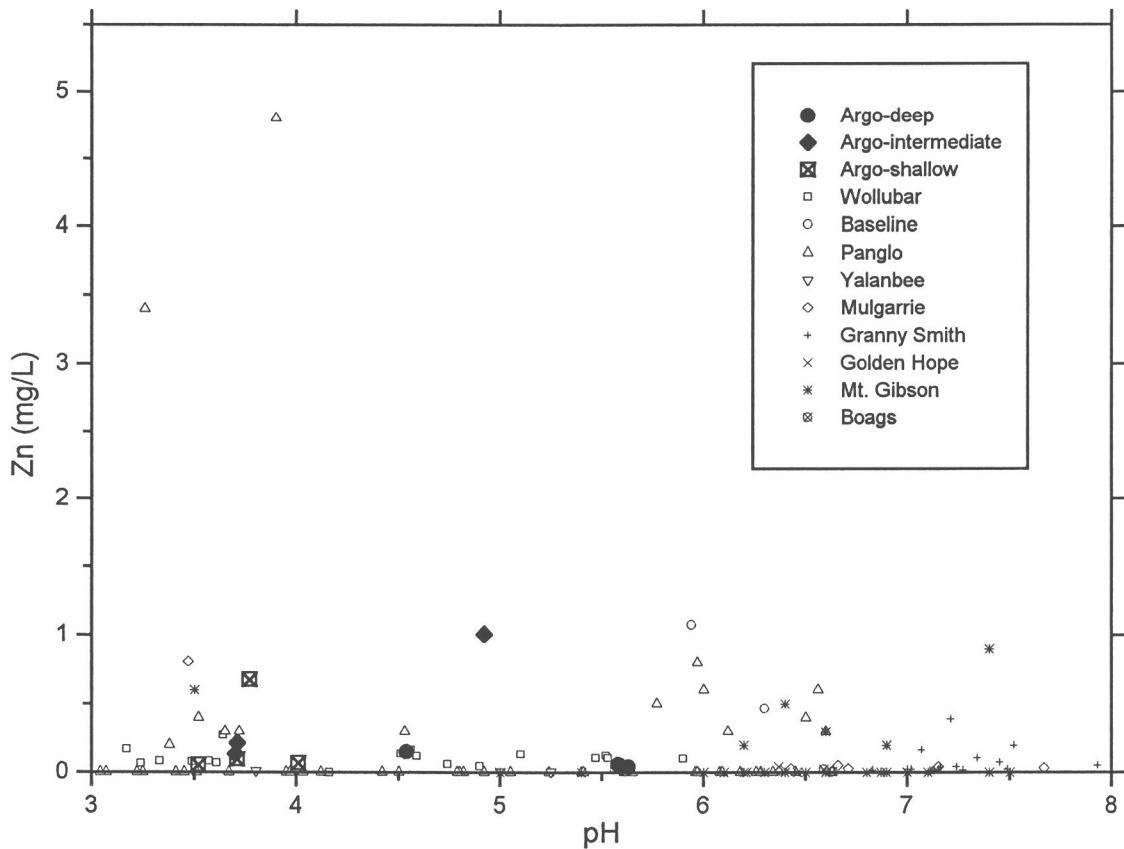


Figure A2.26: Zn vs. pH for groundwaters from Argo and other sites.

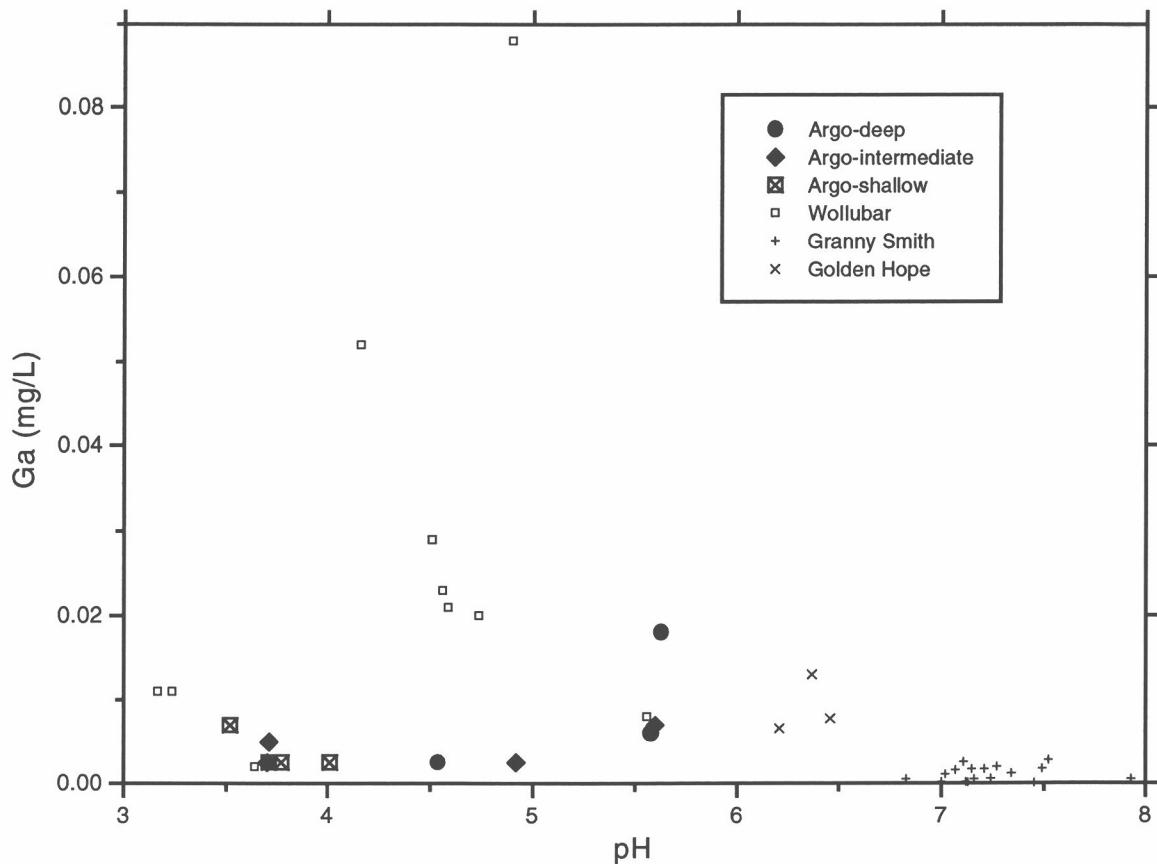


Figure A2.27: Ga vs. pH for groundwaters from Argo and other sites.

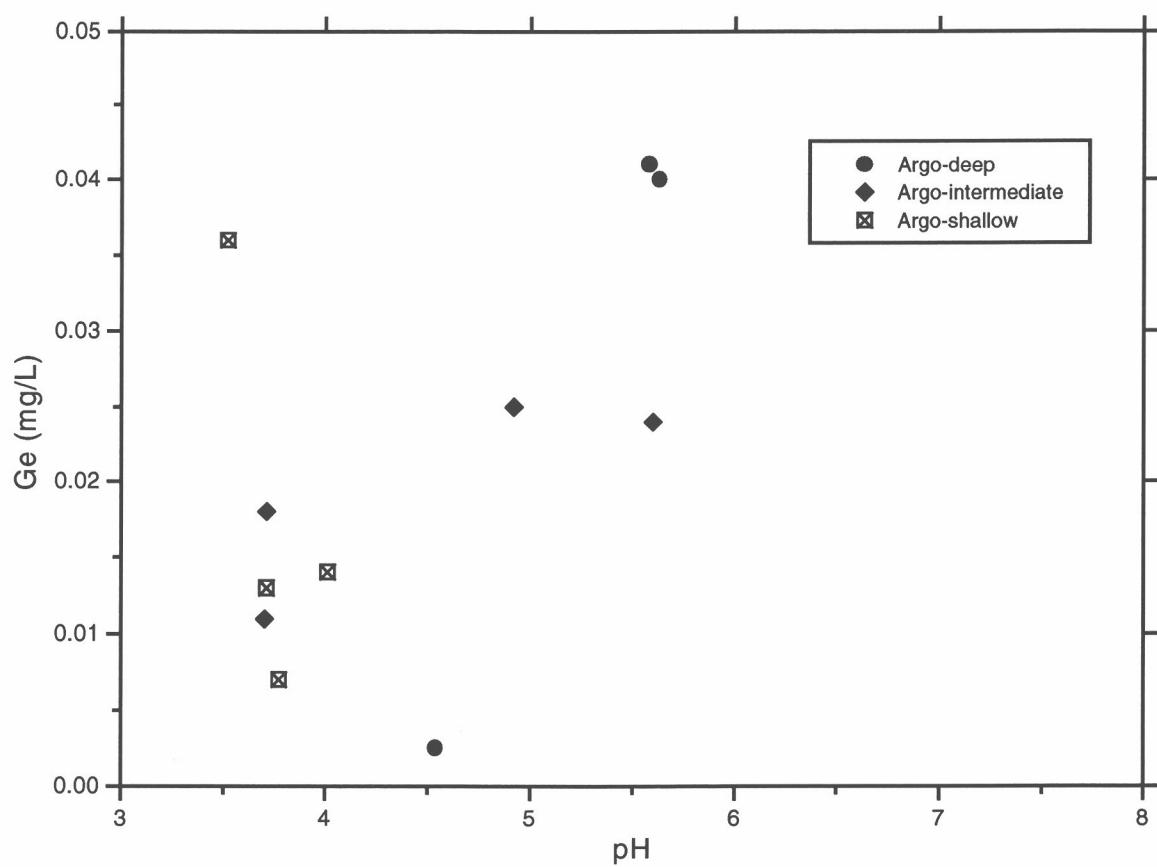


Figure A2.28: Ge vs. pH for groundwaters from Argo.

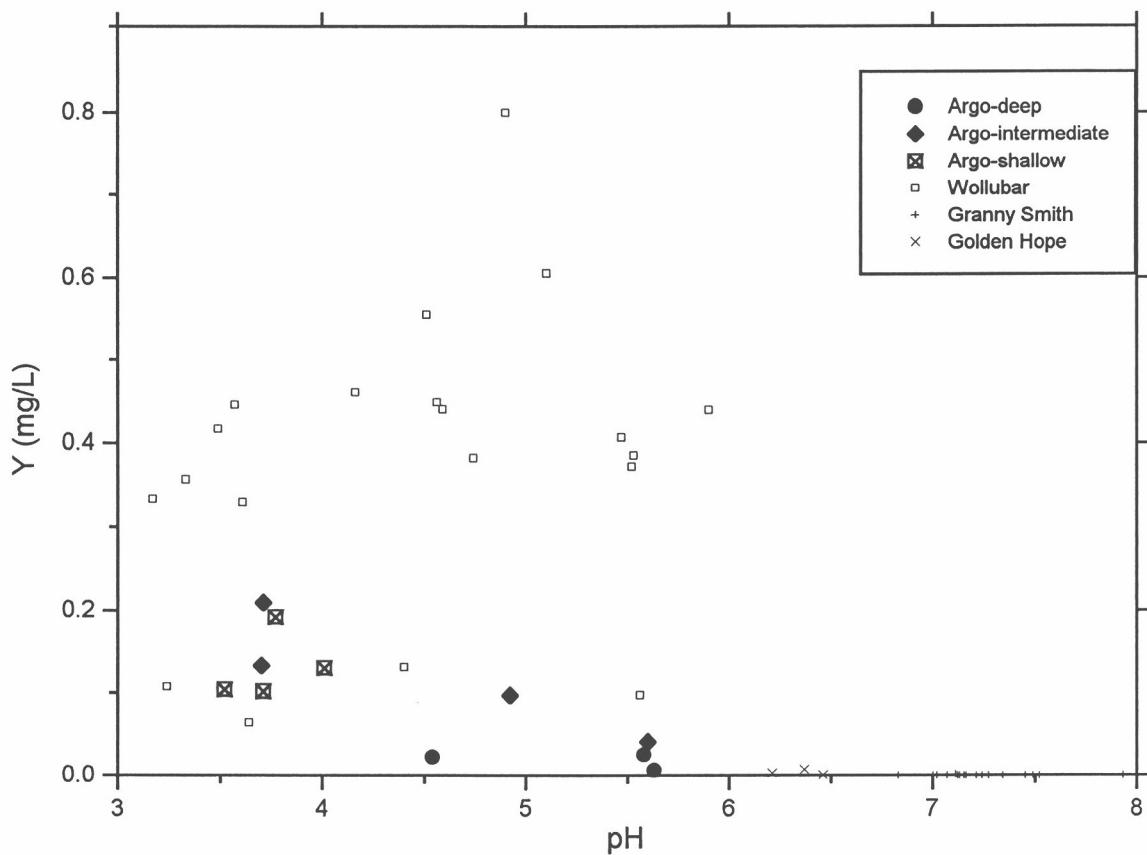


Figure A2.29: Y vs. pH for groundwaters from Argo and other sites.

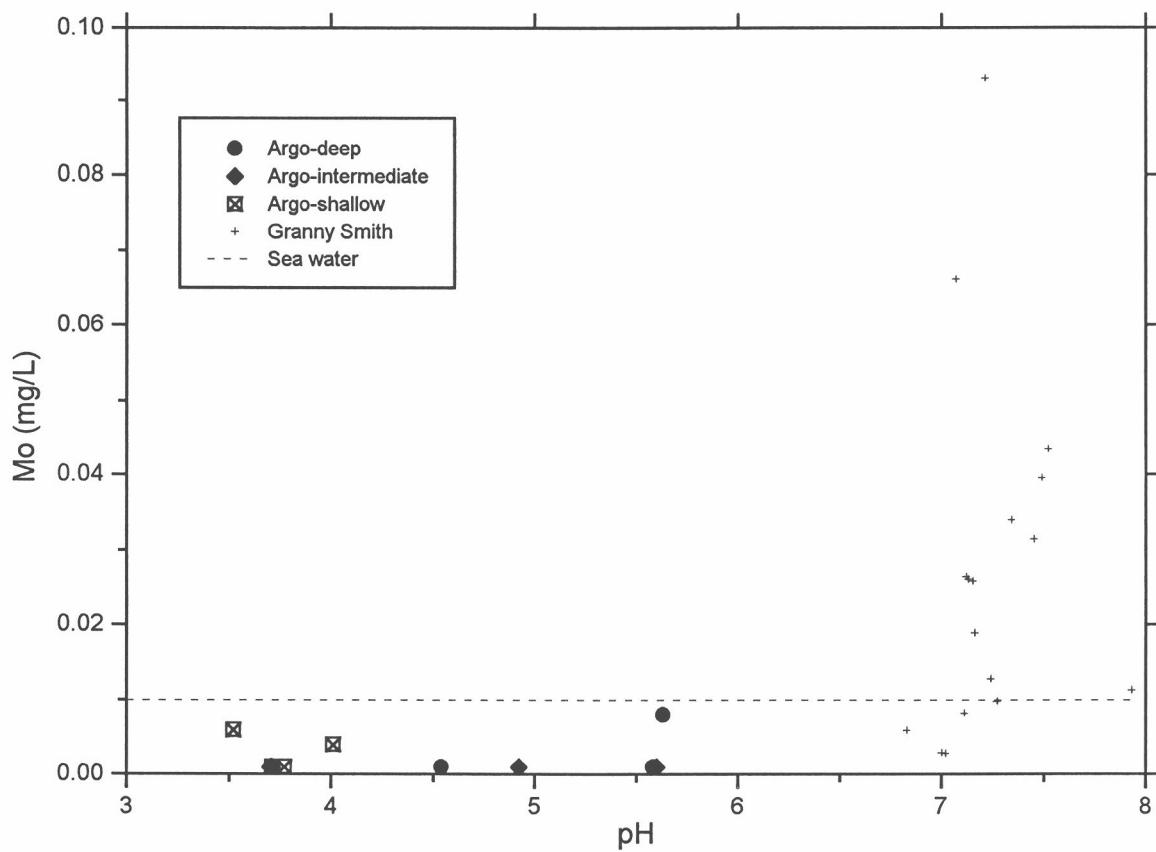


Figure A2.30: Mo vs. pH for groundwaters from Argo and other sites.

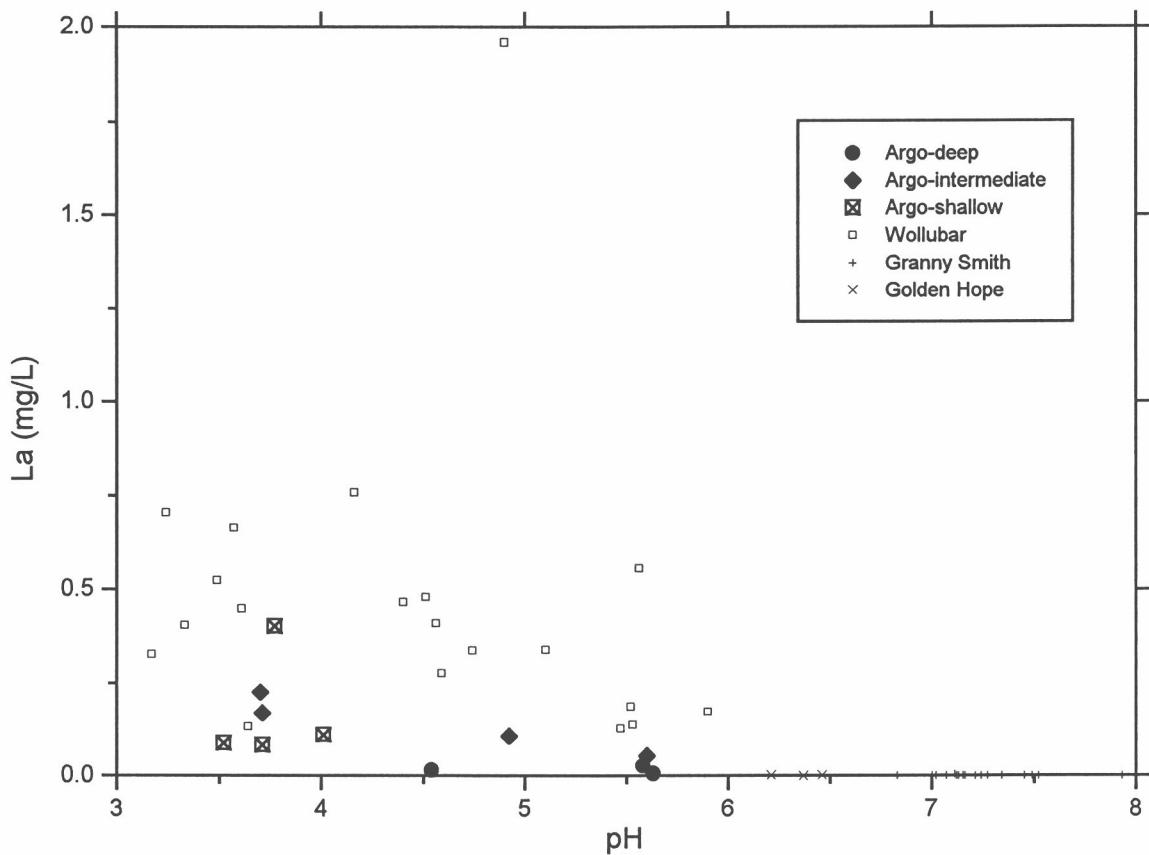


Figure A2.31: La vs. pH for groundwaters from Argo and other sites.

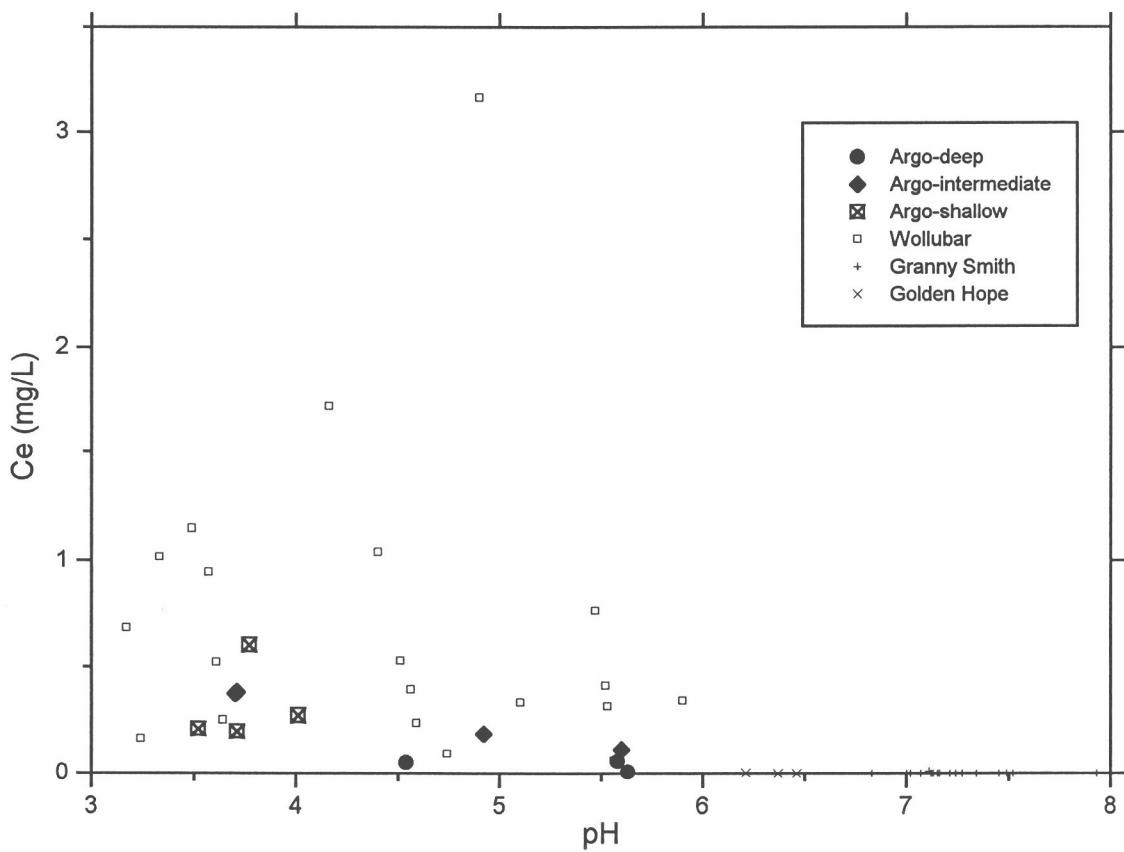


Figure A2.32: Ce vs. pH for groundwaters from Argo and other sites.

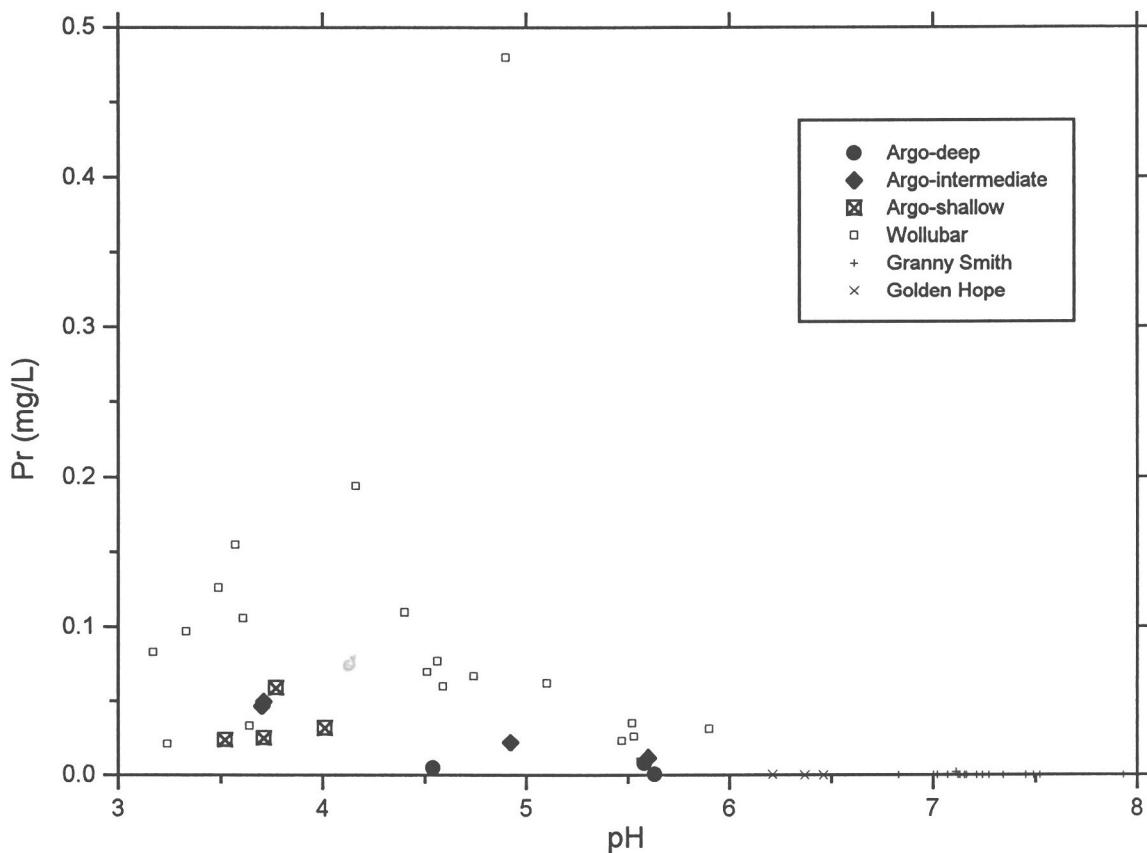


Figure A2.33: Pr vs. pH for groundwaters from Argo and other sites.

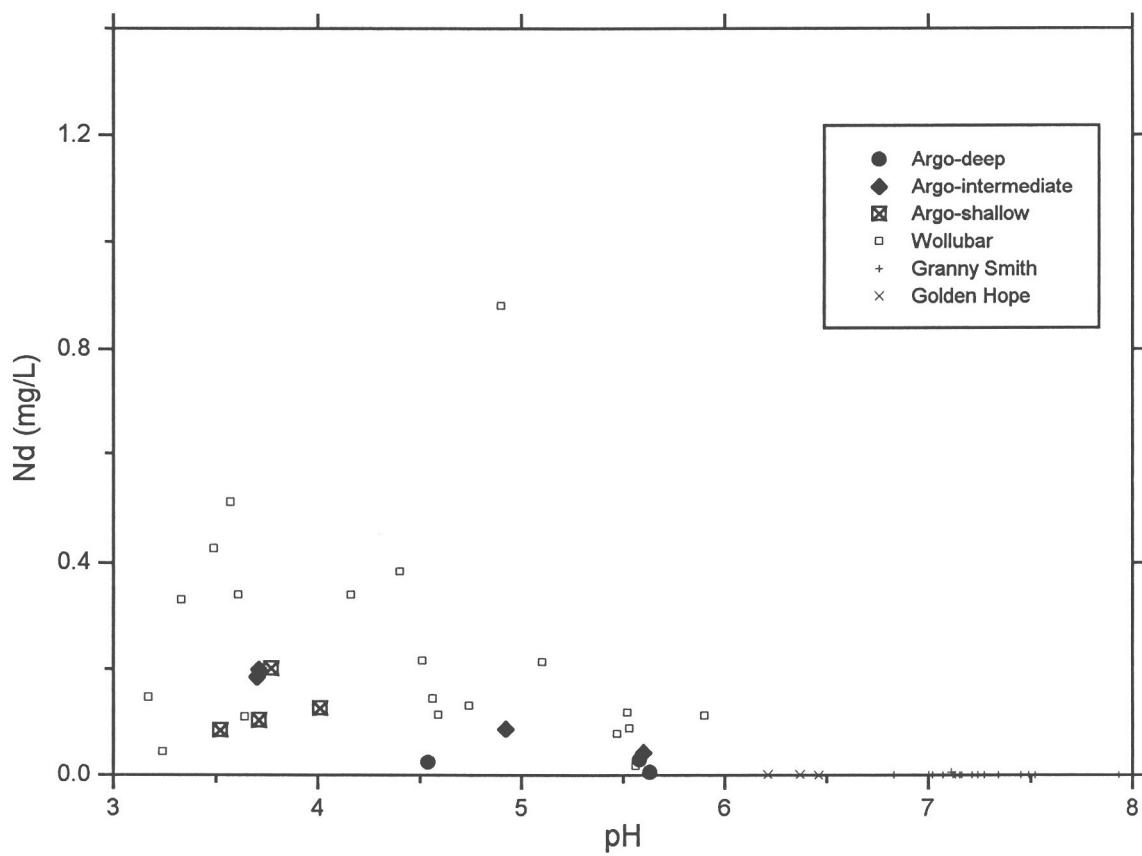


Figure A2.34: Nd vs. pH for groundwaters from Argo and other sites.

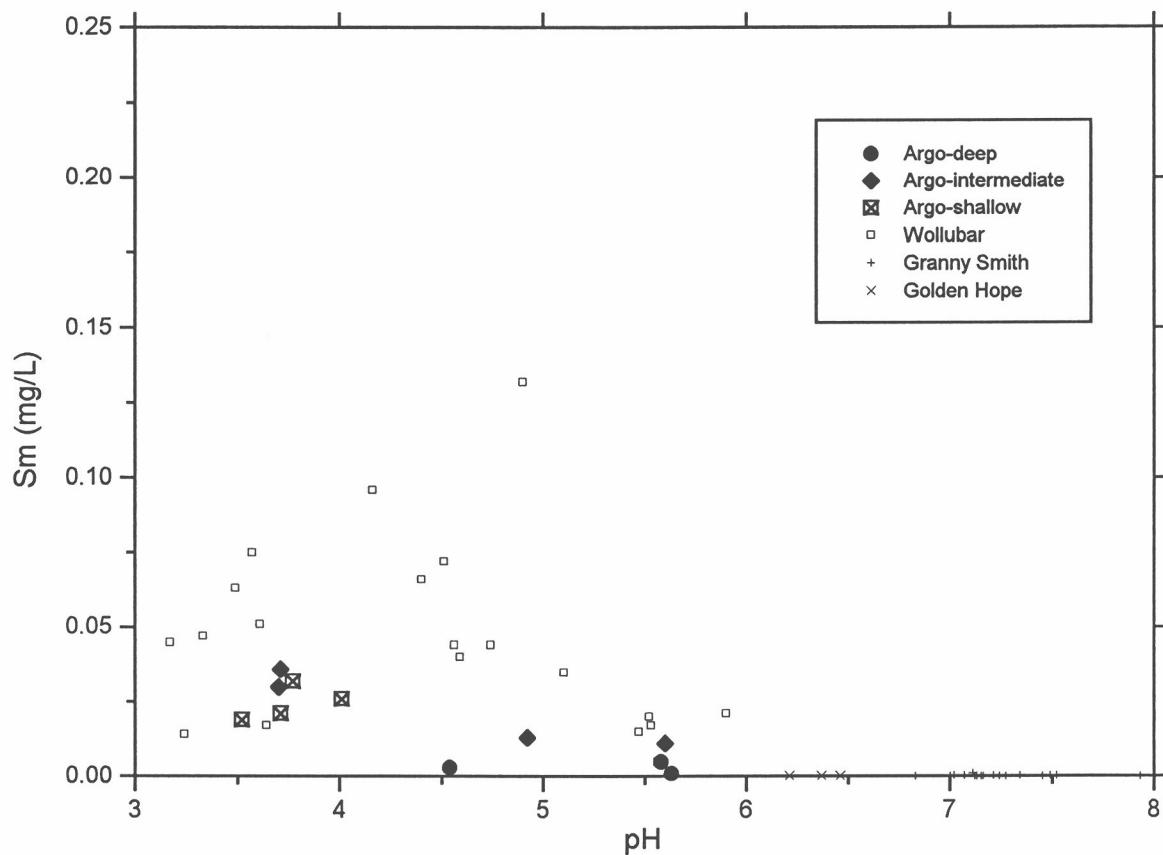


Figure A2.35: Sm vs. pH for groundwaters from Argo and other sites.

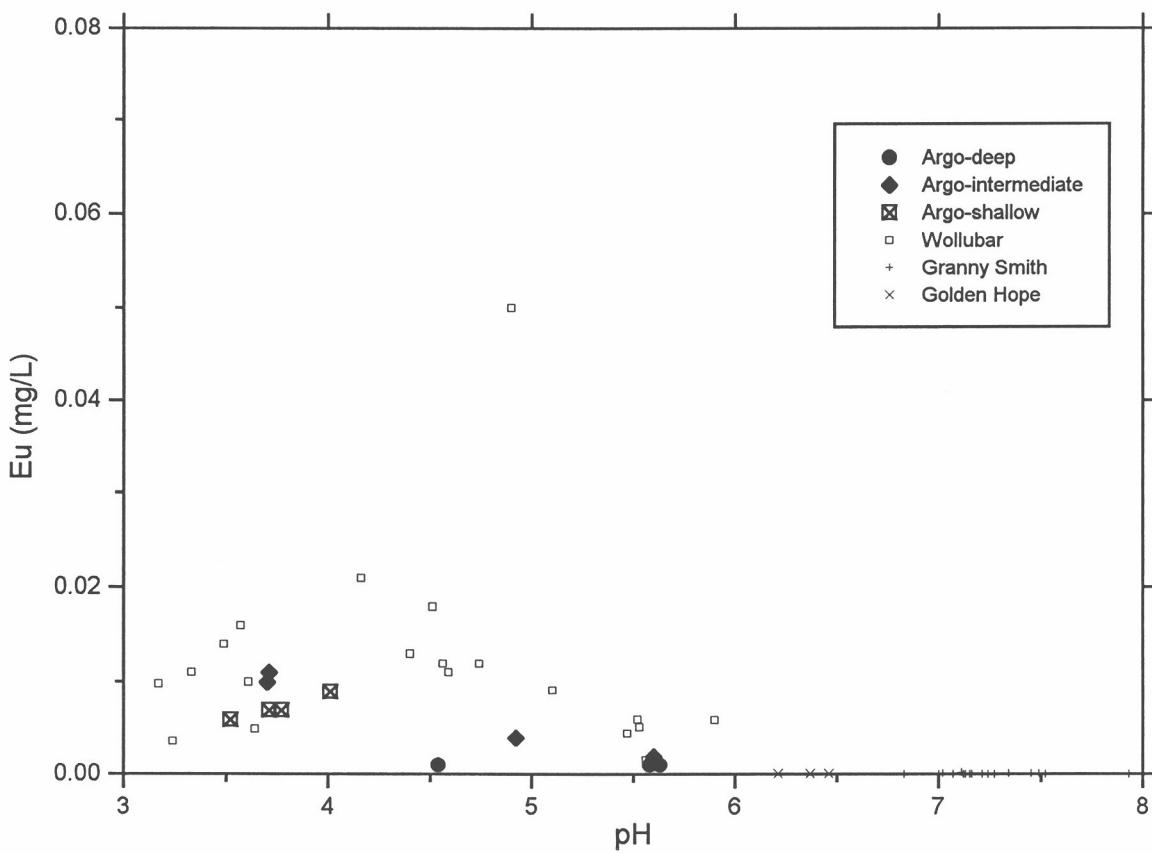


Figure A2.36: Eu vs. pH for groundwaters from Argo and other sites.

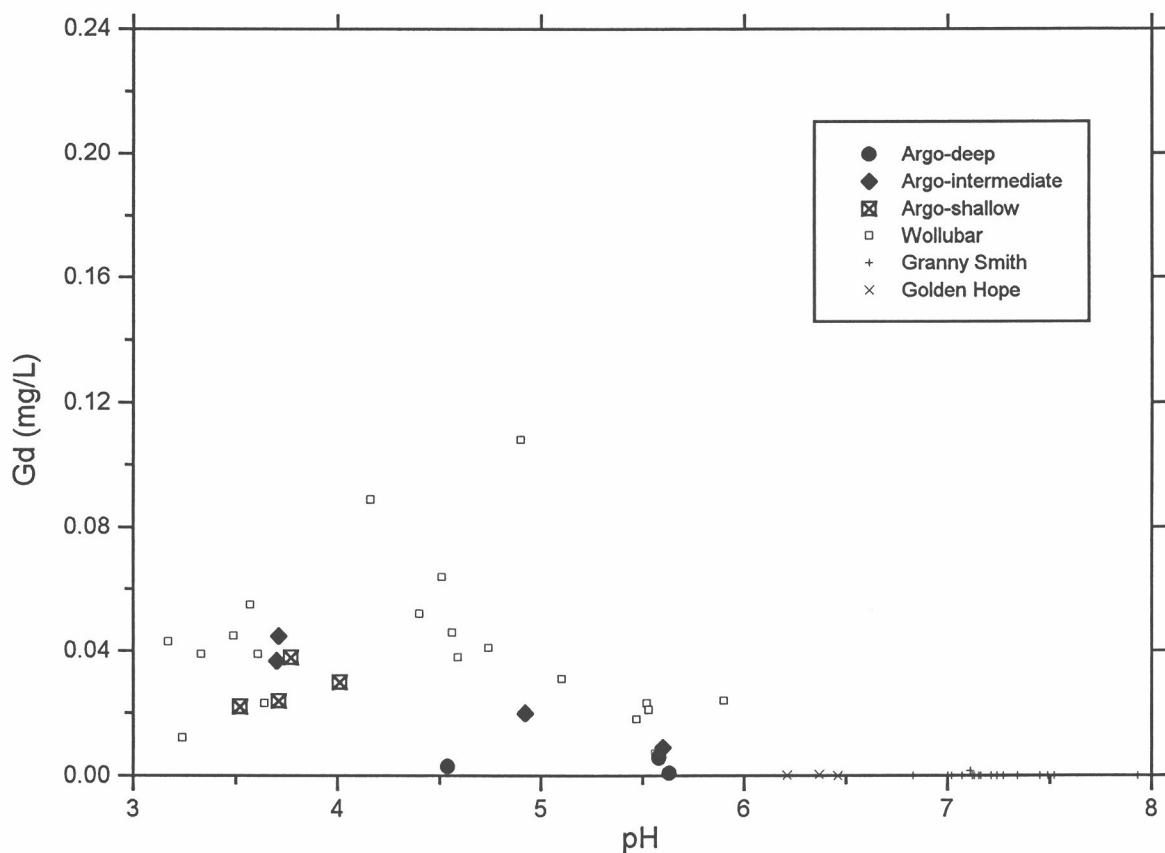


Figure A2.37: Gd vs. pH for groundwaters from Argo and other sites.

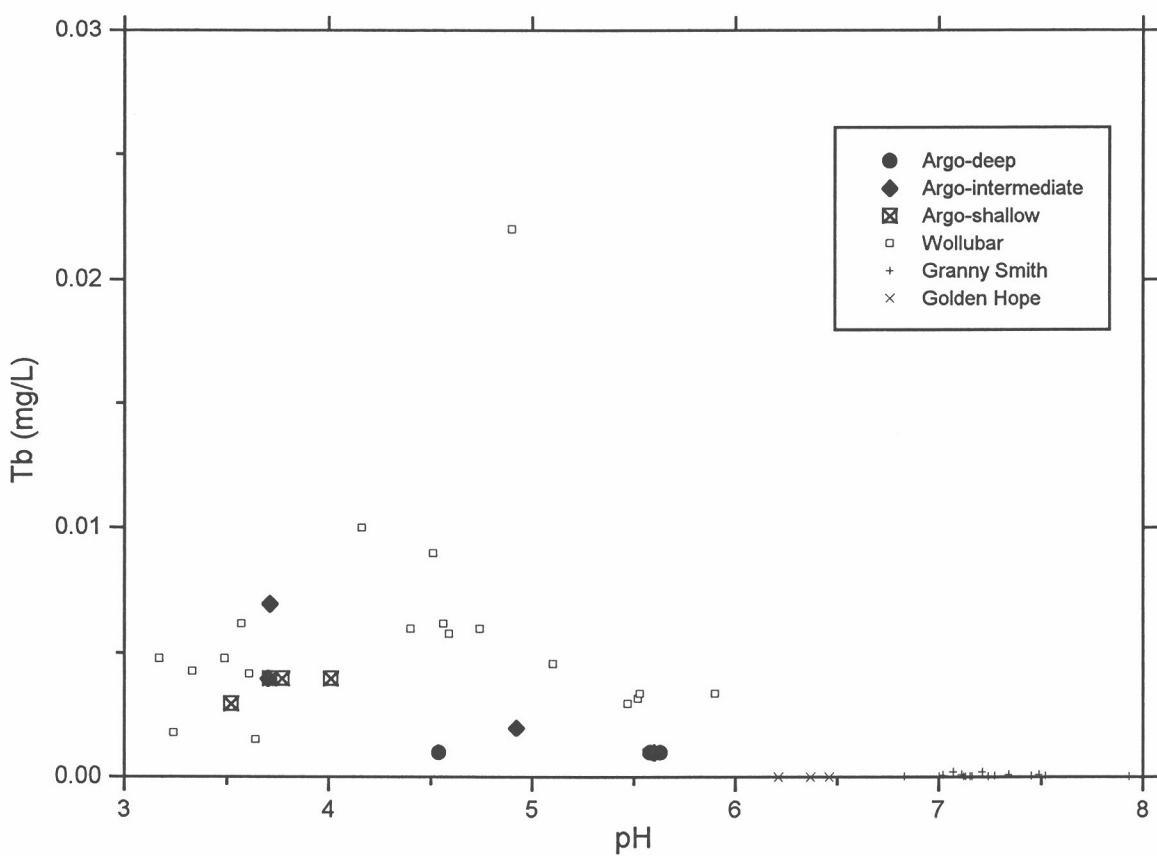


Figure A2.38: Tb vs. pH for groundwaters from Argo and other sites.

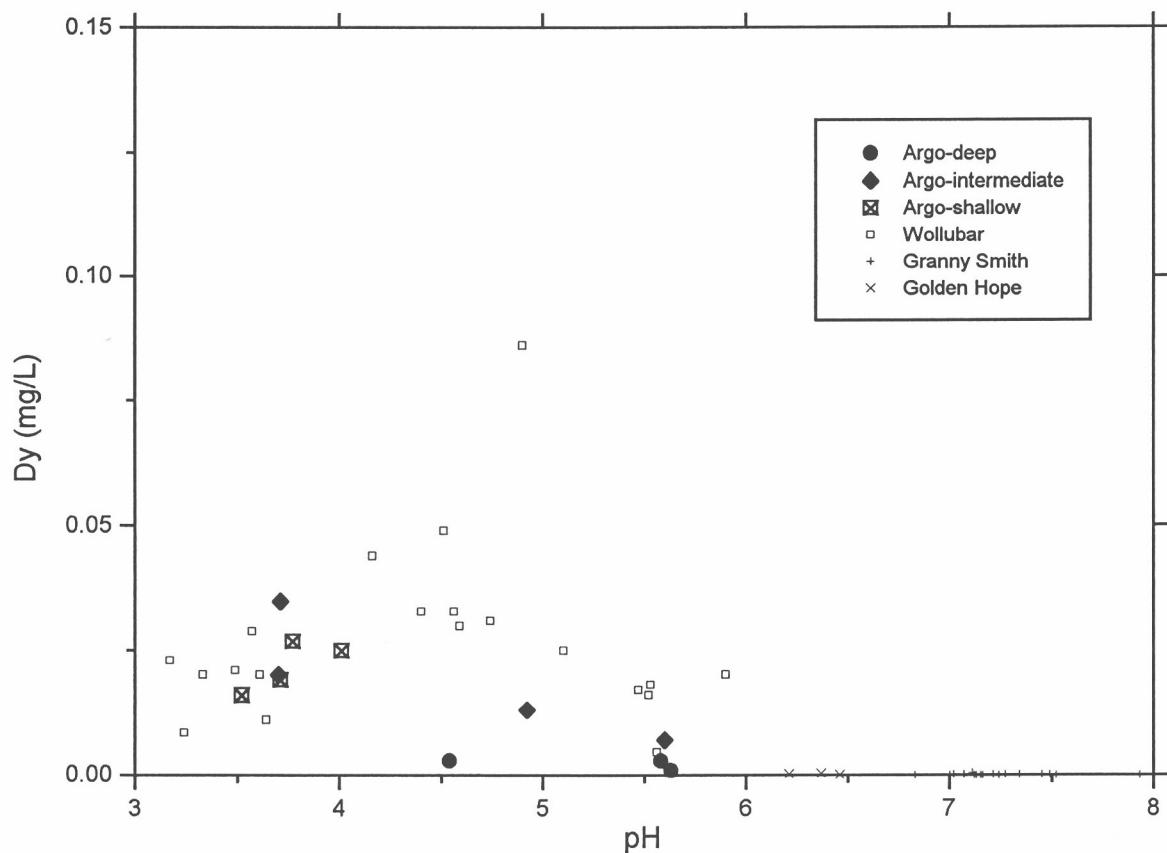


Figure A2.39: Dy vs. pH for groundwaters from Argo and other sites.

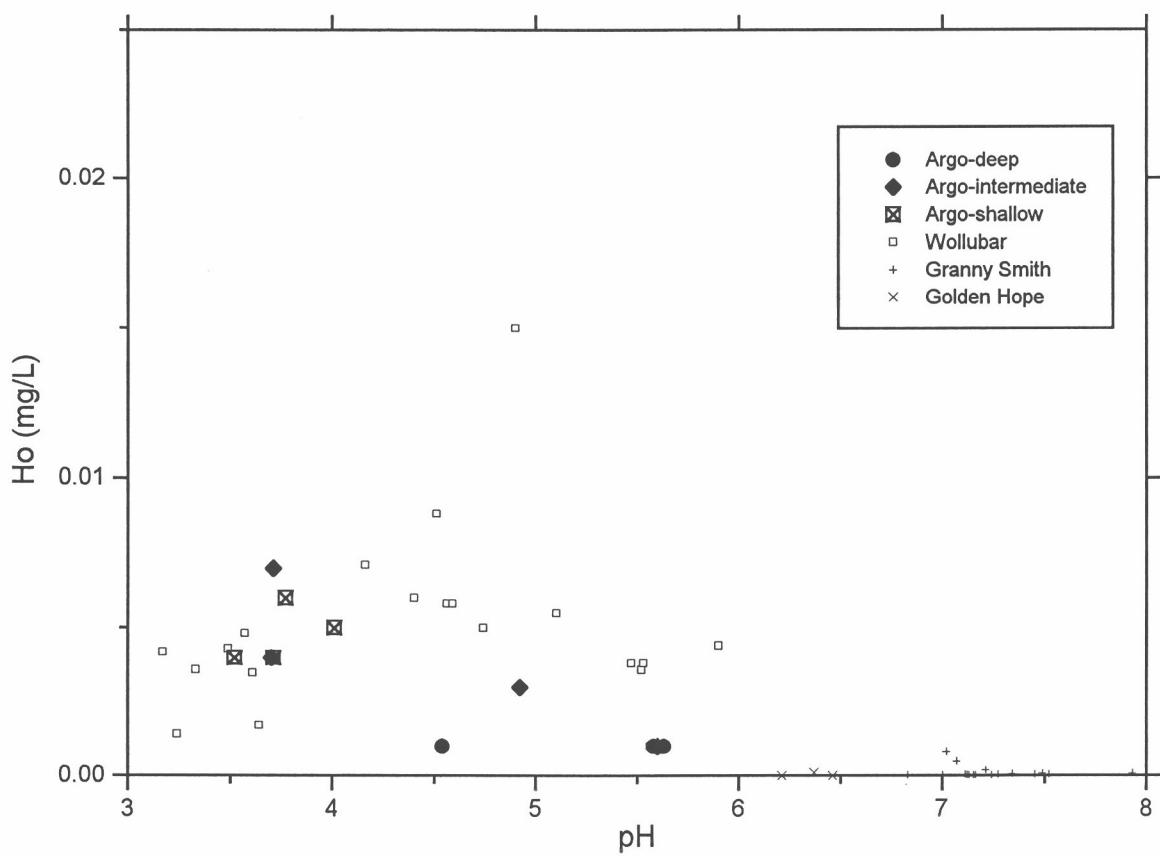


Figure A2.40: Ho vs. pH for groundwaters from Argo and other sites.

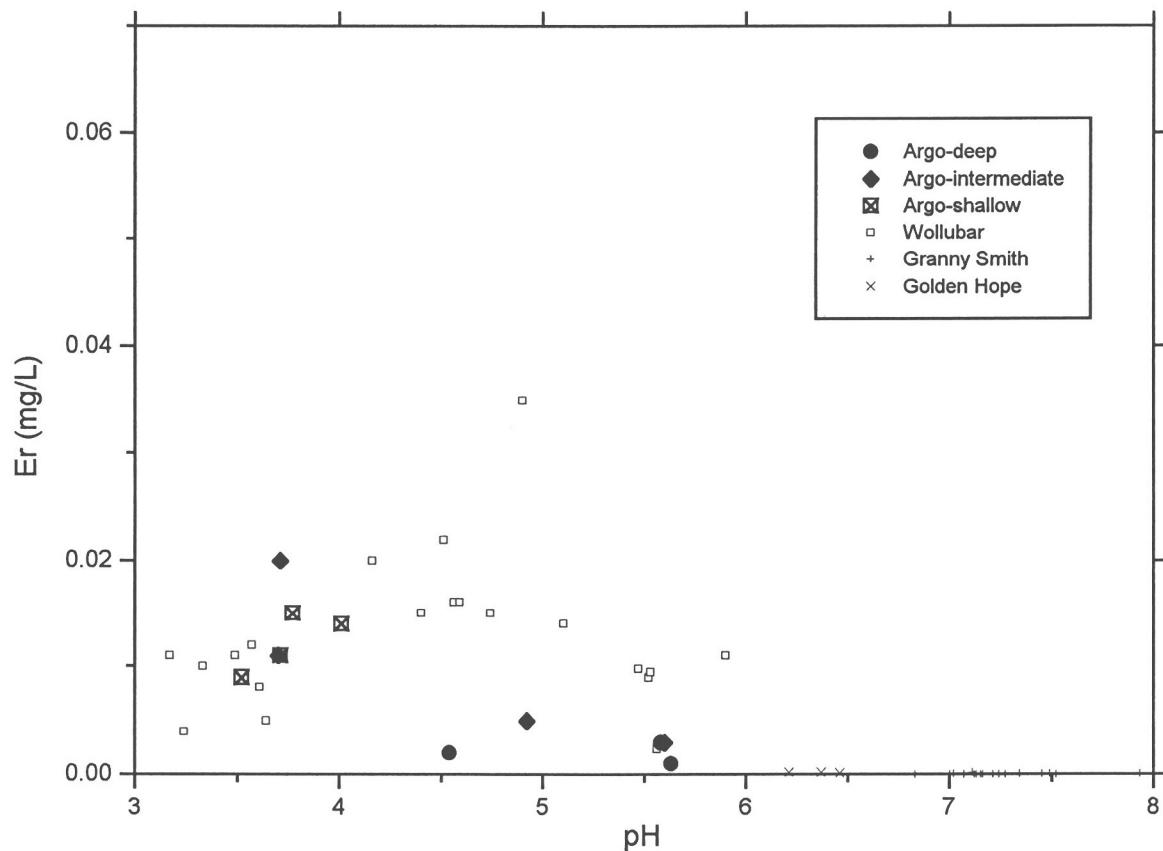


Figure A2.41: Er vs. pH for groundwaters from Argo and other sites.

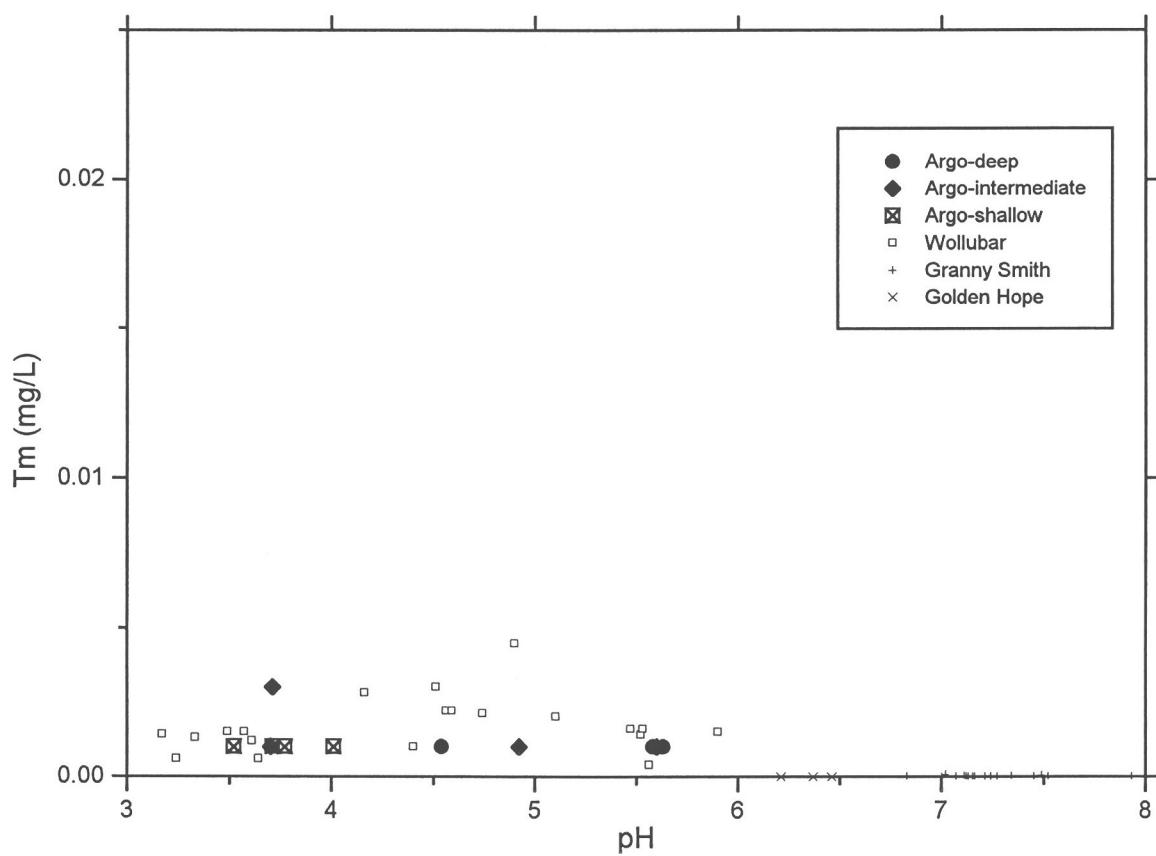


Figure A2.42: Tm vs. pH for groundwaters from Argo and other sites.

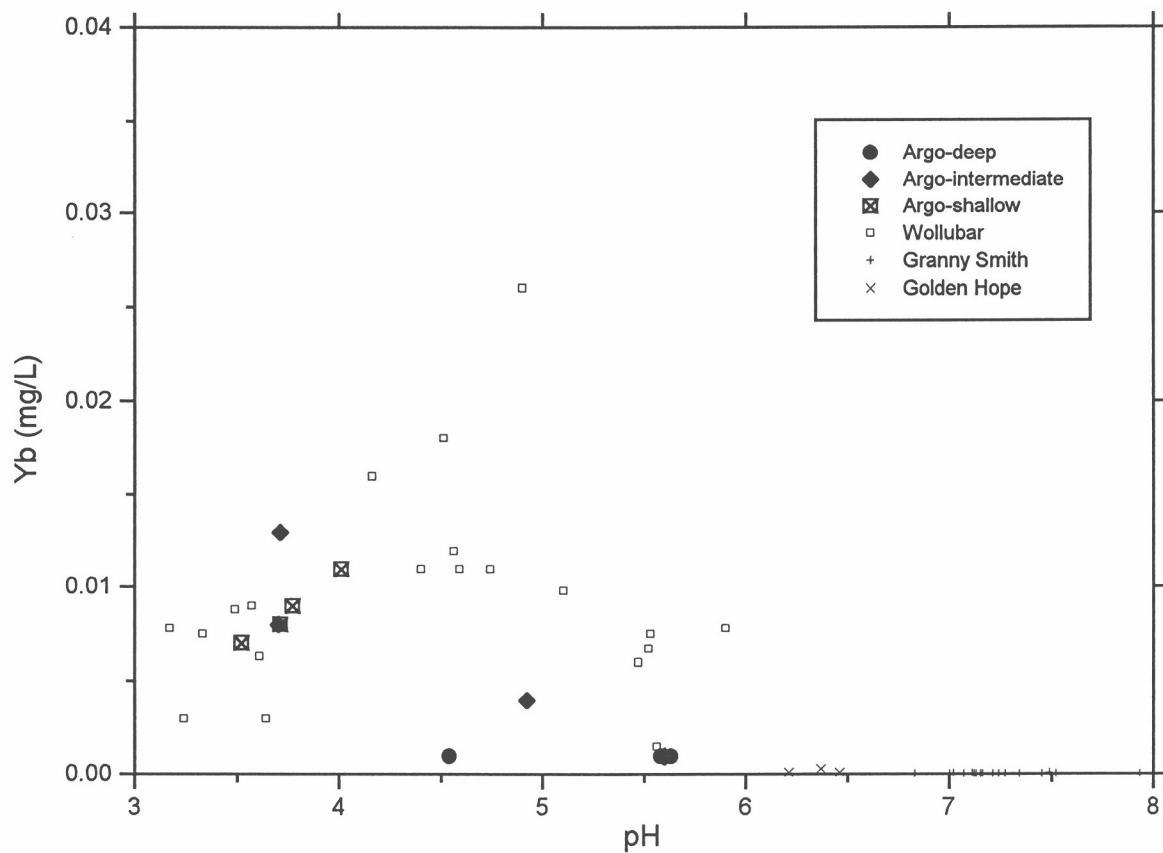


Figure A2.43: Yb vs. pH for groundwaters from Argo and other sites.

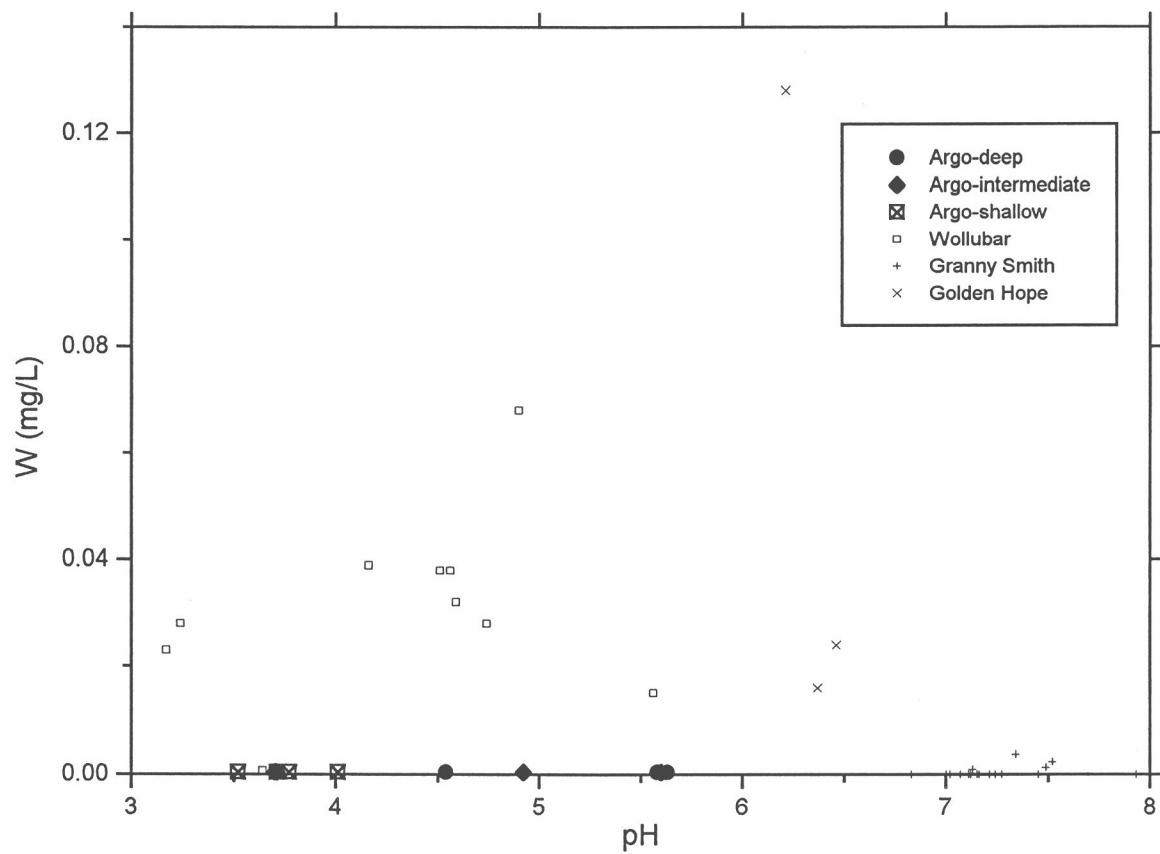


Figure A2.44: W vs. pH for groundwaters from Argo and other sites.

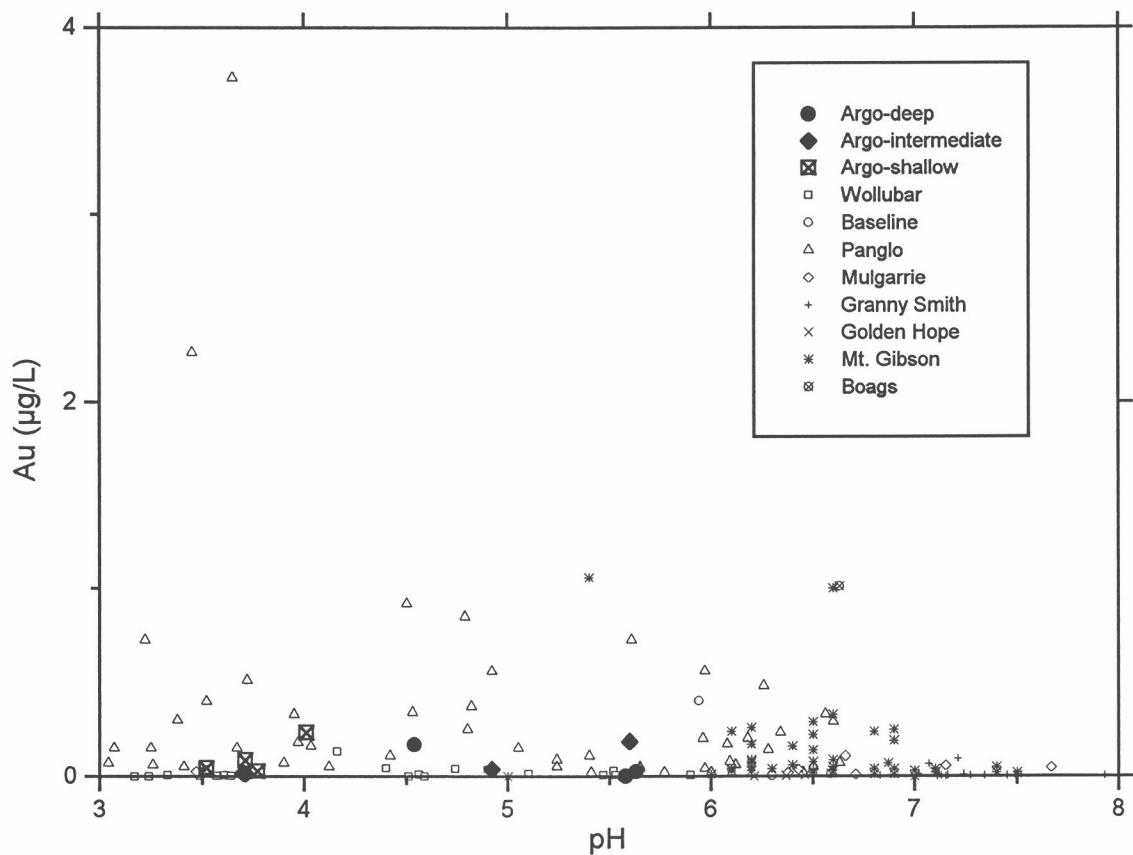


Figure A2.45: Au vs. pH for groundwaters from Argo and other sites.

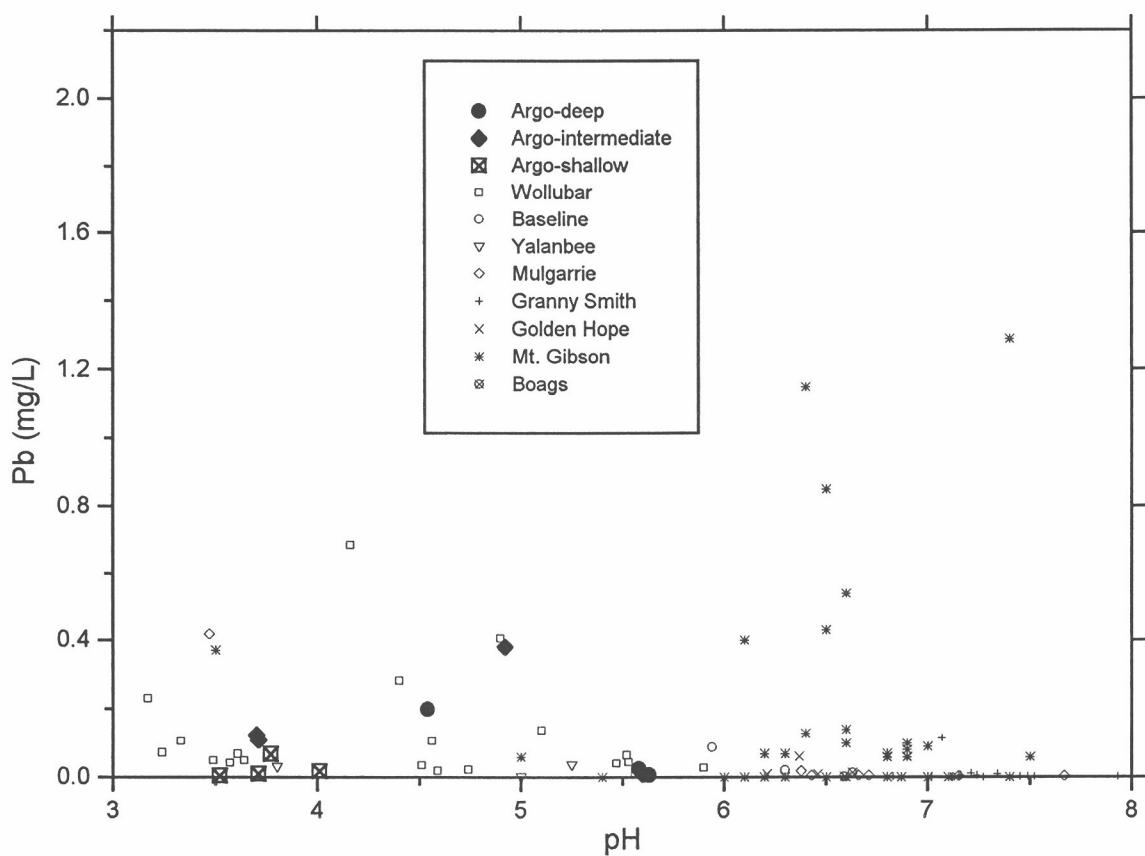


Figure A2.46: Pb vs. pH for groundwaters from Argo and other sites.

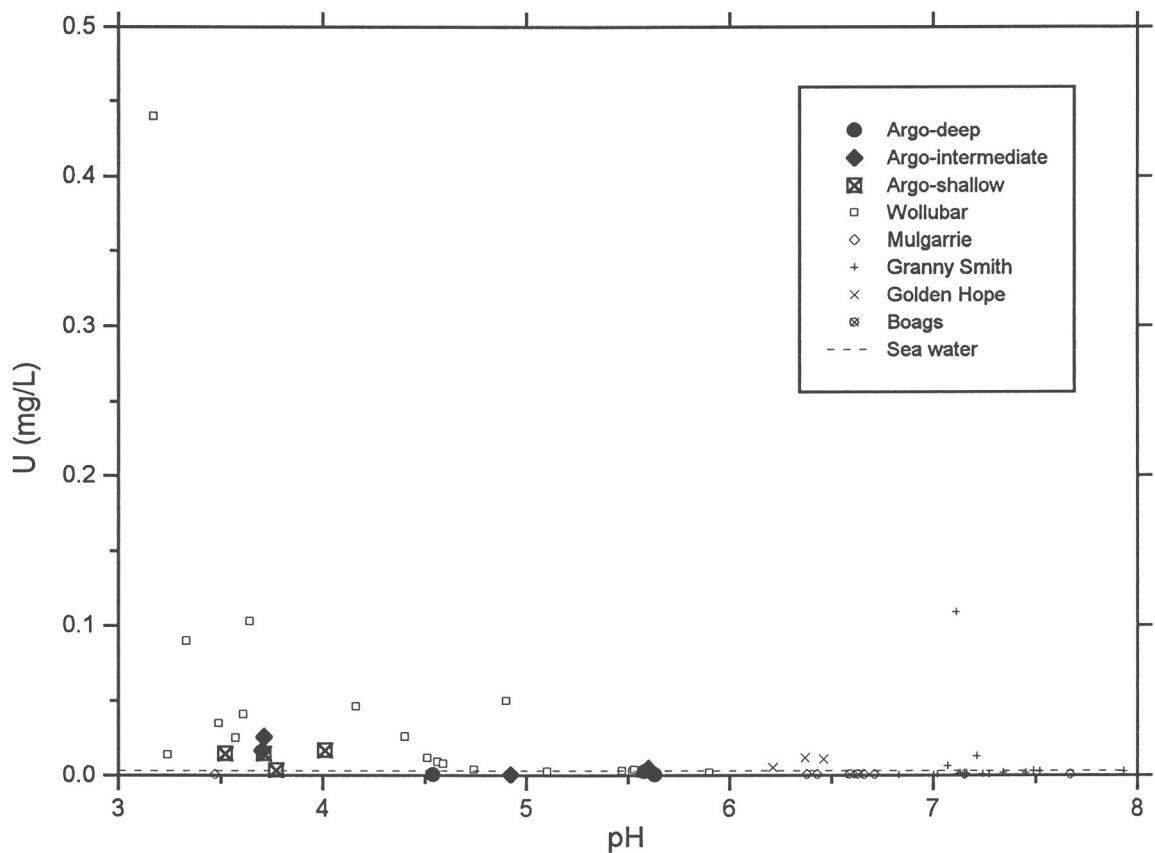


Figure A2.47: U vs. pH for groundwaters from Argo and other sites.

Appendix 3: Saturation Indices - groundwaters

Table A3: SI values for Groundwaters at Argo.

Mineral	Formula	1	2	3	4	5	6	7	8	9	10	11
Halite	NaCl	-0.6	-2.0	-1.7	-0.4	-1.2	-2.0	-1.8	-1.5	-2.1	-1.6	-0.9
Gypsum	CaSO ₄ .2H ₂ O	-0.1	-0.9	-0.6	-0.2	-0.6	-0.9	-0.9	-0.9	-1.0	-0.8	-0.4
Celestine	SrSO ₄	-0.6	-1.3	-1.2	-0.5	-1.2	-1.3	-1.3	-1.2	-1.2	-1.2	-0.8
Barite	BaSO ₄	nd	-0.1	0.2	nd	-0.2	0.0	-0.1	0.0	0.3	nd	nd
Calcite	CaCO ₃	-2.0	nd	-3.1	-2.8	nd	nd	nd	nd	nd	-4.0	-4.9
Dolomite	CaMg(CO ₃) ₂	-1.9	nd	-4.6	-3.2	nd	nd	nd	nd	nd	-5.9	-7.5
amorphous silica	SiO ₂	-0.4	0.1	-0.4	-0.6	0.0	0.0	0.0	0.0	0.0	-0.8	-0.3
amorphous alumina	AlOH ₃	-0.3	-2.8	-0.3	-0.4	-2.6	-3.3	-1.7	-2.6	-2.9	-1.0	-2.8
Jurbanite	AlOH ₄ SO	0.2	1.4	0.2	0.2	1.7	1.3	2.0	1.7	1.1	0.9	-0.1
Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	6.5	2.4	6.5	6.1	2.8	1.4	4.6	2.7	2.0	4.3	1.7
Siderite	FeCO ₃	-3.9	nd	nd	-2.8	nd	nd	nd	nd	nd	-2.1	-6.8
Ferrihydrite	Fe(OH) ₃	-0.9	nd	nd	-0.4	-1.5	-2.2	-1.1	-1.5	-2.1	-0.2	-2.1
Rhodochrosite	MnCO ₃	-2.5	nd	-2.9	-3.5	nd	nd	nd	nd	nd	-3.4	-4.6
Tenorite	Cu(OH) ₂ .H ₂ O	-4.5	-7.0	-3.6	-7.4	-7.1	-7.4	-6.1	-6.8	-7.3	-7.1	-5.6
Smithsonite	ZnCO ₃	-5.9	nd	-5.9	-6.5	nd	nd	nd	nd	nd	-5.1	-7.6
Cerussite	PbCO ₃	-5.3	nd	-4.9	-5.5	nd	nd	nd	nd	nd	-4.0	-6.1
Theophrasite	Ni(OH) ₂	nd	-9.5	-5.7	-6.8	-9.8	-9.9	-8.8	-9.7	-9.4	-7.1	-8.7
Sphaerocobaltite	CoCO ₃	-5.3	nd	-5.1	-5.4	nd	nd	nd	nd	nd	-5.5	-7.2
Native Gold	Au	1.5	-1.5	1.1	nd	-1.6	-4.7	-1.6	-1.2	-0.8	3.1	0.1
Sodium autunite	Na ₂ (UO ₂) ₂ (PO ₄) ₂	nd	-6.4	-1.9	0.6	-3.1	-7.0	-4.5	-4.6	-7.4	nd	nd
Ferberite	FeWO ₄	0.3	nd	nd	nd	nd	-2.9	-2.6	nd	nd	nd	nd
Monazite-(La)	LaPO ₄	-1.4	-4.3	-0.8	-0.8	-3.5	-4.6	-3.5	-3.6	-3.5	-1.5	-3.0
Monazite-(Ce)	CePO ₄	-1.1	-3.8	-0.4	-0.3	-3.1	-4.1	-3.0	-3.3	-3.2	-1.2	-2.3
"Monazite-(Sm)"	SmPO ₄	nd	-4.9	-1.4	-1.5	-4.2	-5.2	-4.0	-4.4	-4.5	-2.4	-3.7
"Monazite-(Dy)"	DyPO ₄	nd	-5.1	-1.8	-1.8	-4.3	-5.4	-4.2	-4.8	-4.7	-2.6	-3.8
"Monazite-(Yb)"	YbPO ₄	nd	-5.3	nd	nd	-4.6	-5.7	-4.4	-5.0	-5.1	-2.9	nd
Xenotime	YPO ₄	-1.0	-3.9	-0.5	-0.5	-3.0	-4.2	-3.0	-3.4	-3.4	-1.2	-2.4

nd: not determined (data for one or more solution constituents unknown or below detection)

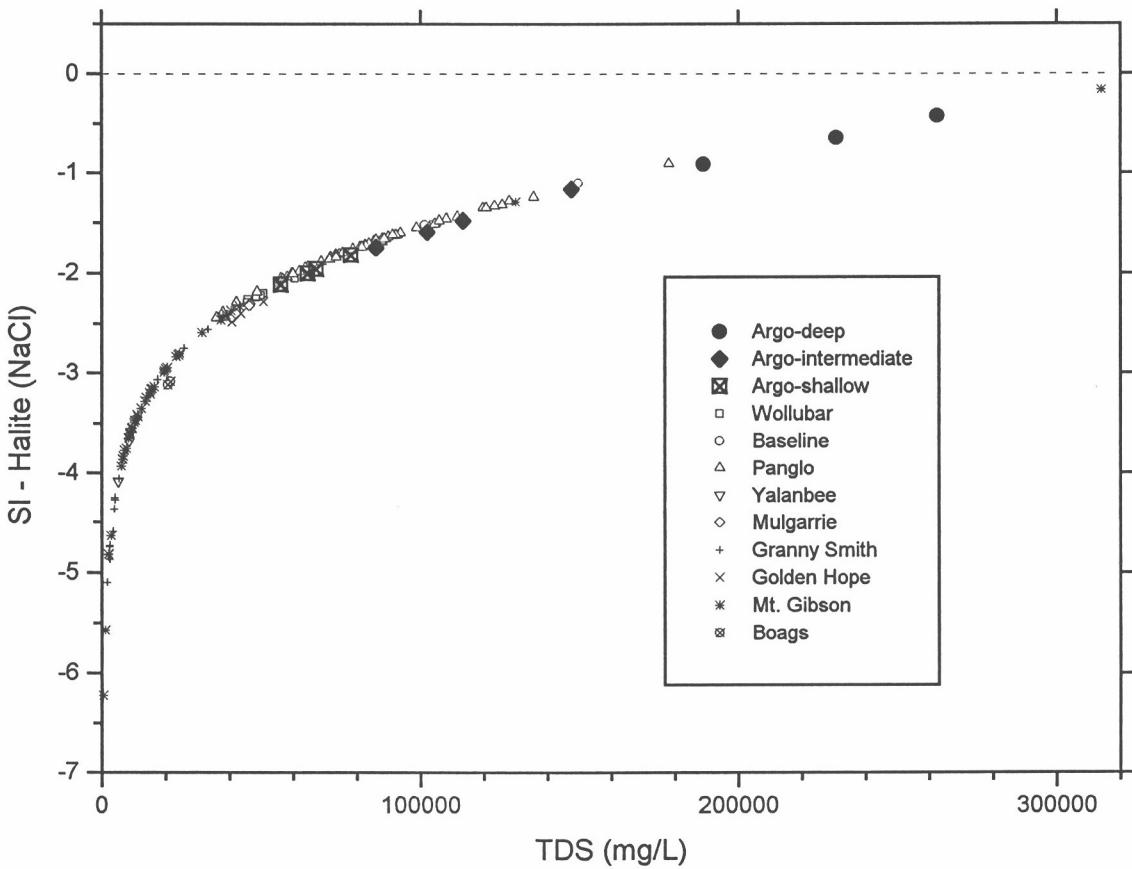


Figure A3.1: SI for halite vs. TDS for groundwaters from Argo and other sites.

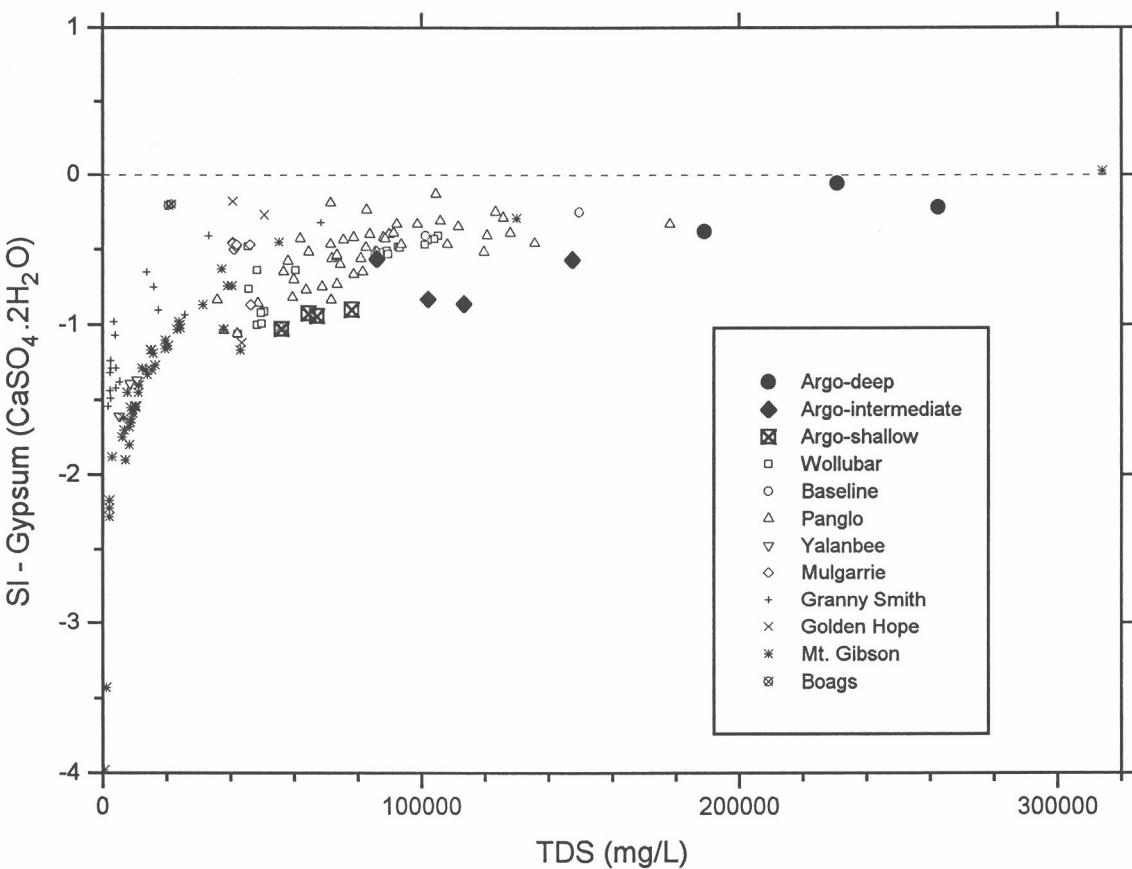


Figure A3.2: SI for gypsum vs. TDS for groundwaters from Argo and other sites.

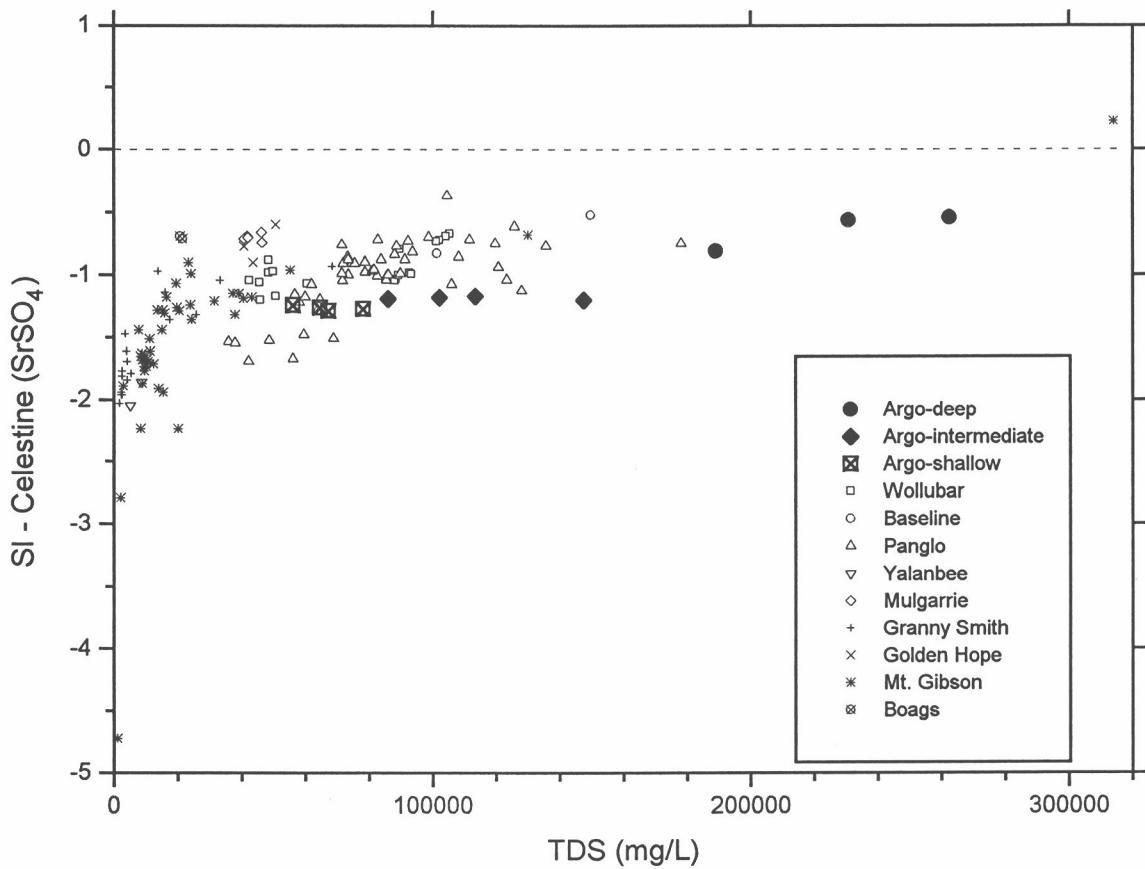


Figure A3.3: SI for celestine vs. TDS for groundwaters from Argo and other sites.

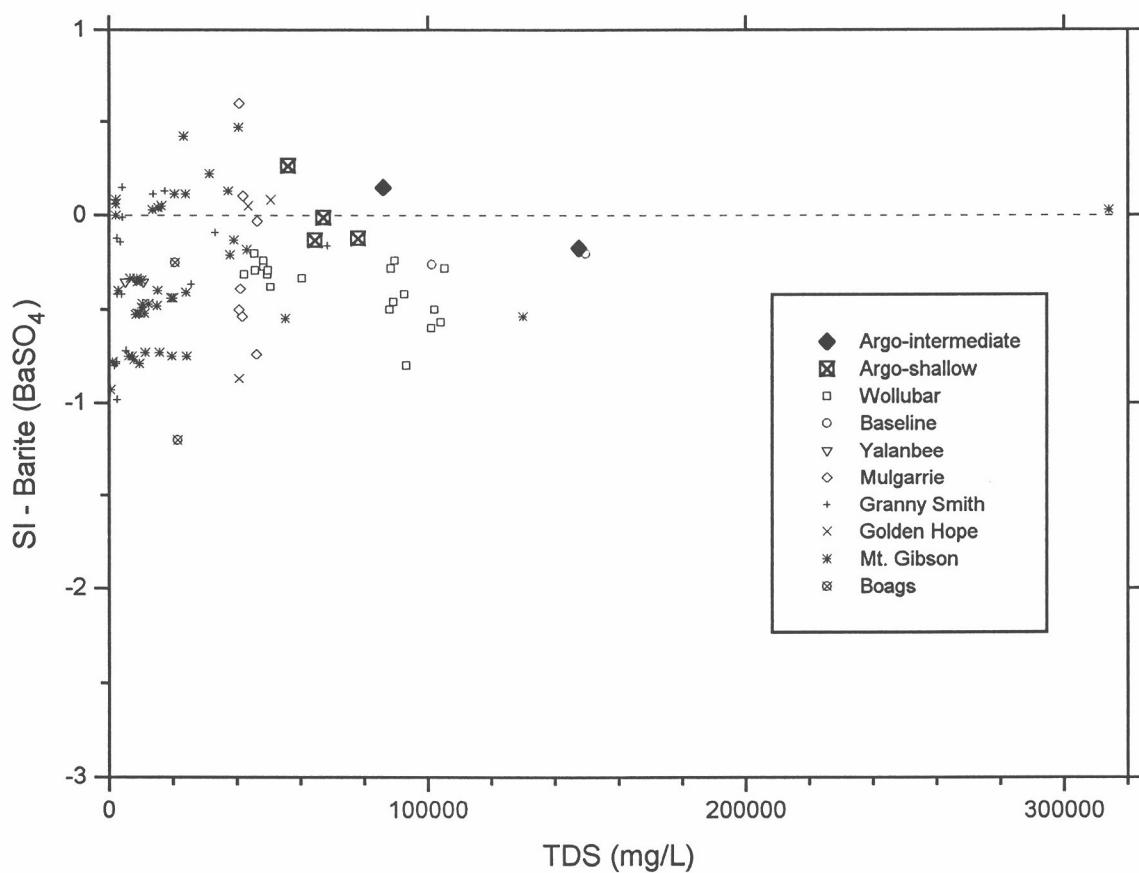


Figure A3.4: SI for barite vs. TDS for groundwaters from Argo and other sites.

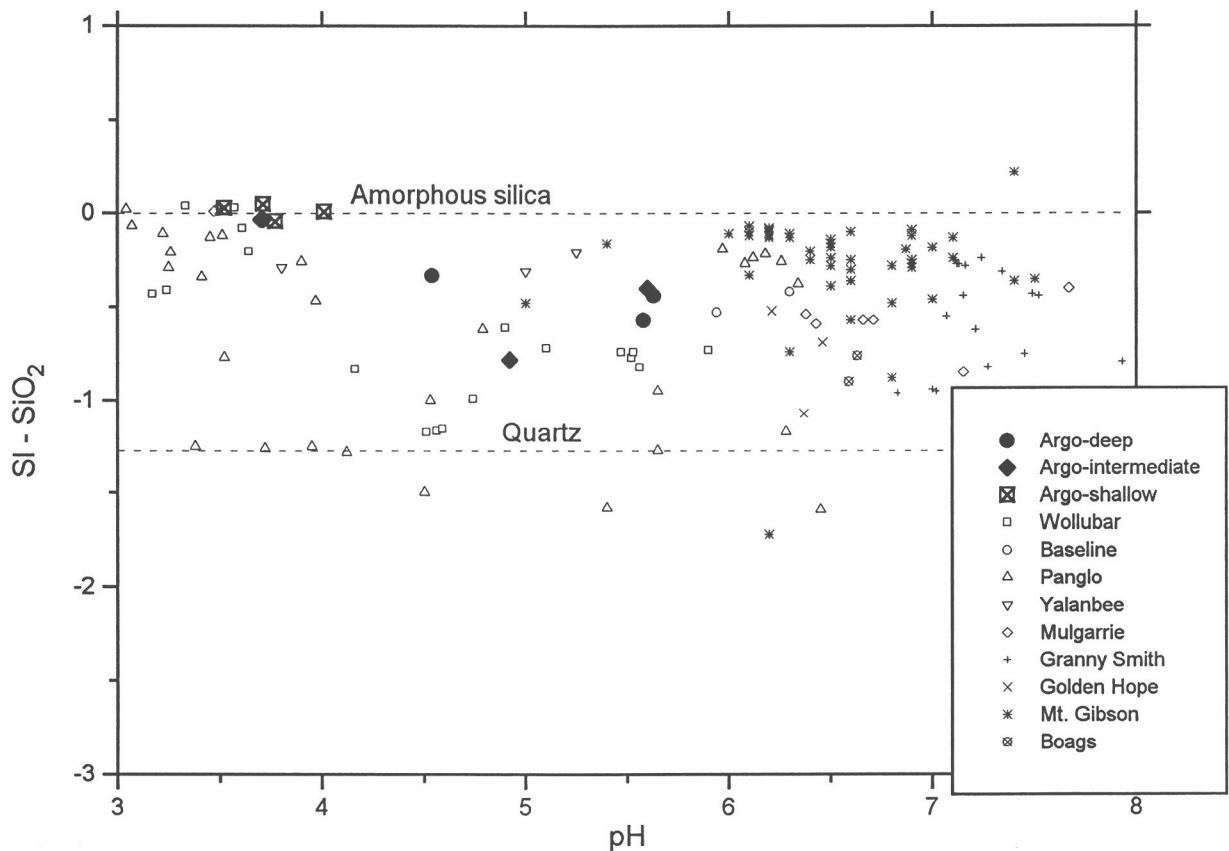


Figure A3.7: SI for SiO_2 vs. pH for groundwaters from Argo and other sites.

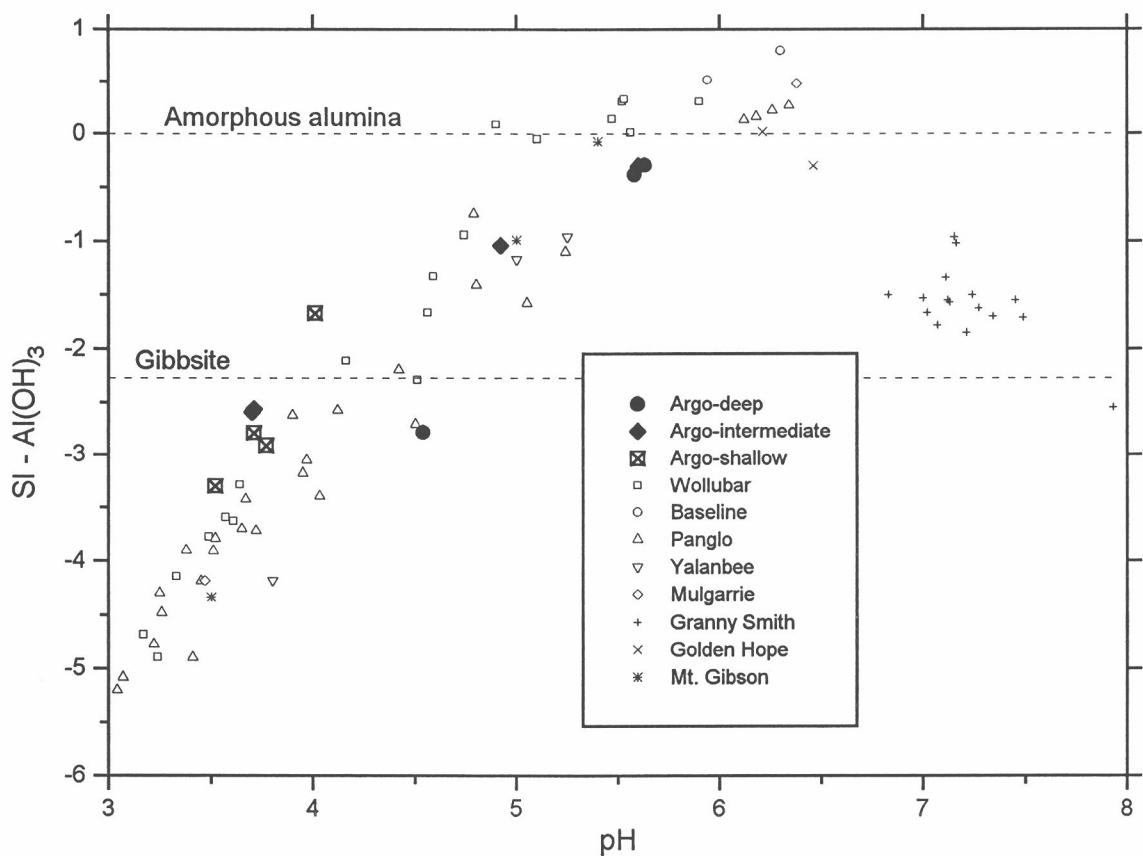


Figure A3.8: SI for $\text{Al}(\text{OH})_3$ vs. pH for groundwaters from Argo and other sites.

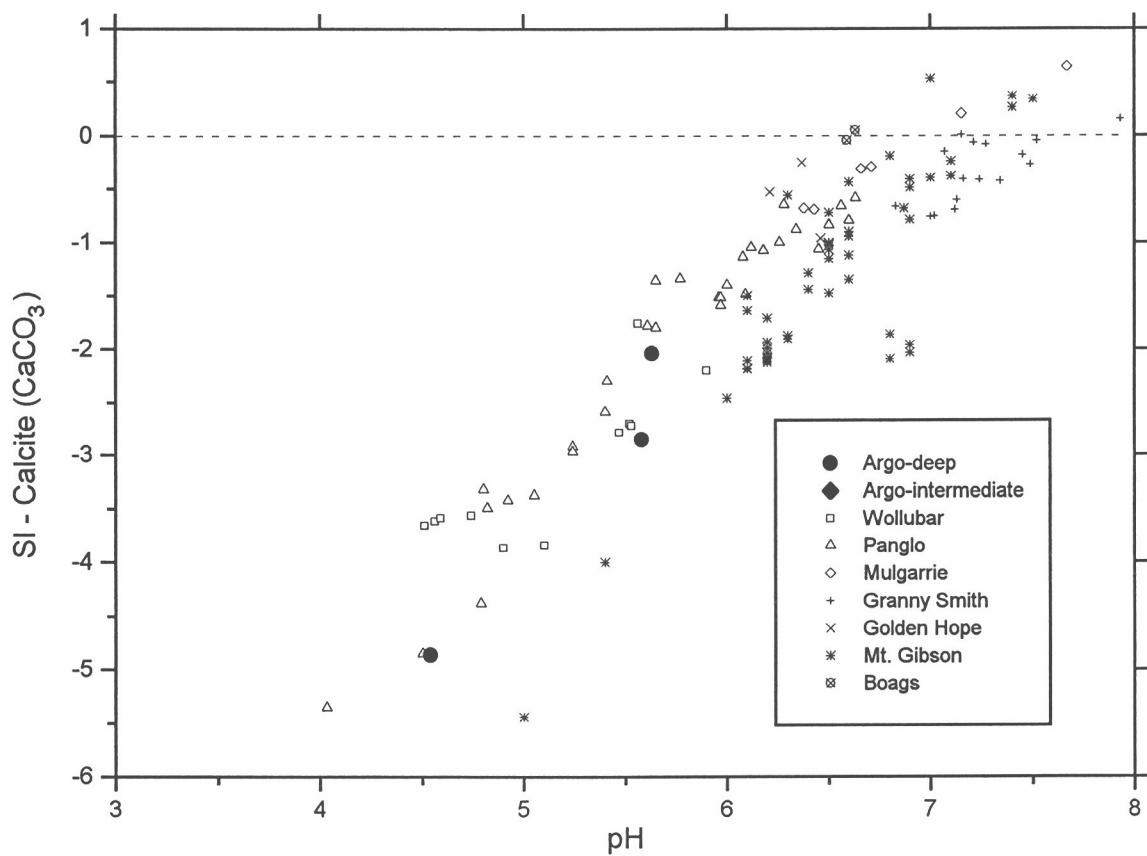


Figure A3.5: SI for calcite vs. pH for groundwaters from Argo and other sites.

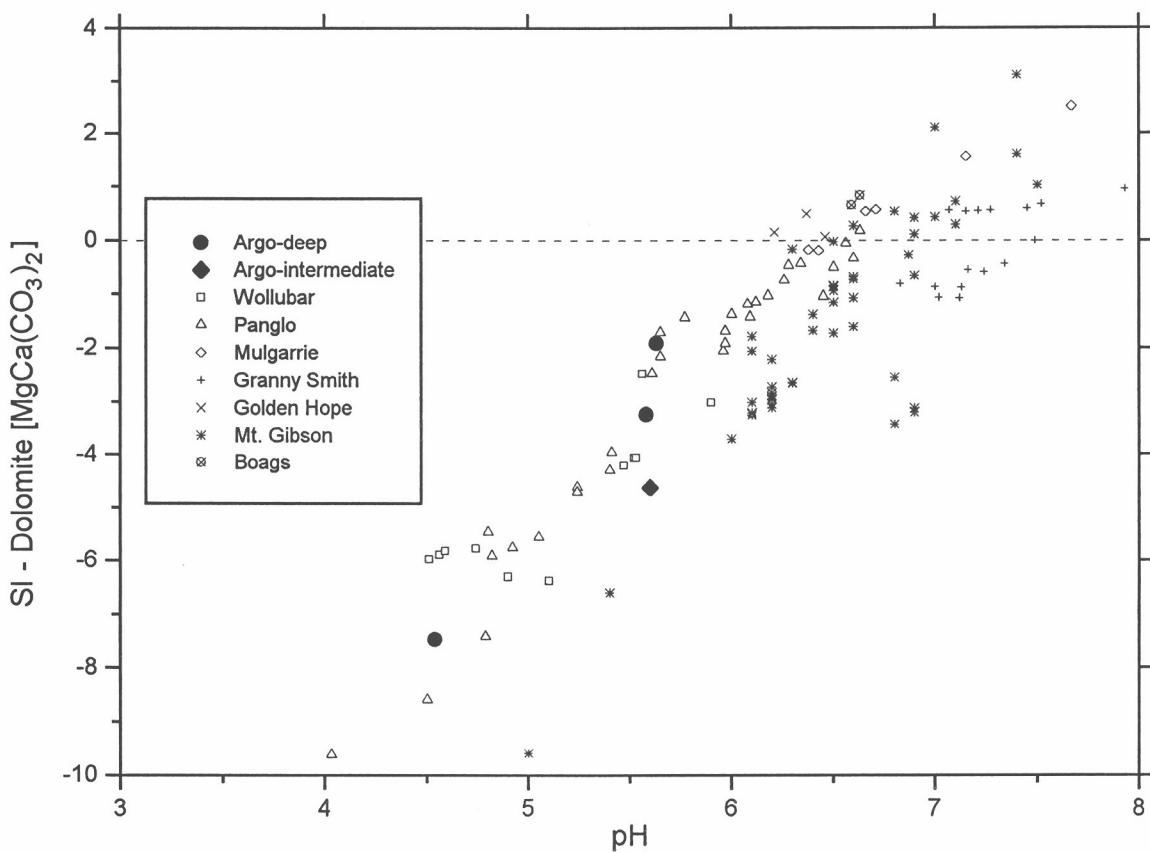


Figure A3.6: SI for dolomite vs. pH for groundwaters from Argo and other sites.

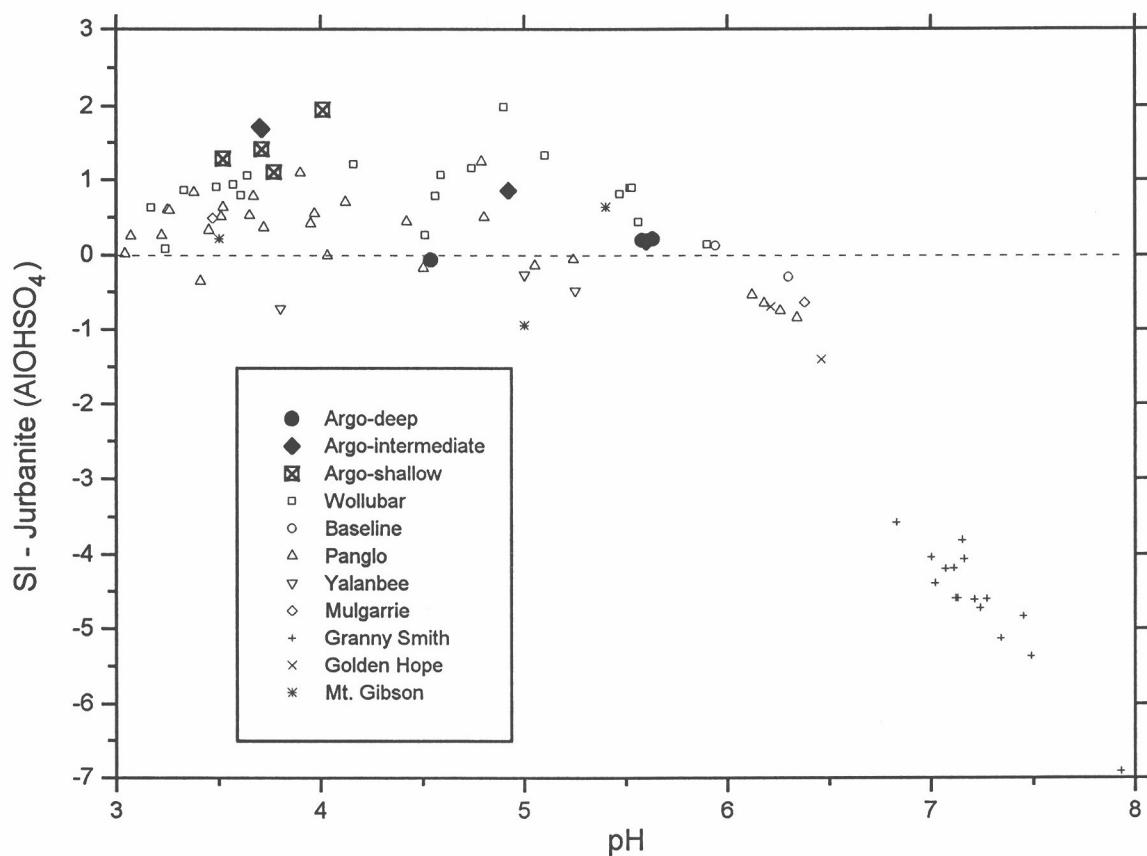


Figure A3.9: SI for jurbanite vs. pH for groundwaters from Argo and other sites.

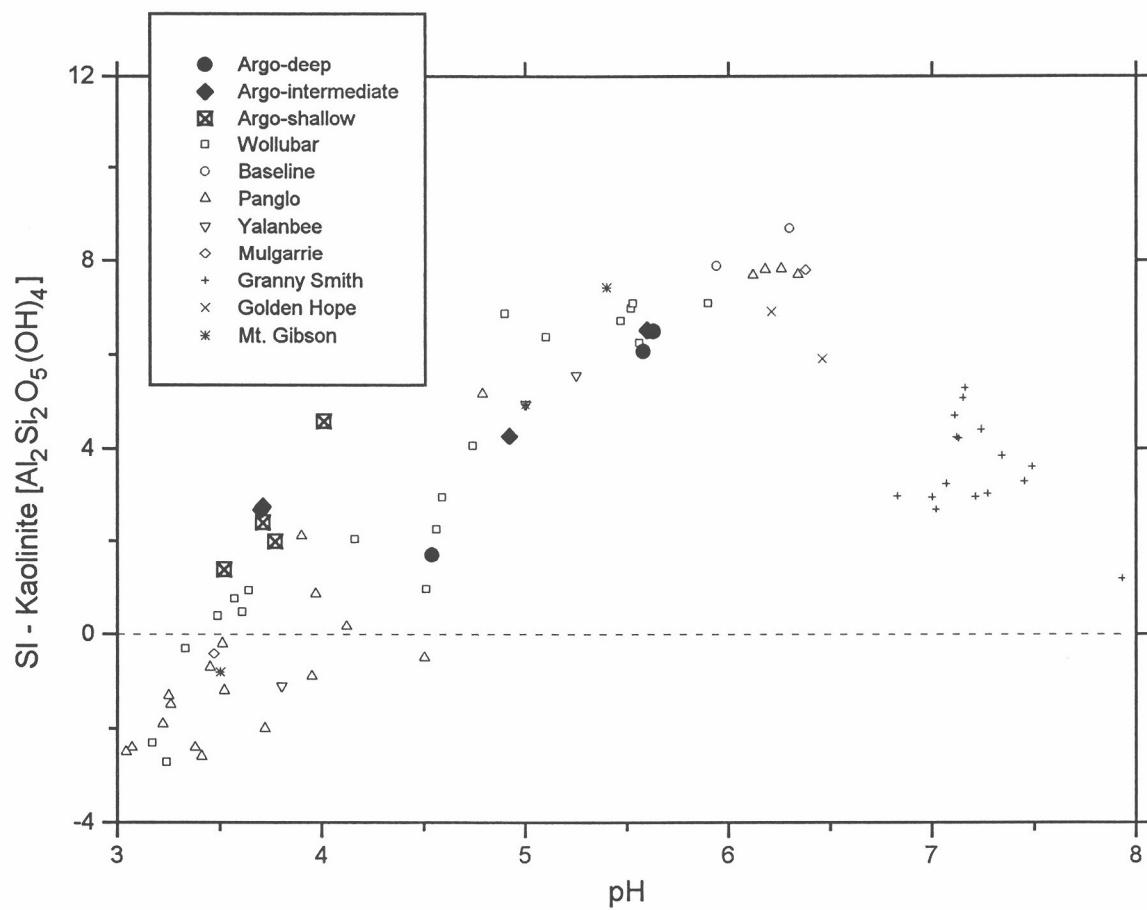


Figure A3.10: SI for kaolinite vs. pH for groundwaters from Argo and other sites.

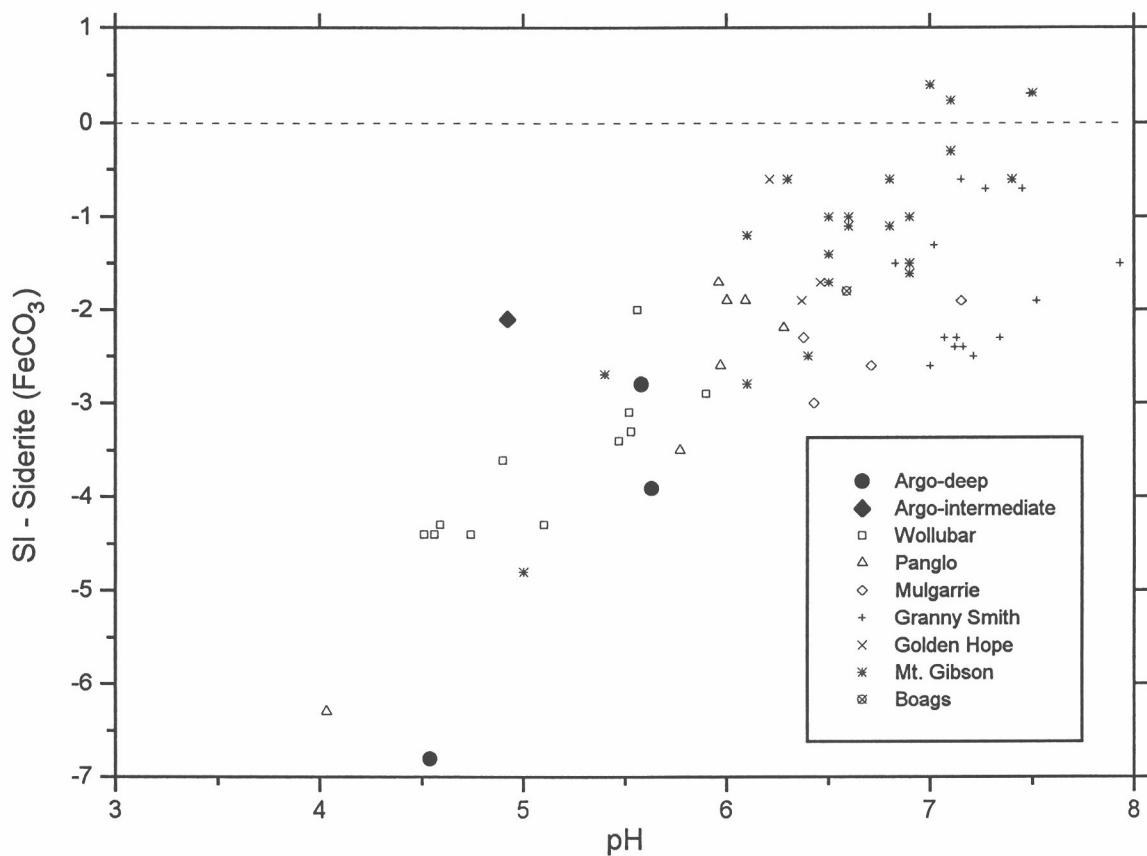


Figure A3.11: SI for siderite vs. pH for groundwaters from Argo and other sites.

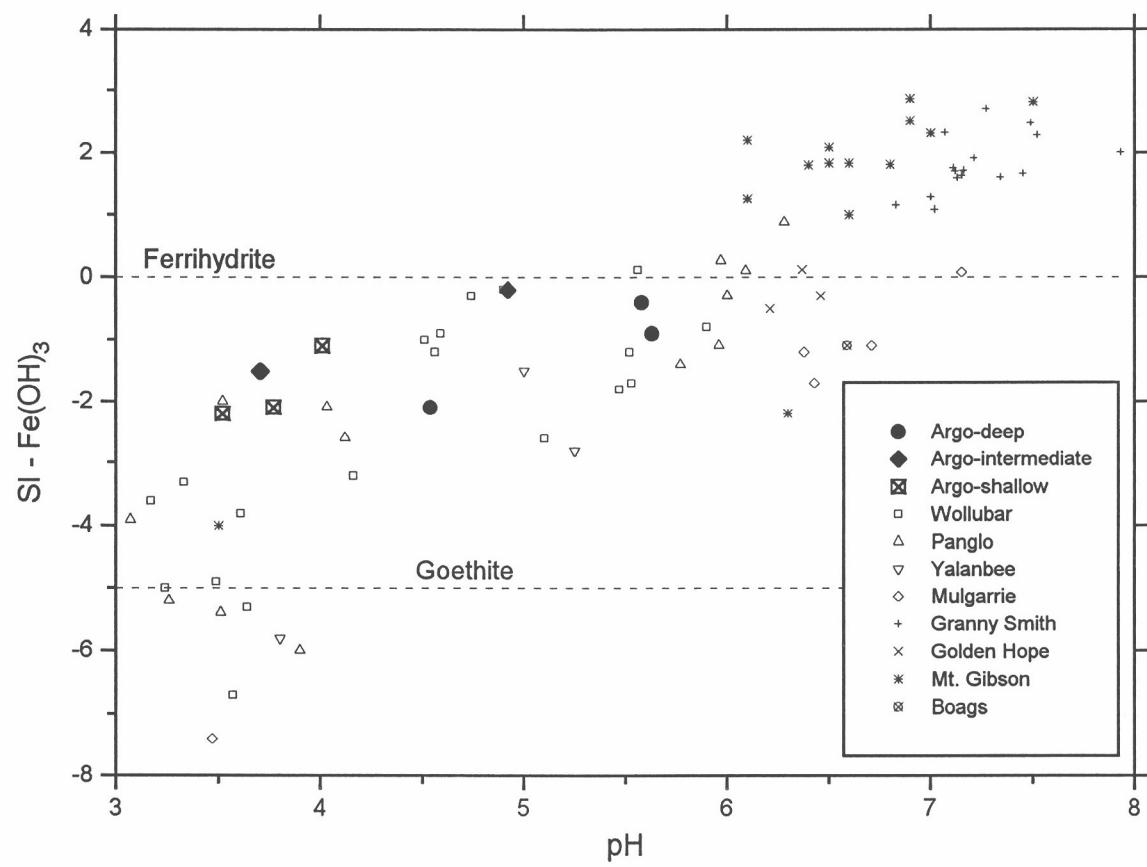


Figure A3.12: SI for Fe(OH)_3 vs. pH for groundwaters from Argo and other sites.

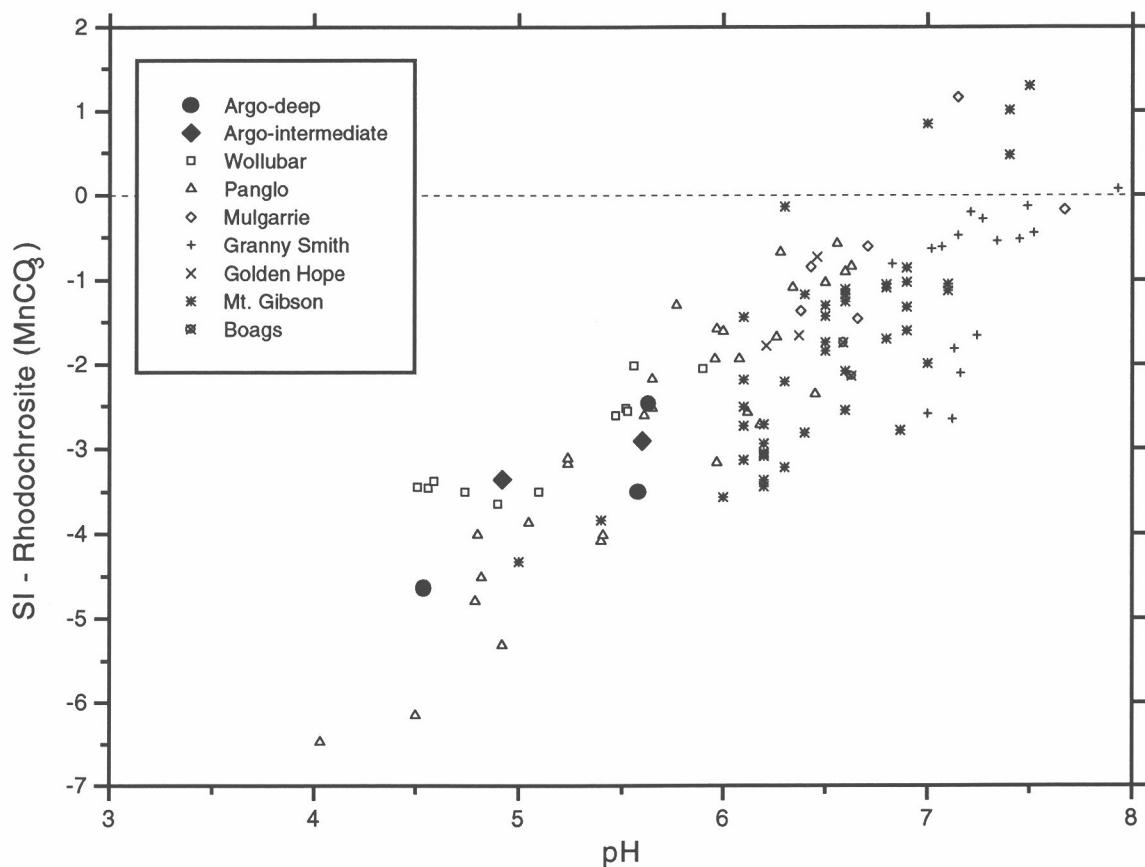


Figure A3.13: SI for rhodochrosite vs. pH for groundwaters from Argo and other sites.

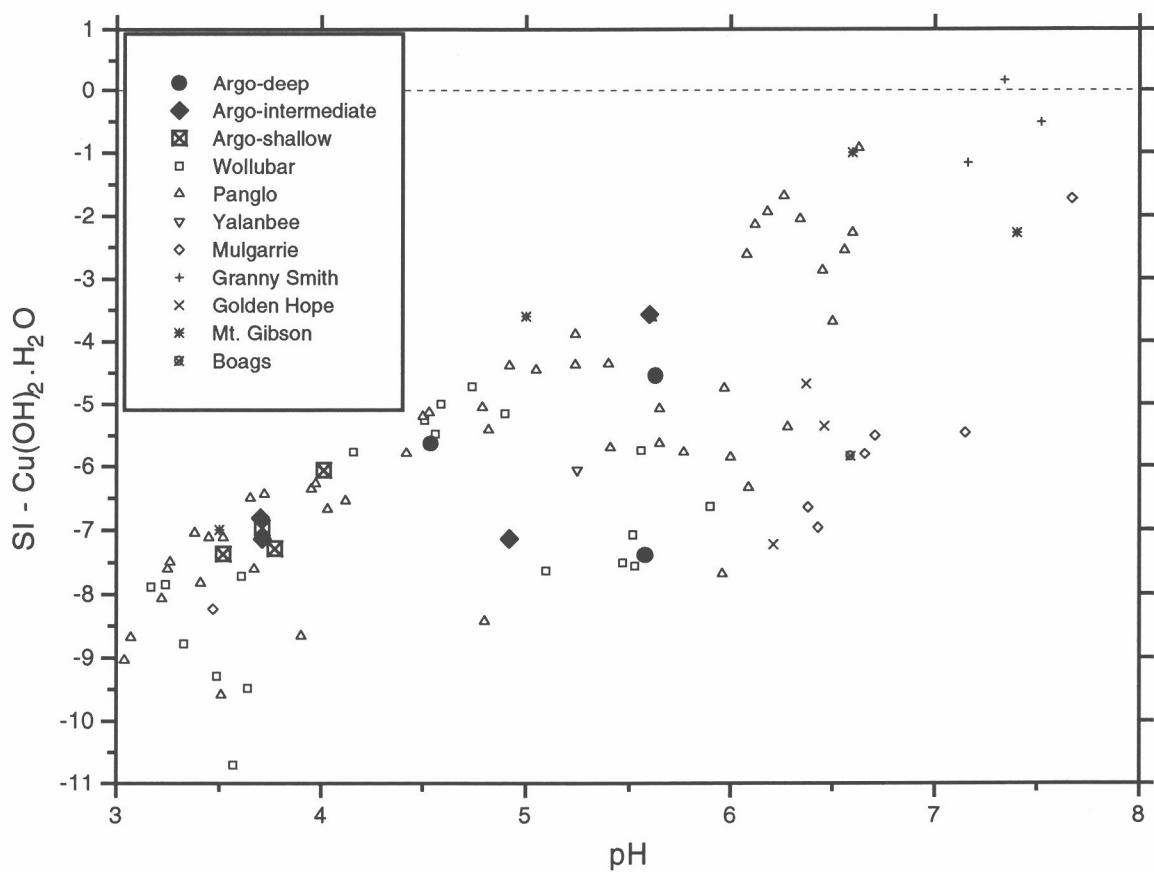


Figure A3.14: SI for Cu(OH)₂.H₂O vs. pH for groundwaters from Argo and other sites.

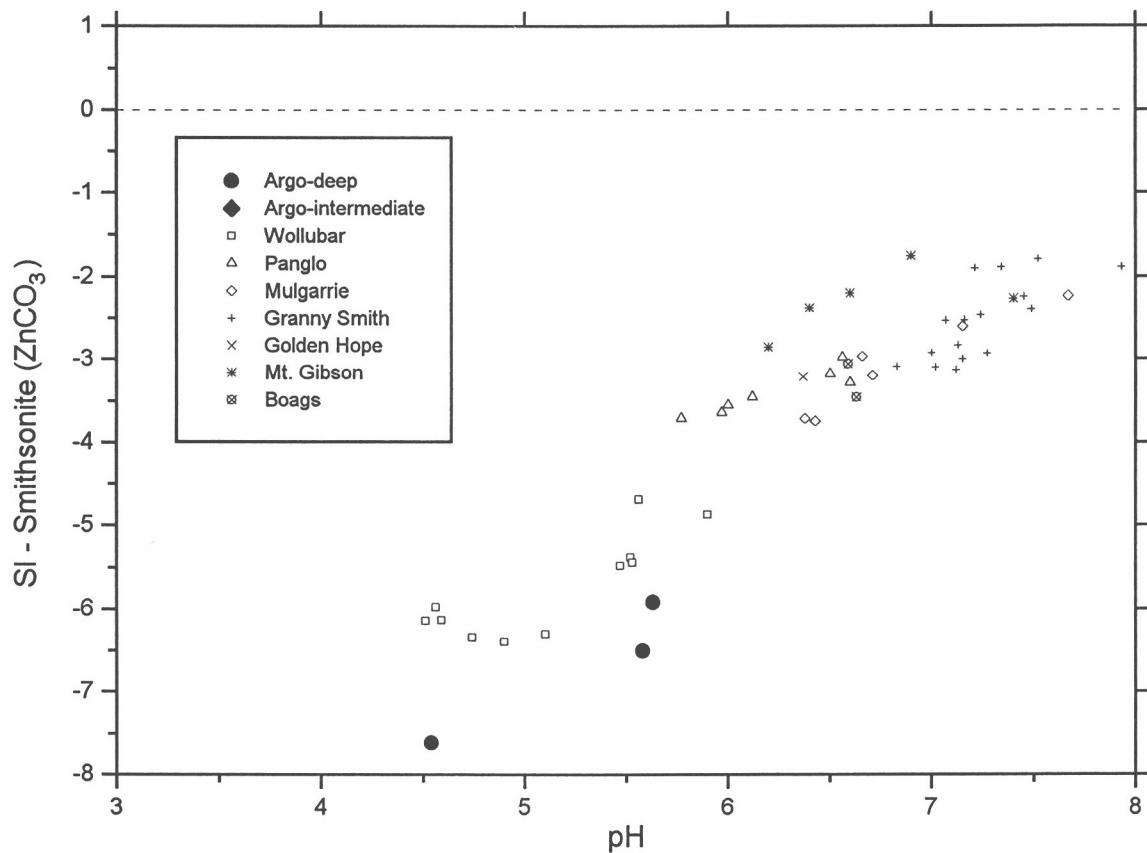


Figure A3.15: SI for smithsonite vs. pH for groundwaters from Argo and other sites.

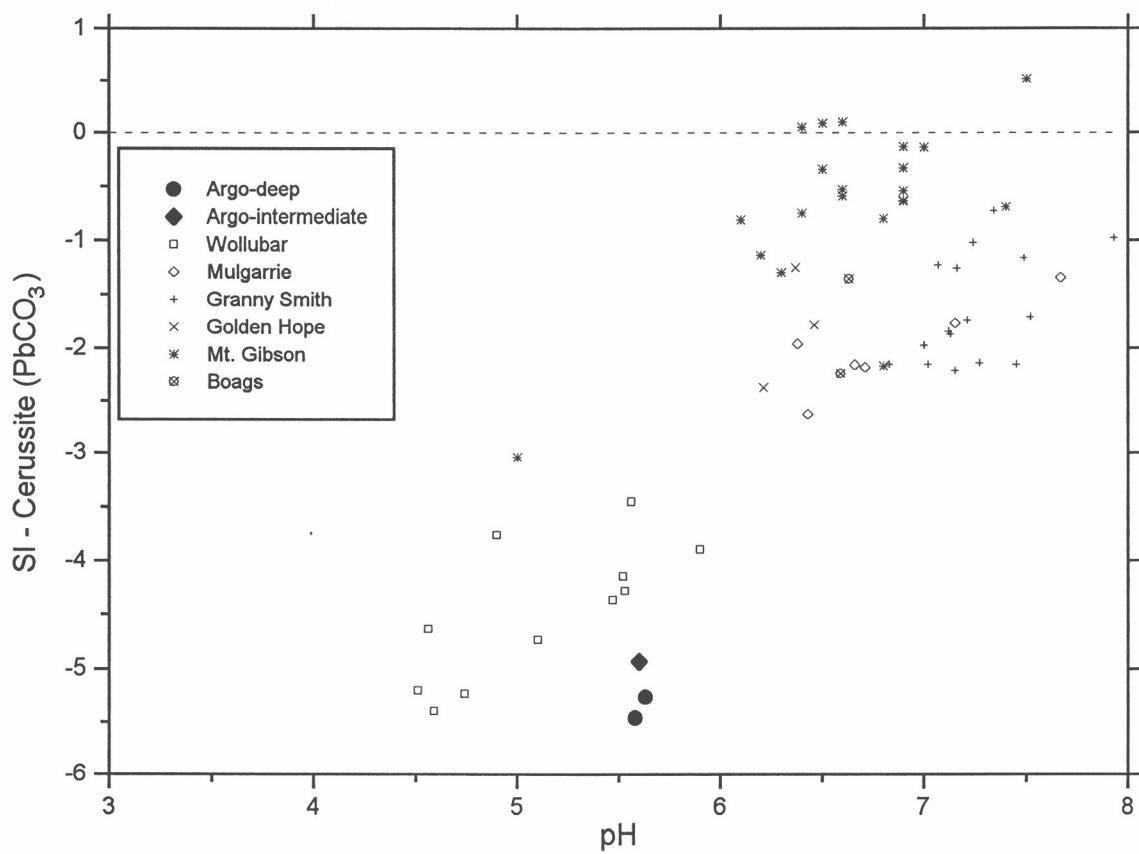


Figure A3.16: SI for cerussite vs. pH for groundwaters from Argo and other sites.

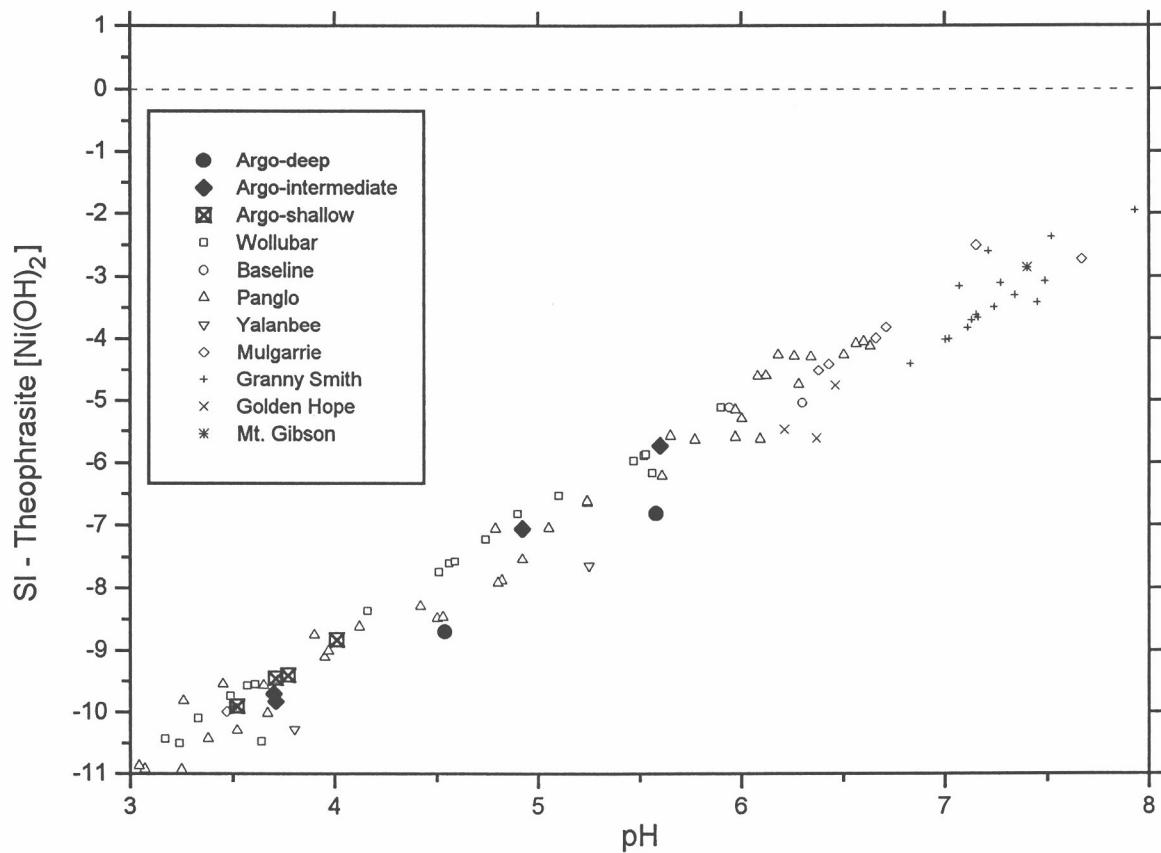


Figure A3.17: SI for theophrasite vs. pH for groundwaters from Argo and other sites.

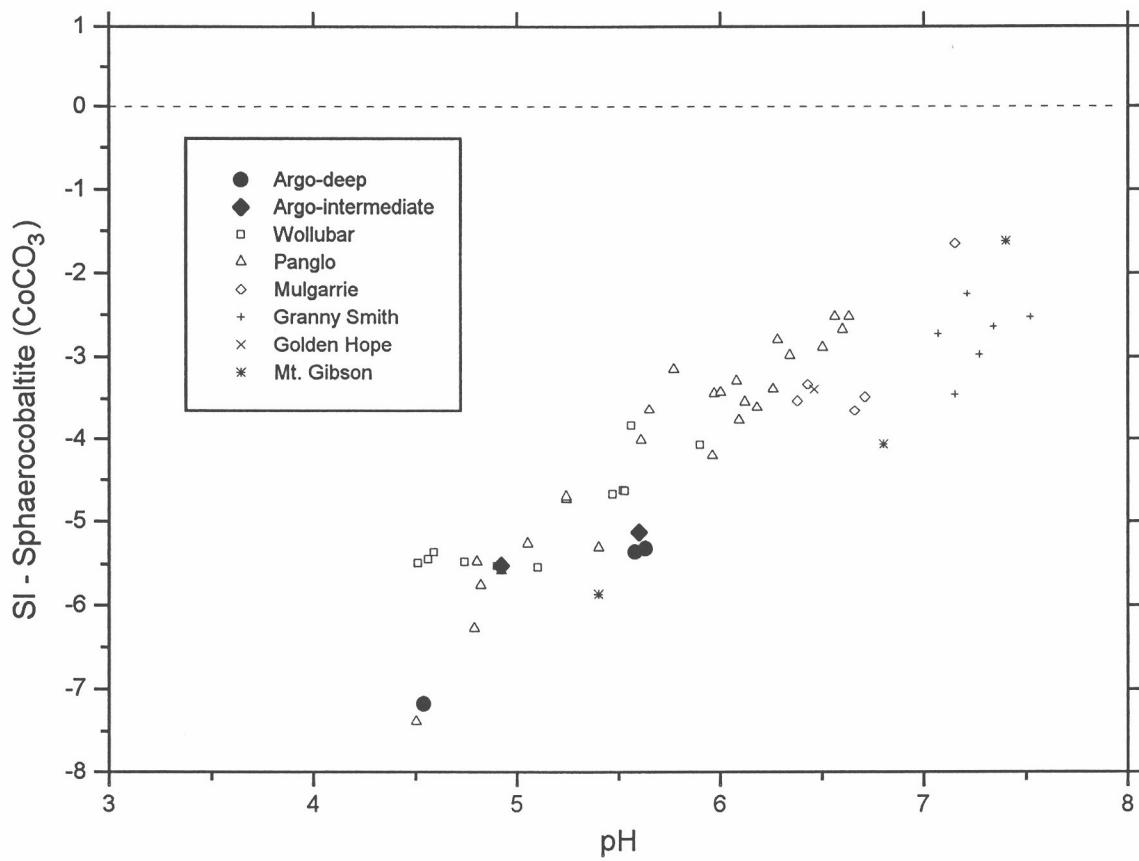


Figure A3.18: SI for sphaerocobaltite vs. pH for groundwaters from Argo and other sites.

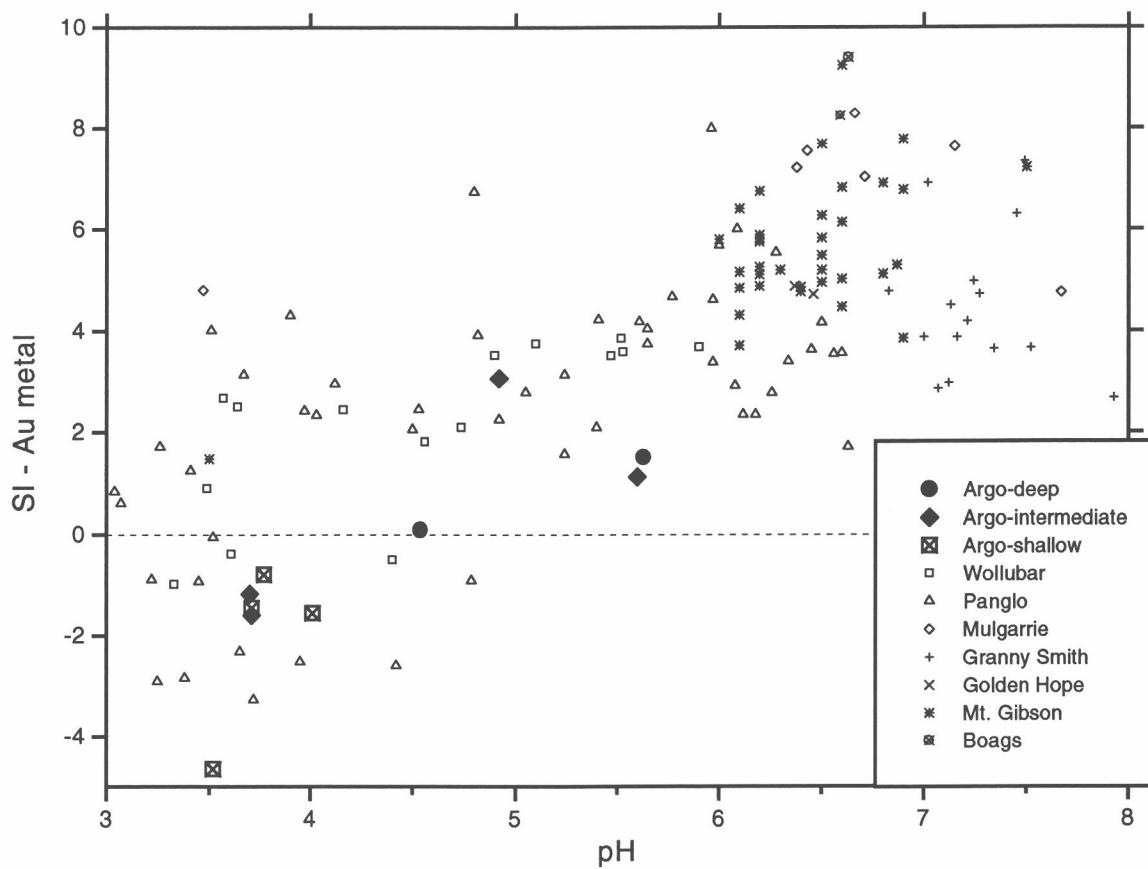


Figure A3.19: SI for Au metal vs. pH for groundwaters from Argo and other sites.

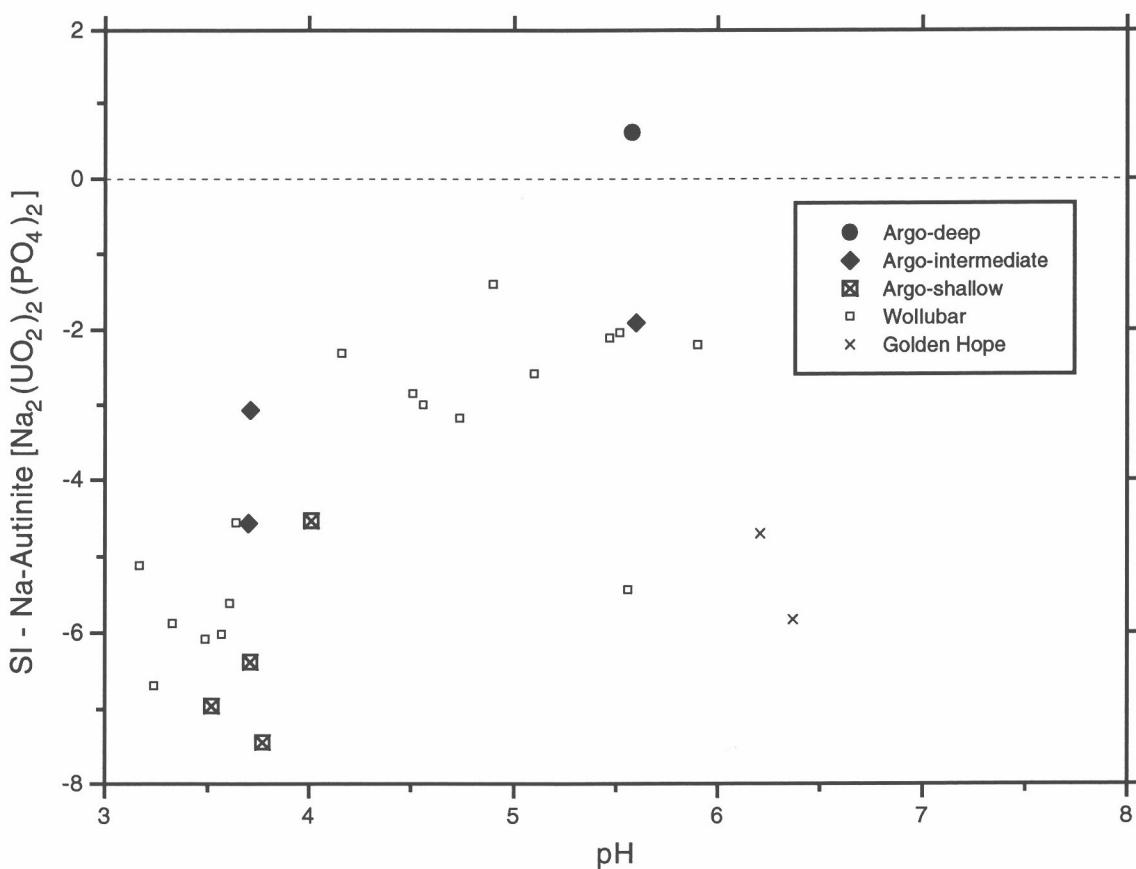


Figure A3.20: SI for Na-autinite vs. pH for groundwaters from Argo and other sites.

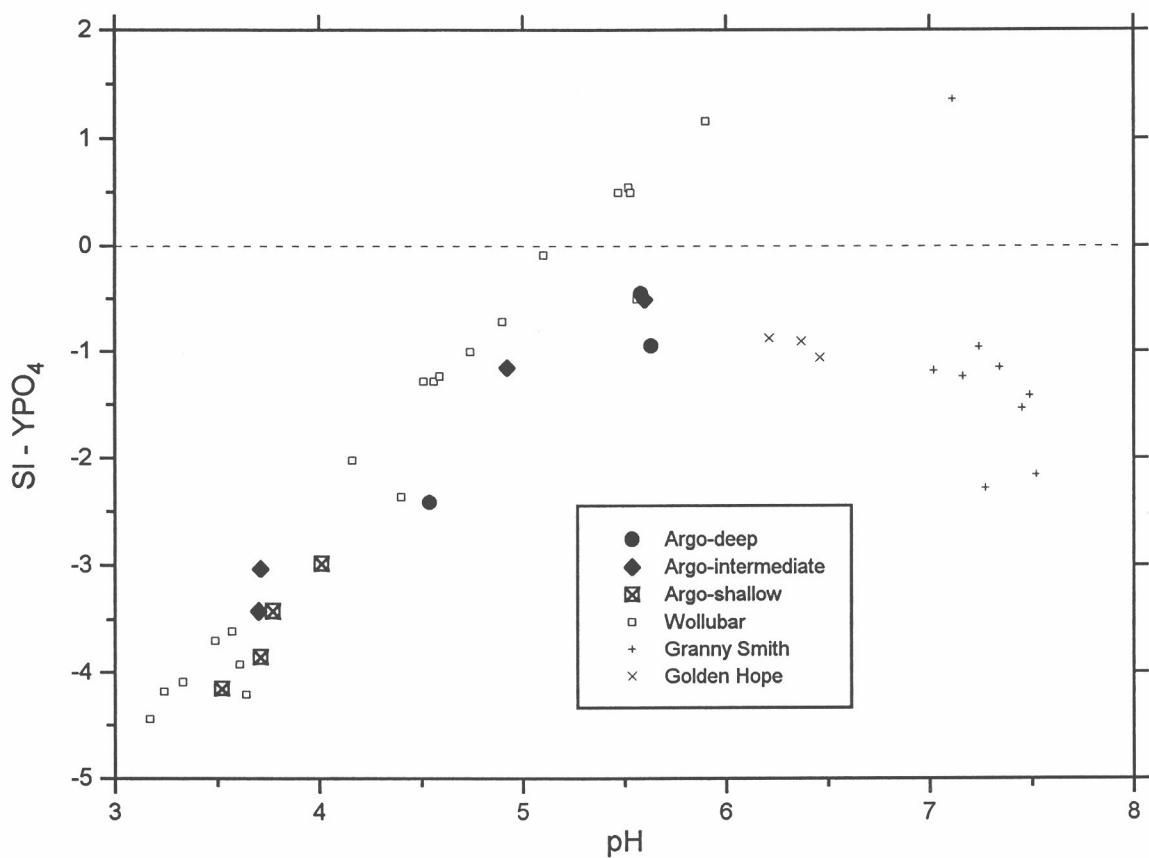


Figure A3.21: SI for YPO_4 vs. pH for groundwaters from Argo and other sites.

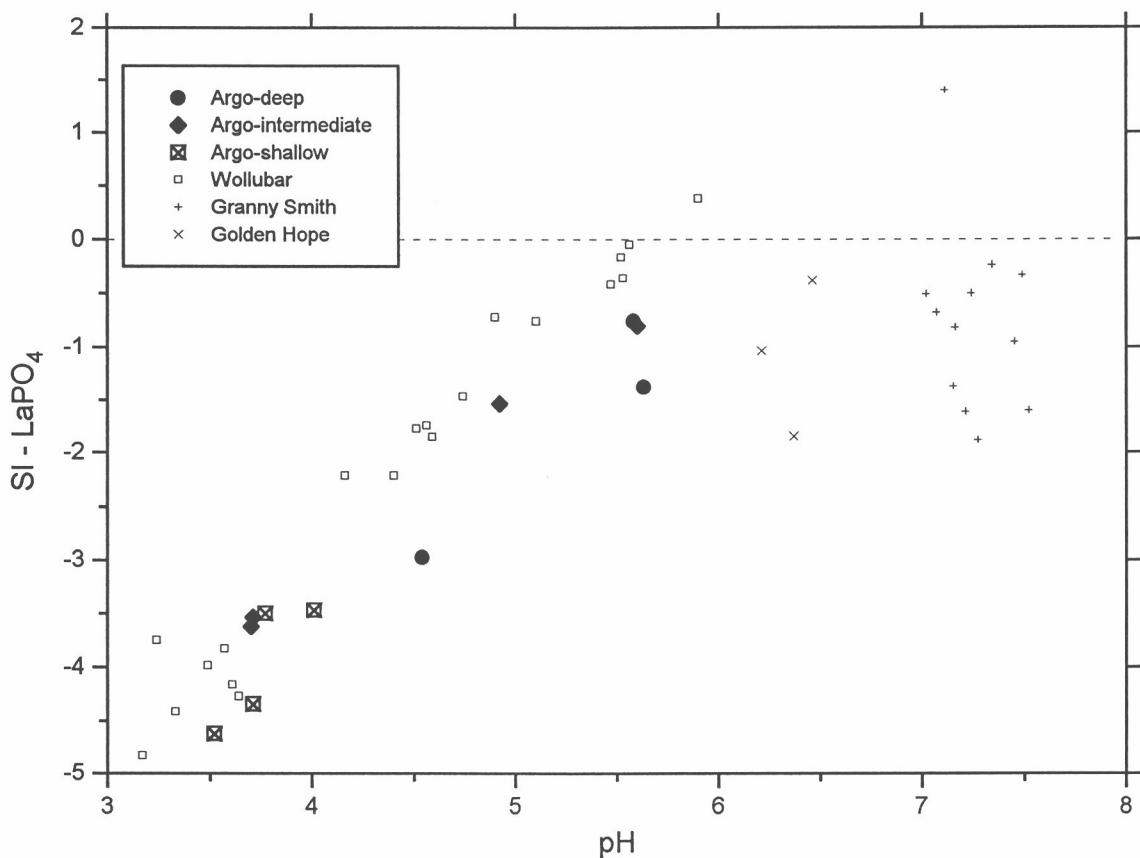


Figure A3.22: SI for LaPO_4 vs. pH for groundwaters from Argo and other sites.

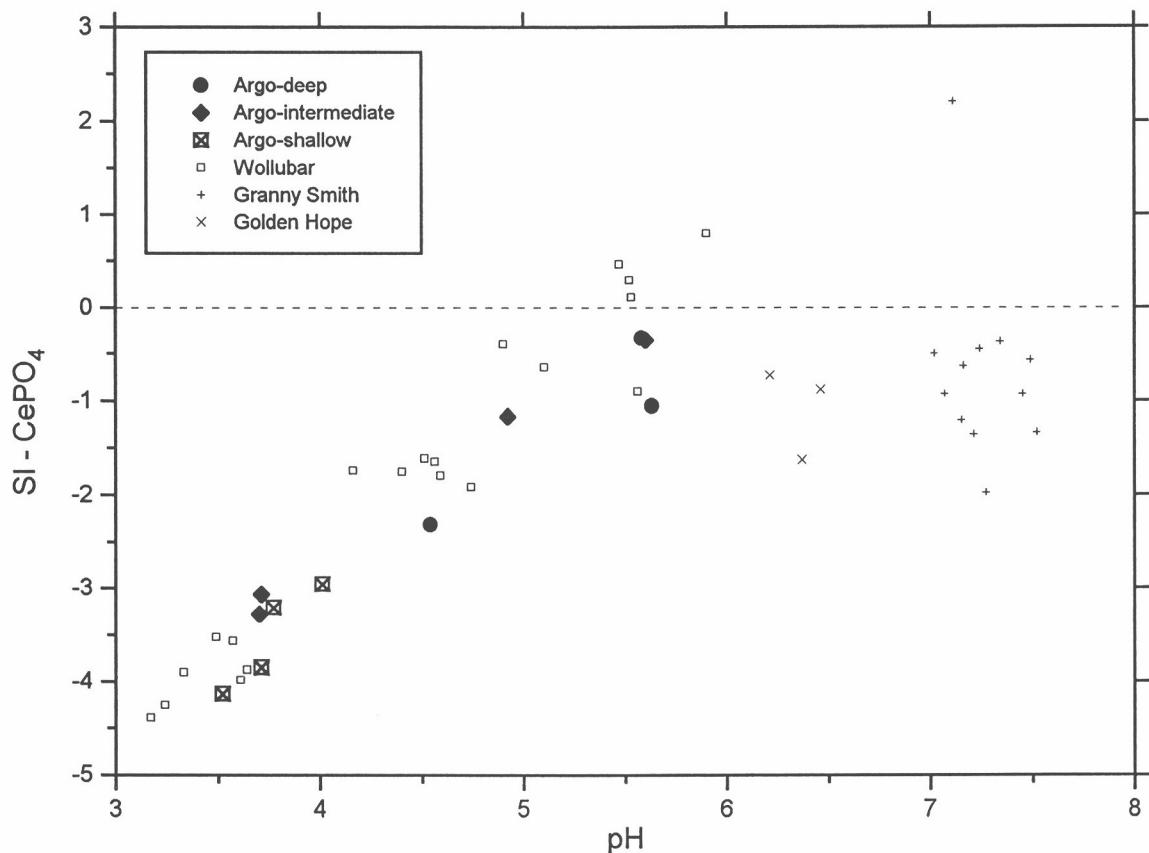


Figure A3.23: SI for CePO_4 vs. pH for groundwaters from Argo and other sites.

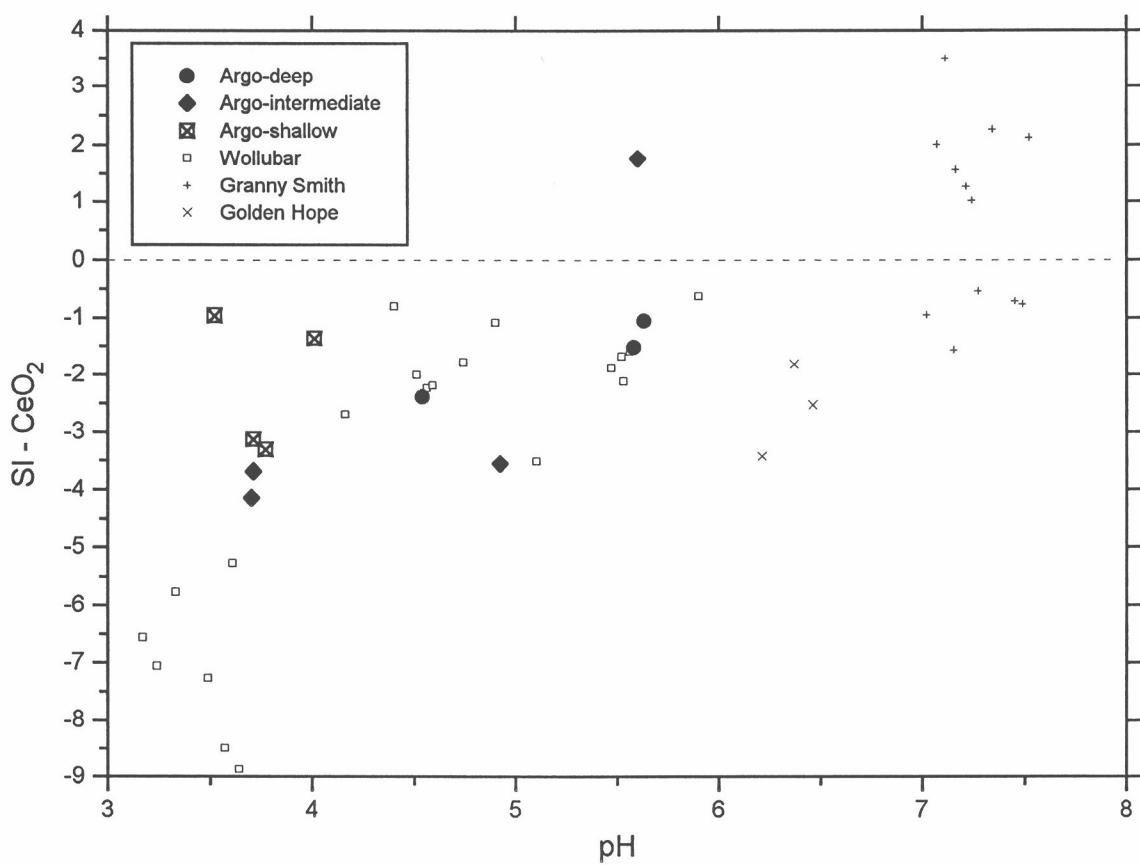


Figure A3.24: SI for CeO_2 vs. pH for groundwaters from Argo and other sites.

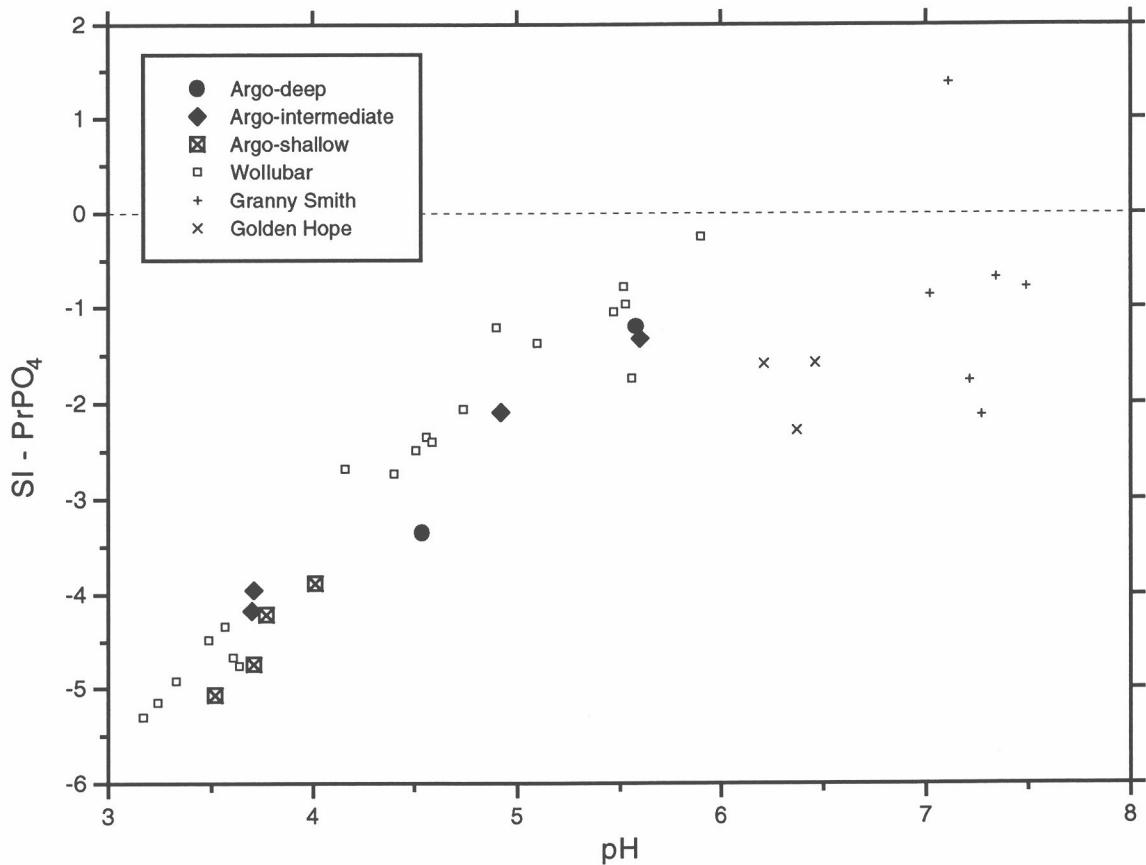


Figure A3.25: SI for PrPO_4 vs. pH for groundwaters from Argo and other sites.

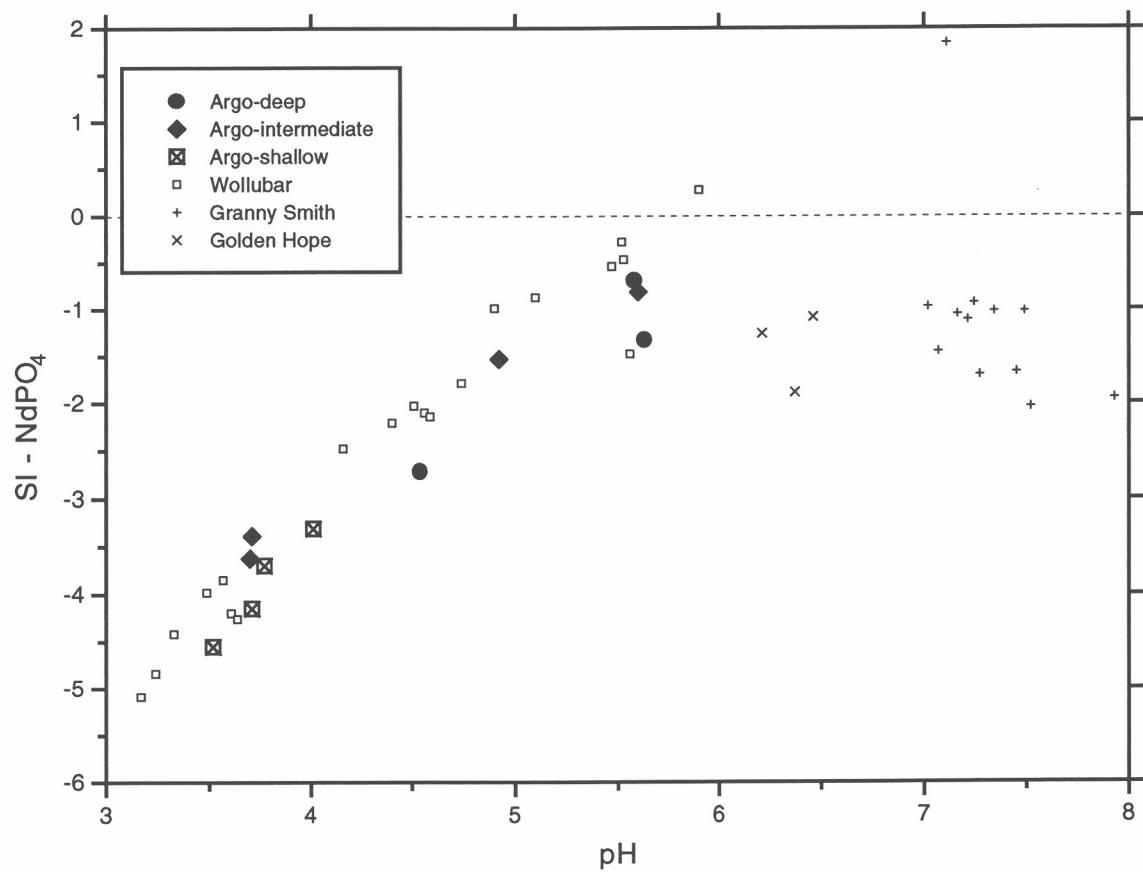


Figure A3.26: SI for NdPO_4 vs. pH for groundwaters from Argo and other sites.

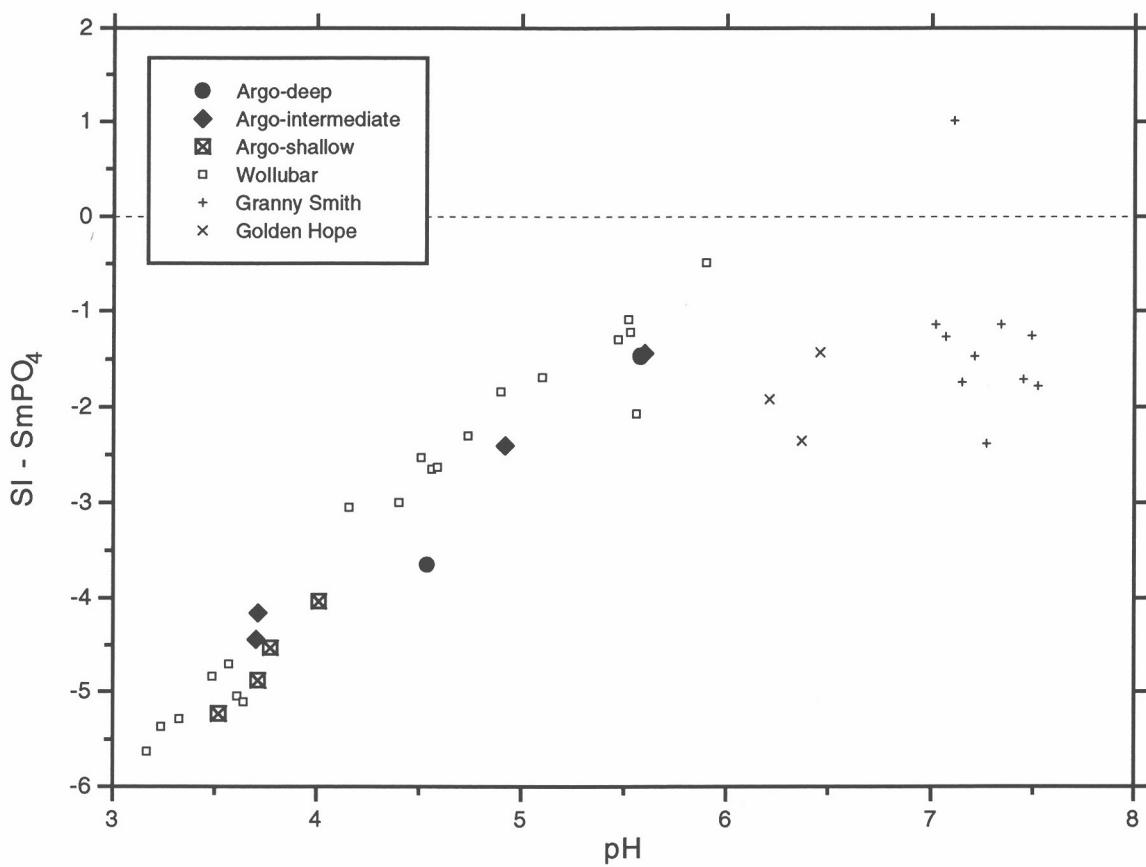


Figure A3.27: SI for SmPO₄ vs. pH for groundwaters from Argo and other sites.

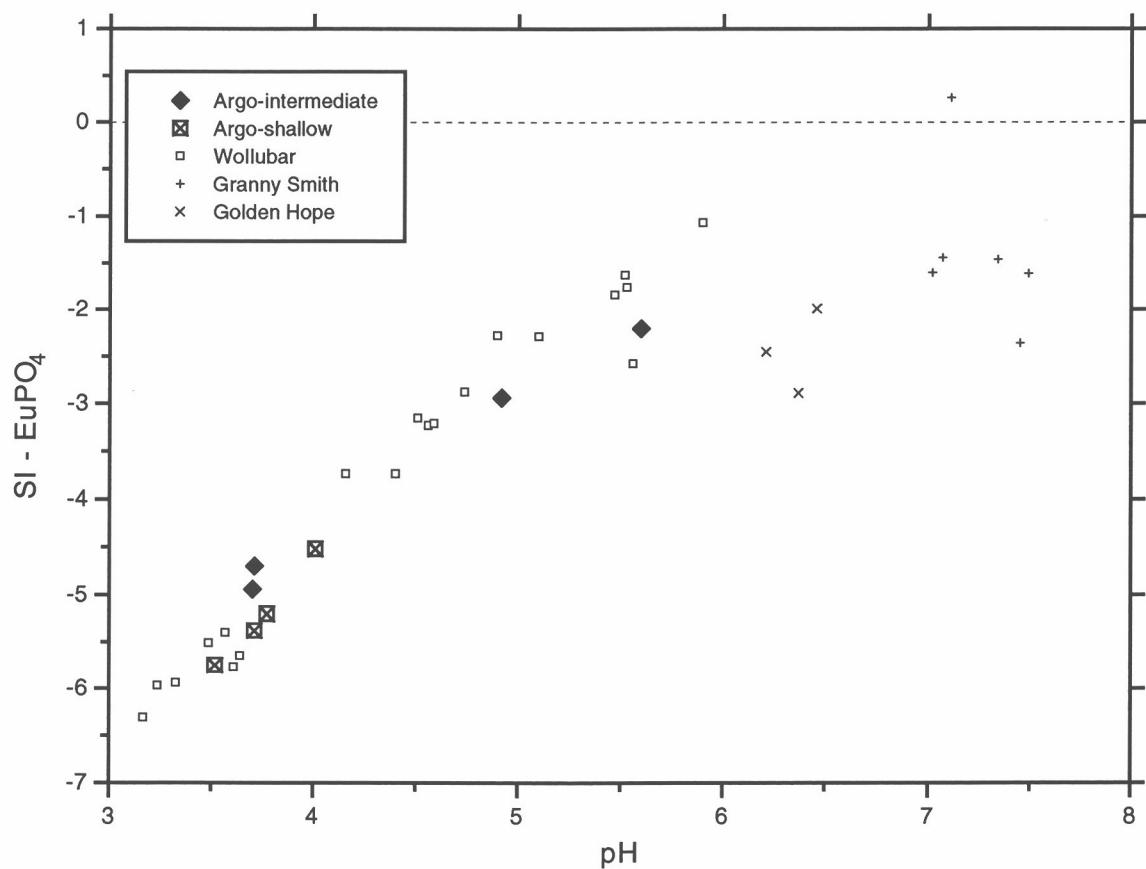


Figure A3.28: SI for EuPO₄ vs. pH for groundwaters from Argo and other sites.

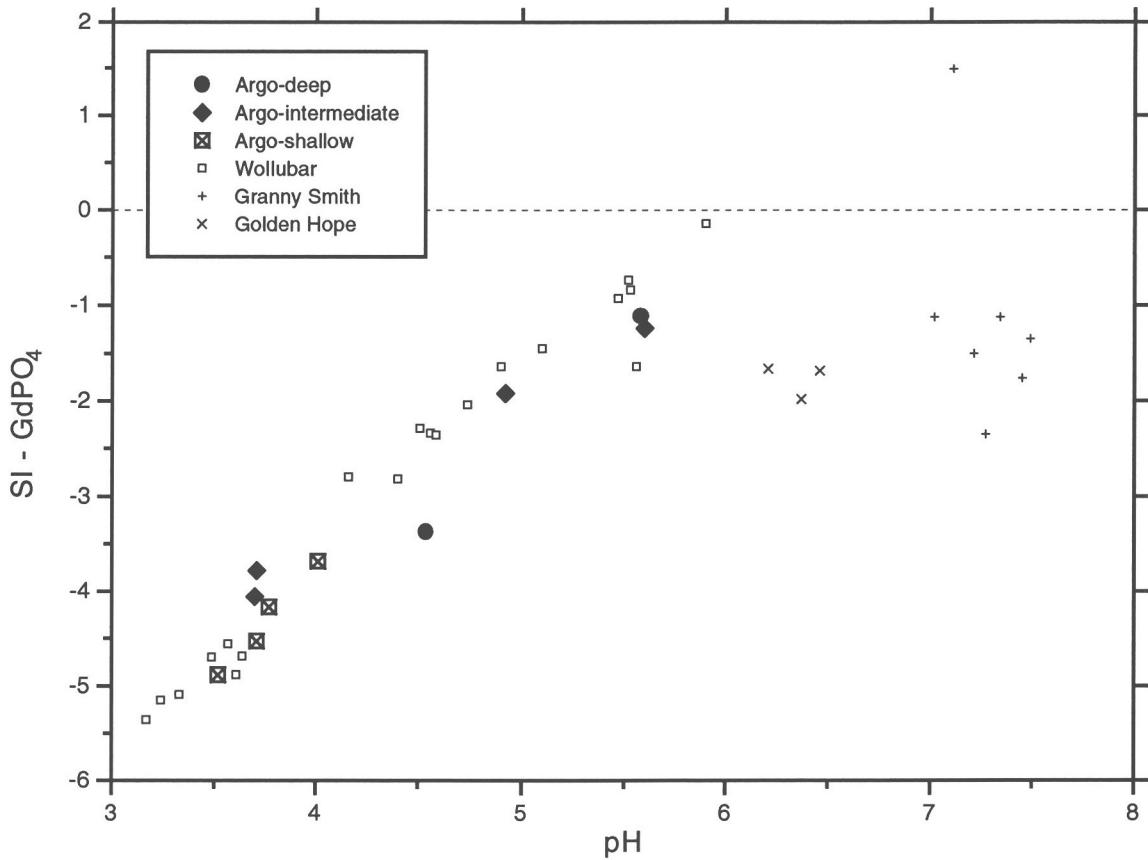


Figure A3.29: SI for GdPO_4 vs. pH for groundwaters from Argo and other sites.

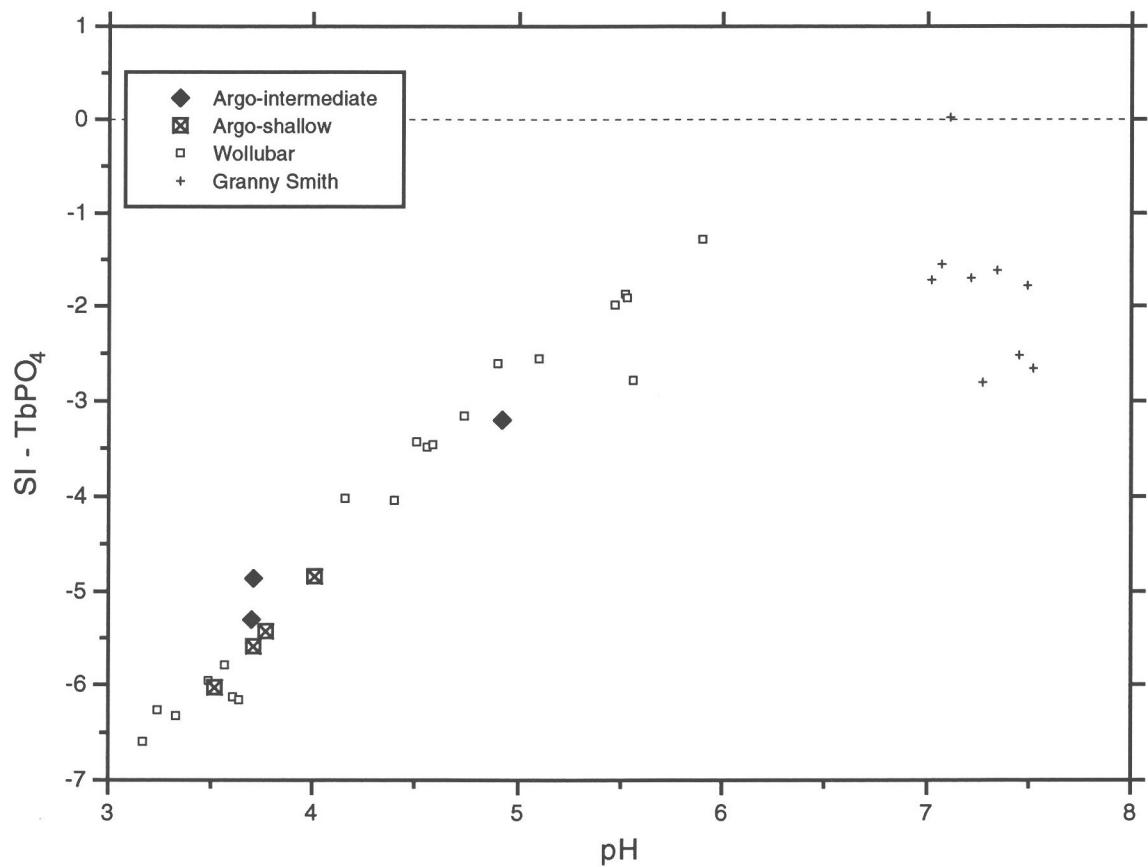


Figure A3.30: SI for TbPO_4 vs. pH for groundwaters from Argo and other sites.

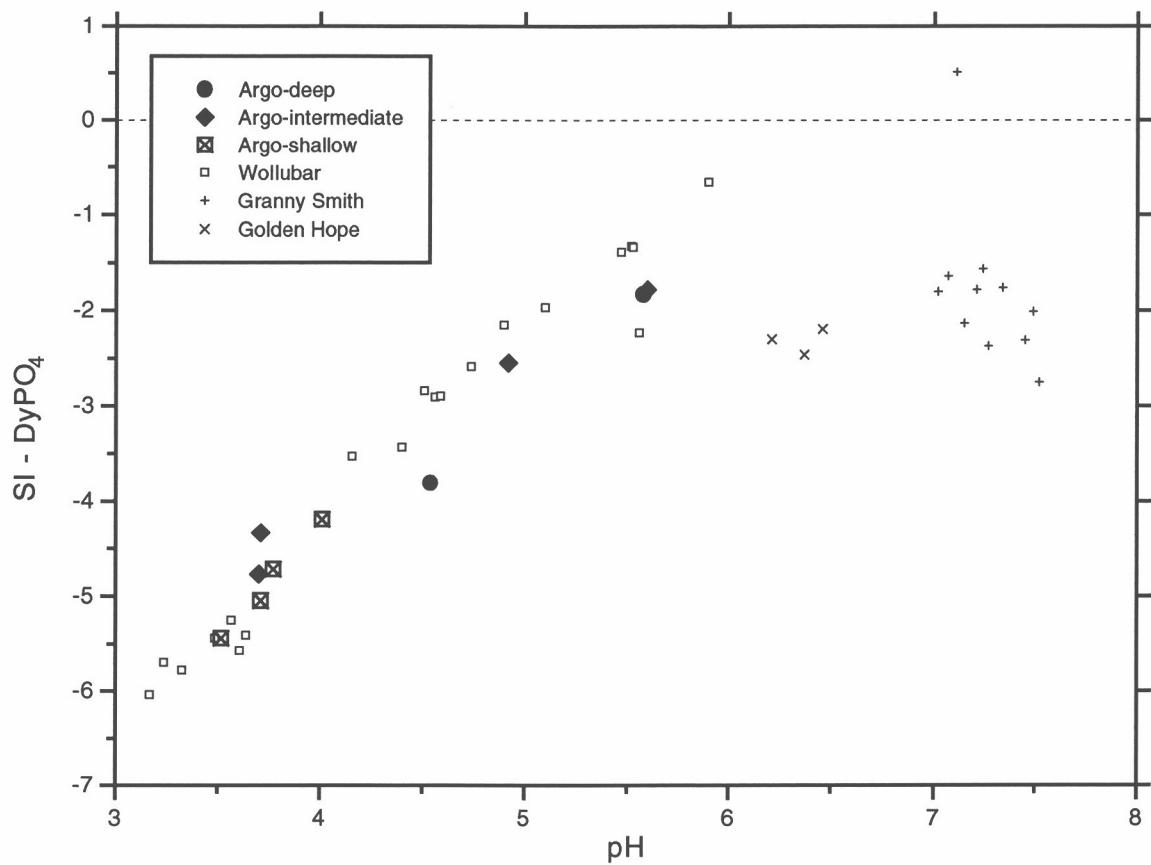


Figure A3.31: SI for DyPO_4 vs. pH for groundwaters from Argo and other sites.

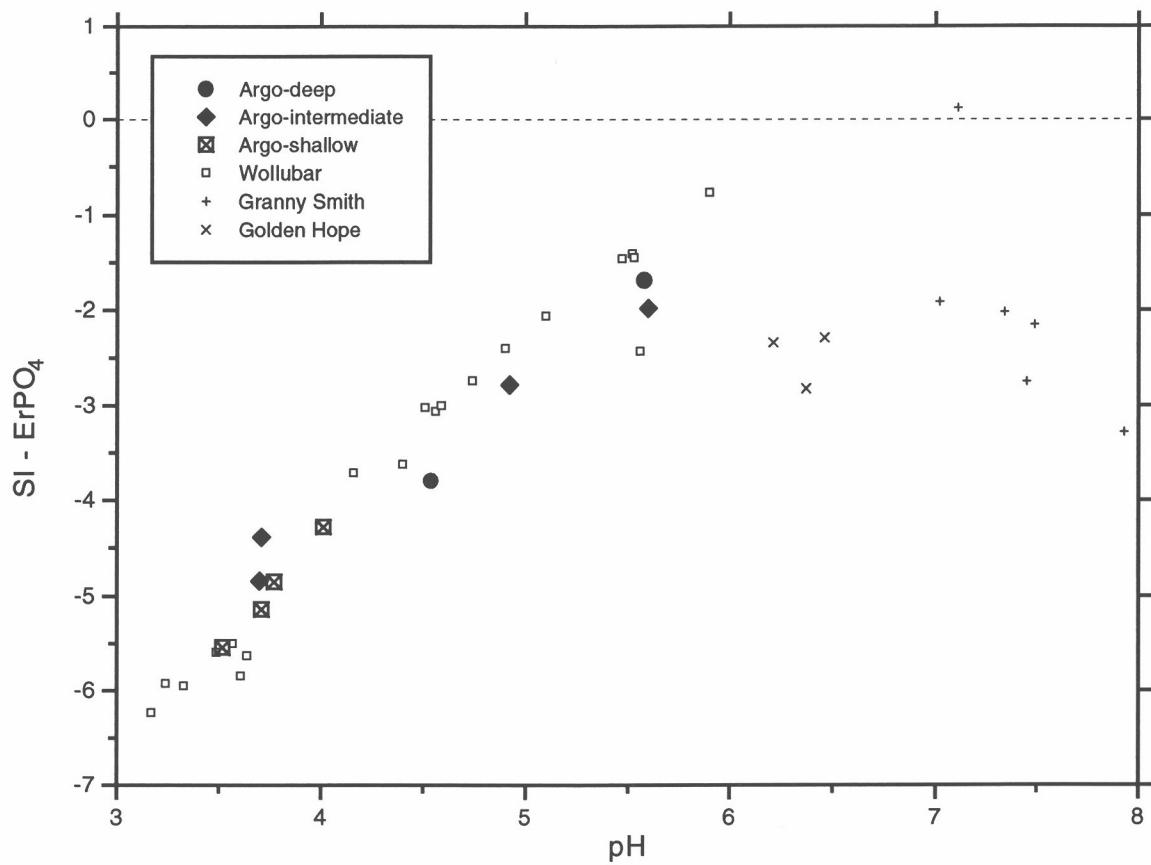


Figure A3.33: SI for ErPO_4 vs. pH for groundwaters from Argo and other sites.

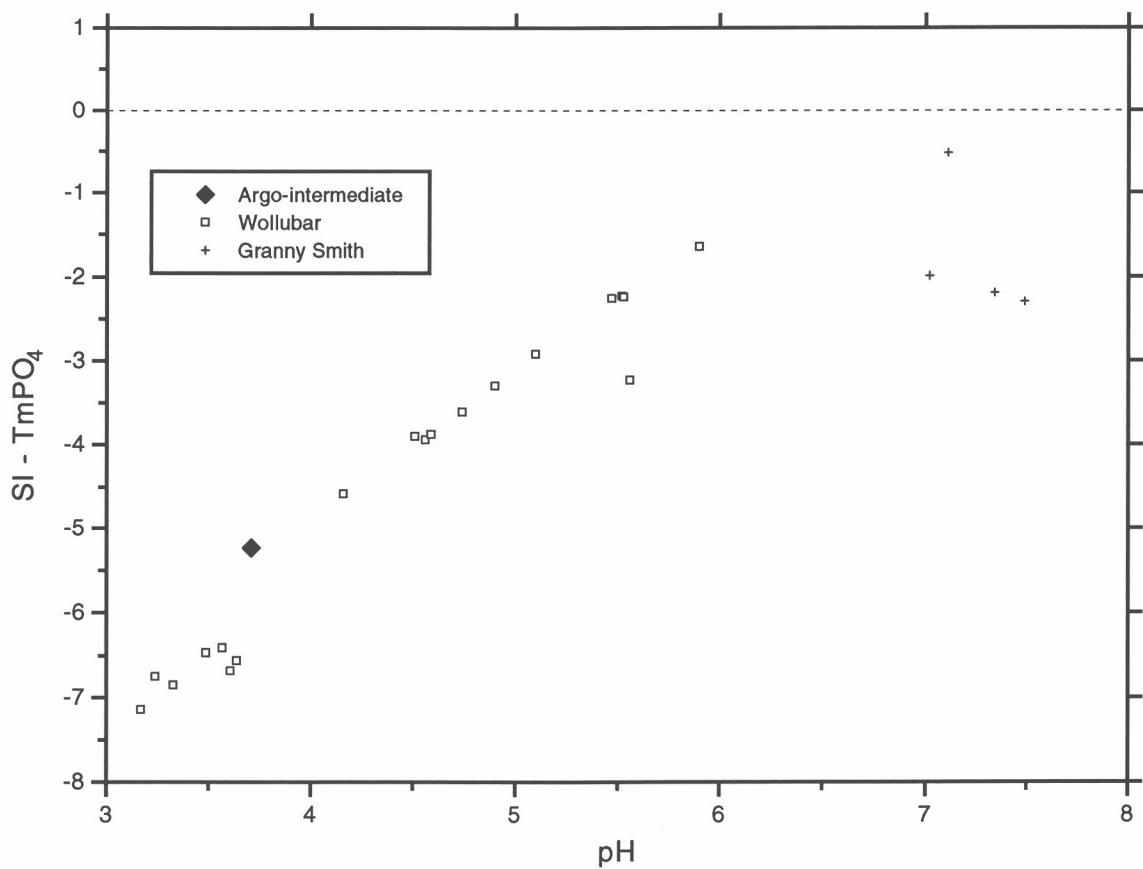


Figure A3.34: SI for TmPO_4 vs. pH for groundwaters from Argo and other sites.

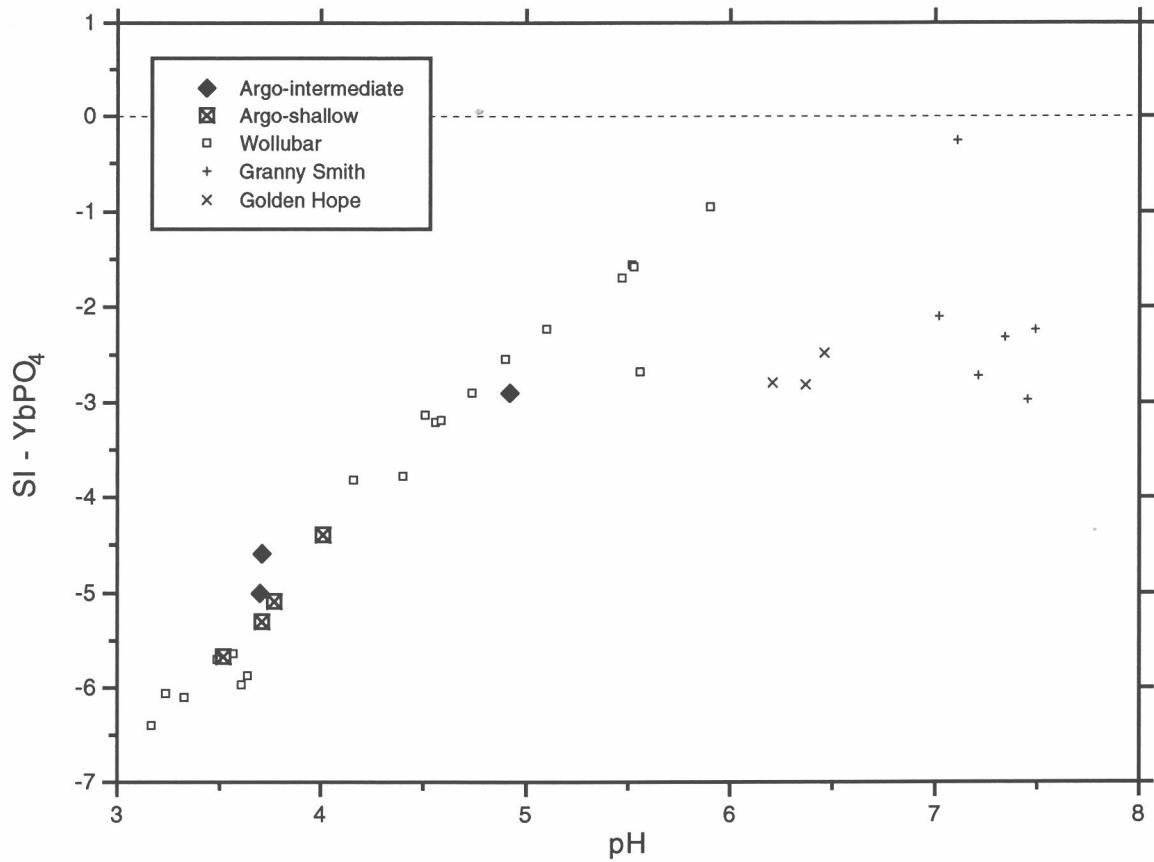
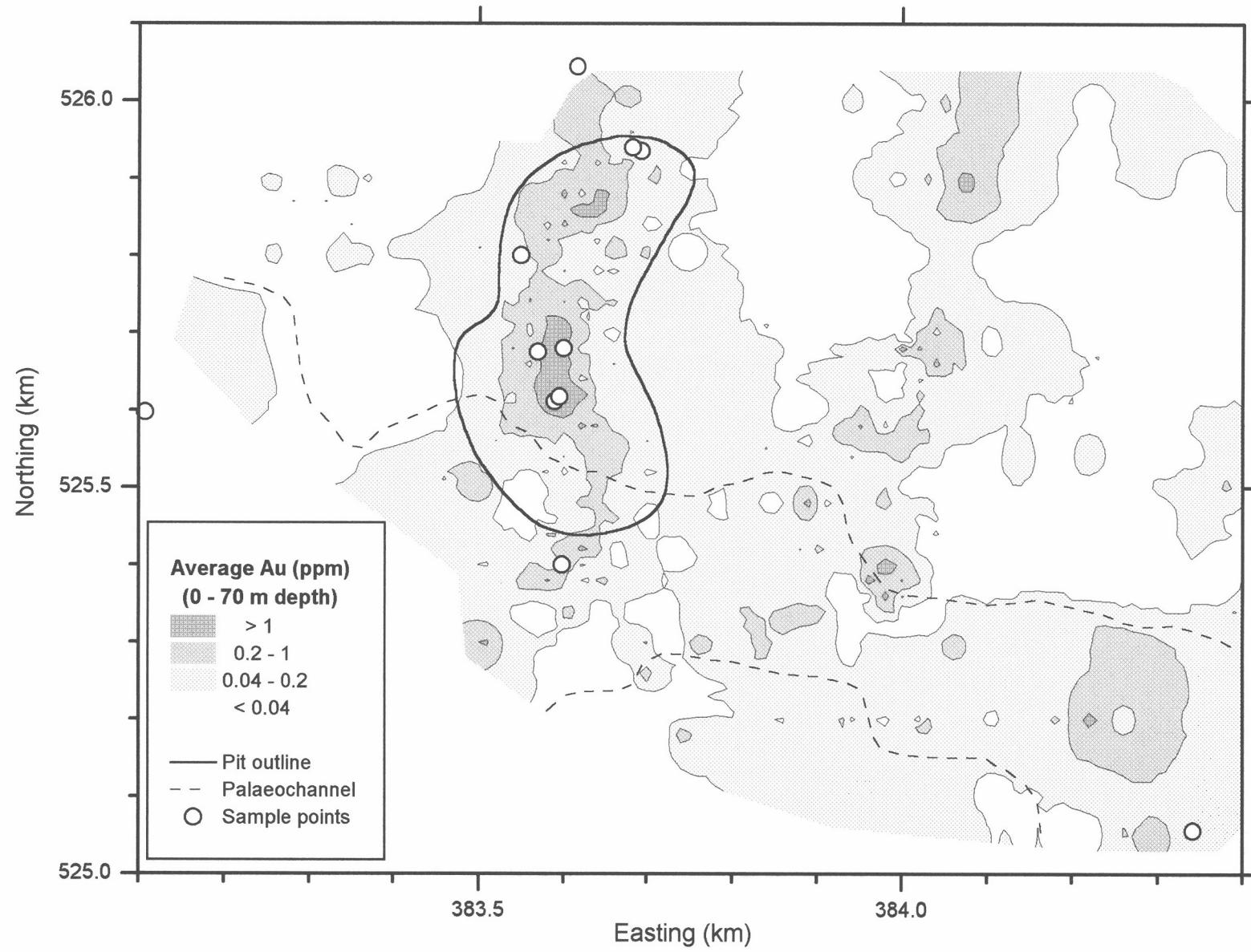


Figure A3.35: SI for YbPO_4 vs. pH for groundwaters from Argo and other sites.

**Appendix 4: Element/ion
distribution maps - groundwaters**

Figure A4.1: Average Au concentration in the regolith (0 - 70 m), with sample points, pit outline and palaeochannel, at Argo (courtesy Western Mining Corporation Ltd.)



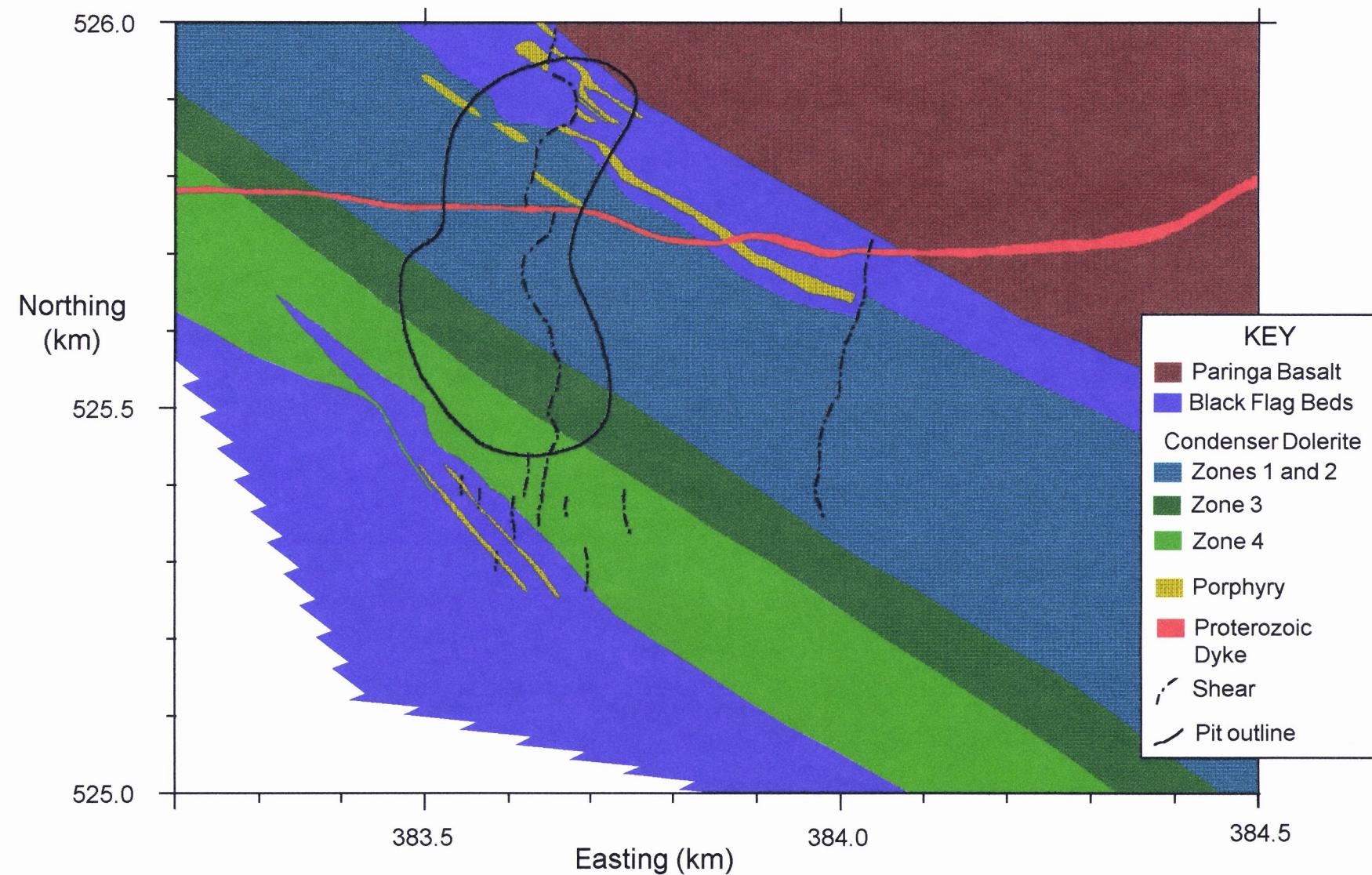


Figure A4.2: Plan of Argo area showing geology (modified from Western Mining Corporation Limited plans).

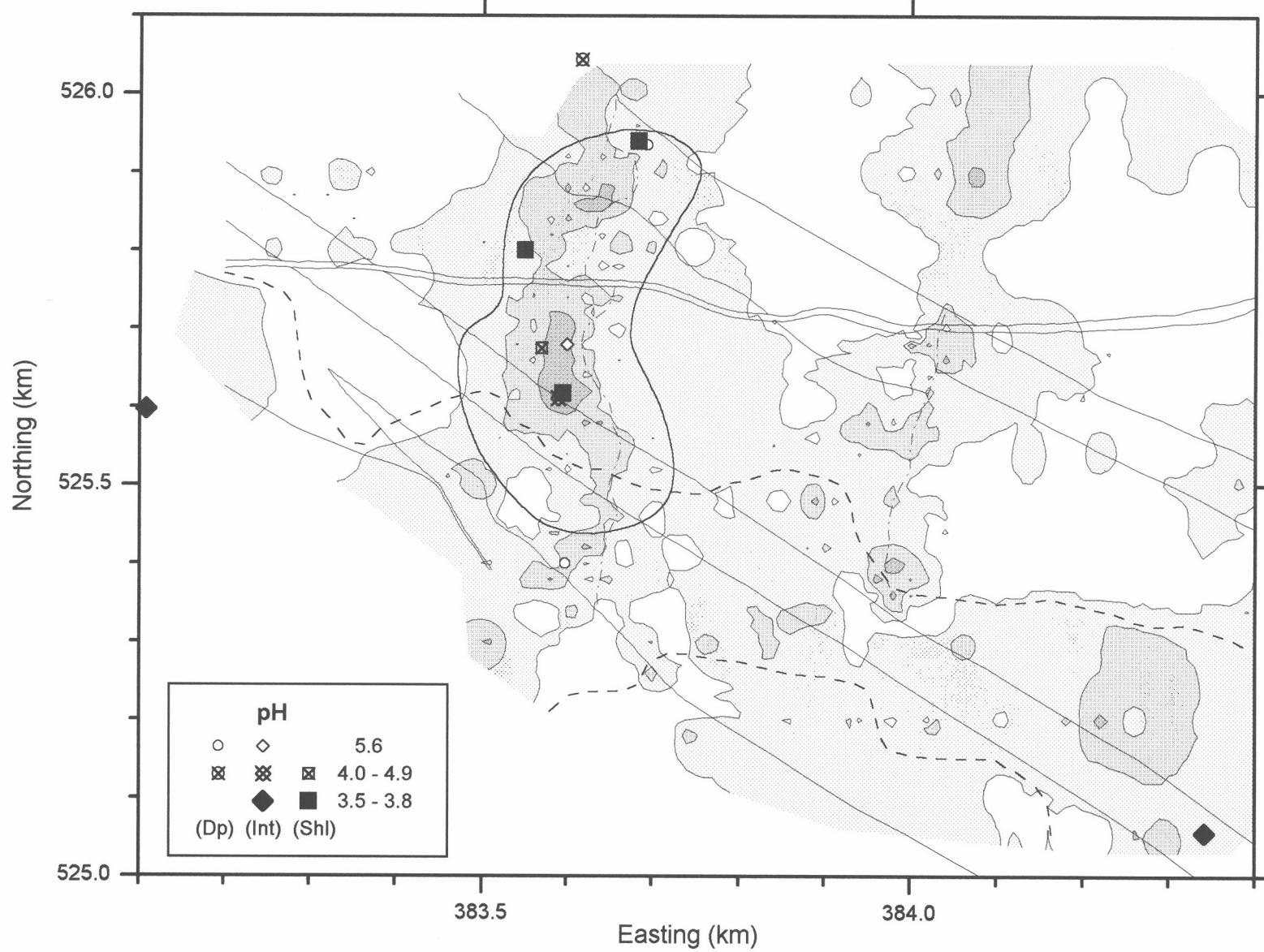


Figure A4.3: pH distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

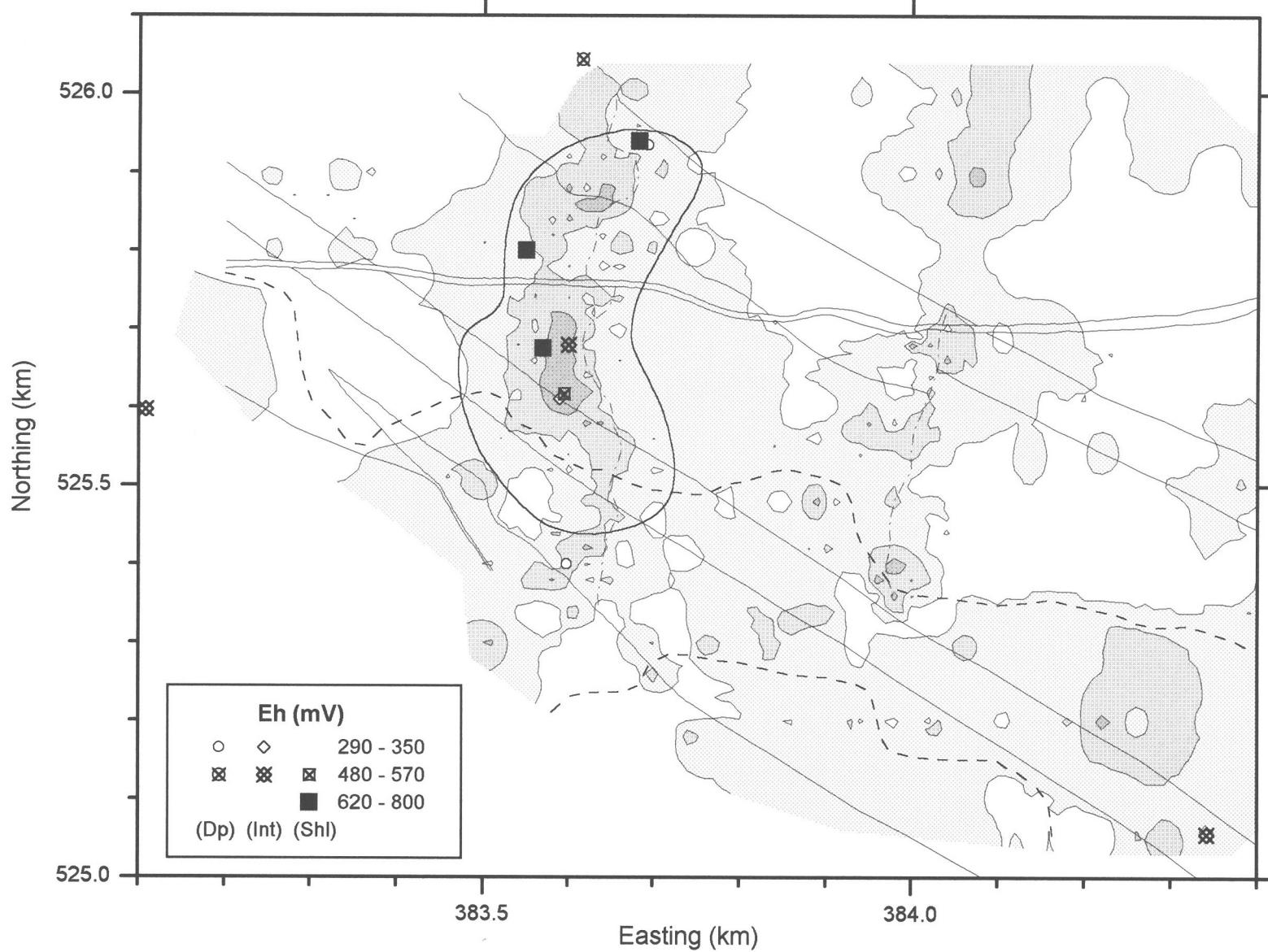


Figure A.4: Eh distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A.1 and A.2).

Figure A4.5: TDS distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

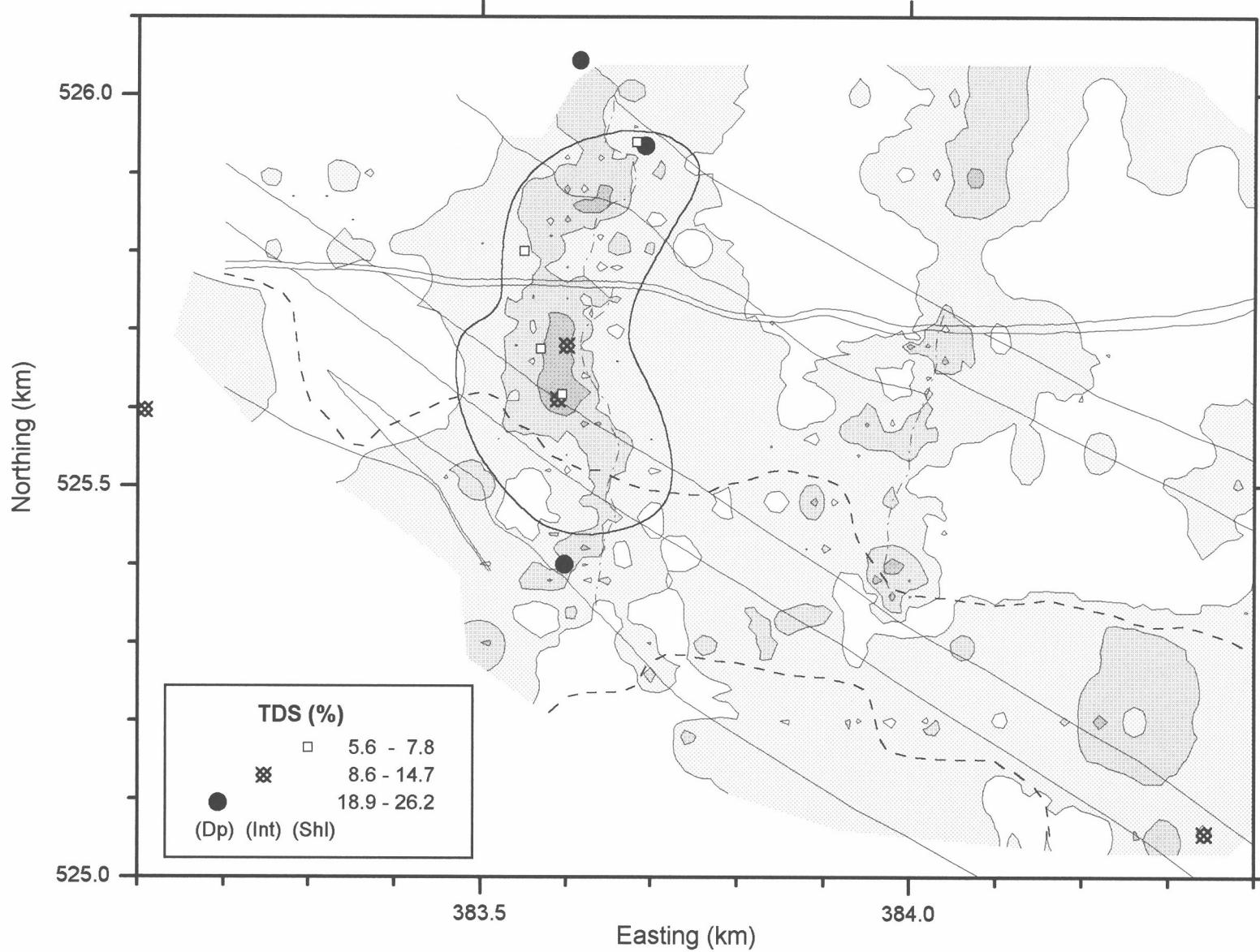


Figure A4.6: Bicarbonate distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

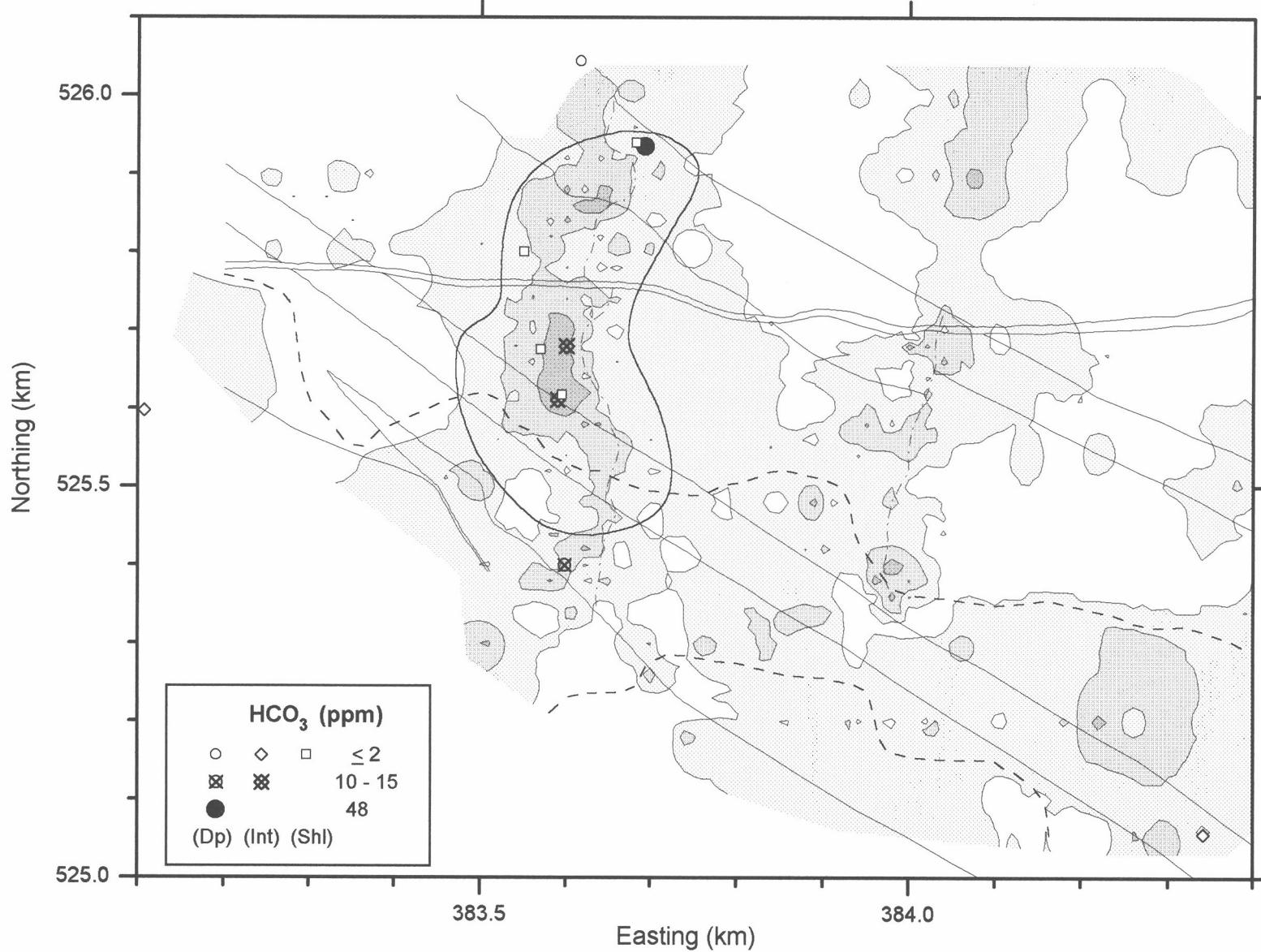


Figure A4.7: Phosphorus distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

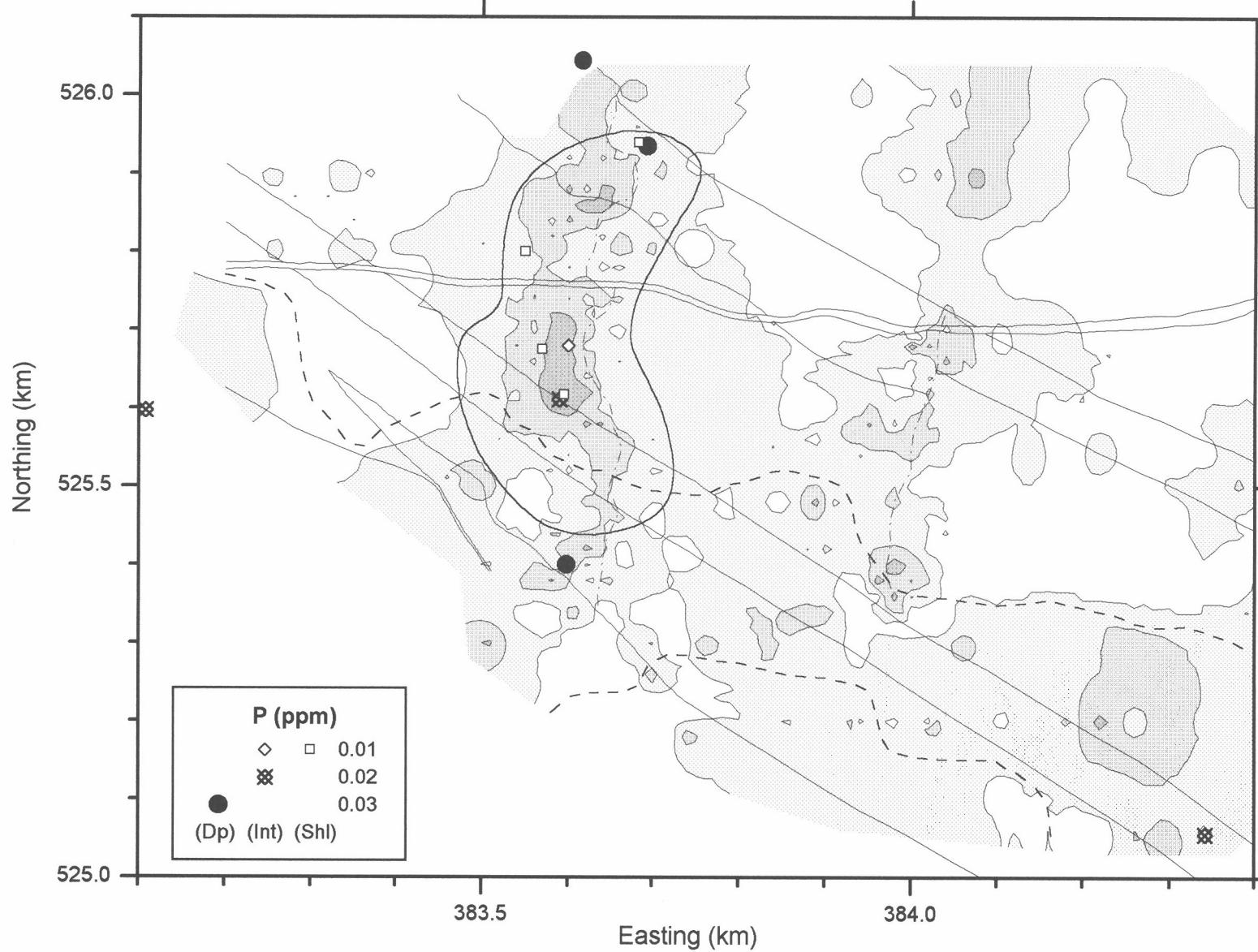


Figure A4.8: Lithium distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

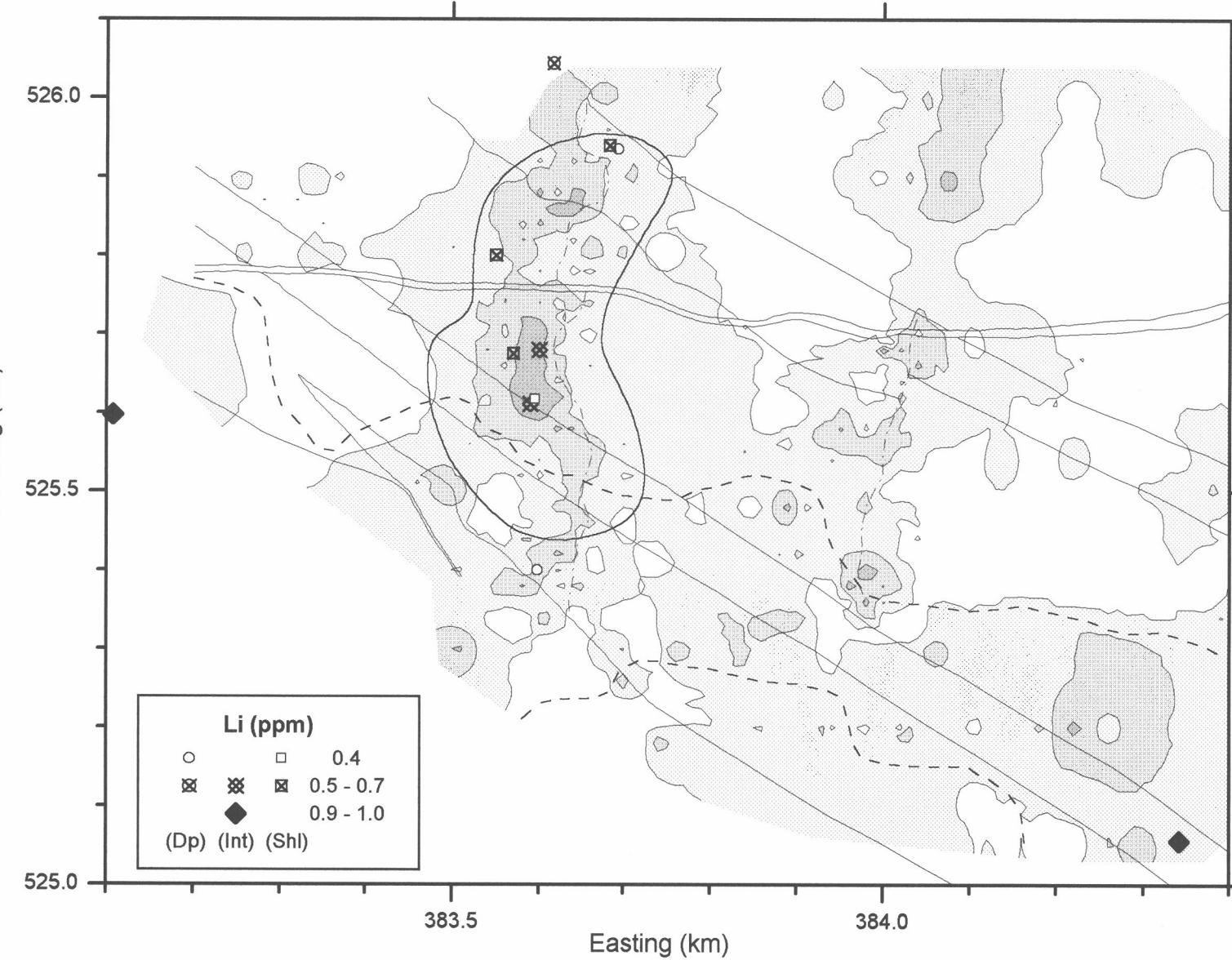


Figure A4.9: Boron distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

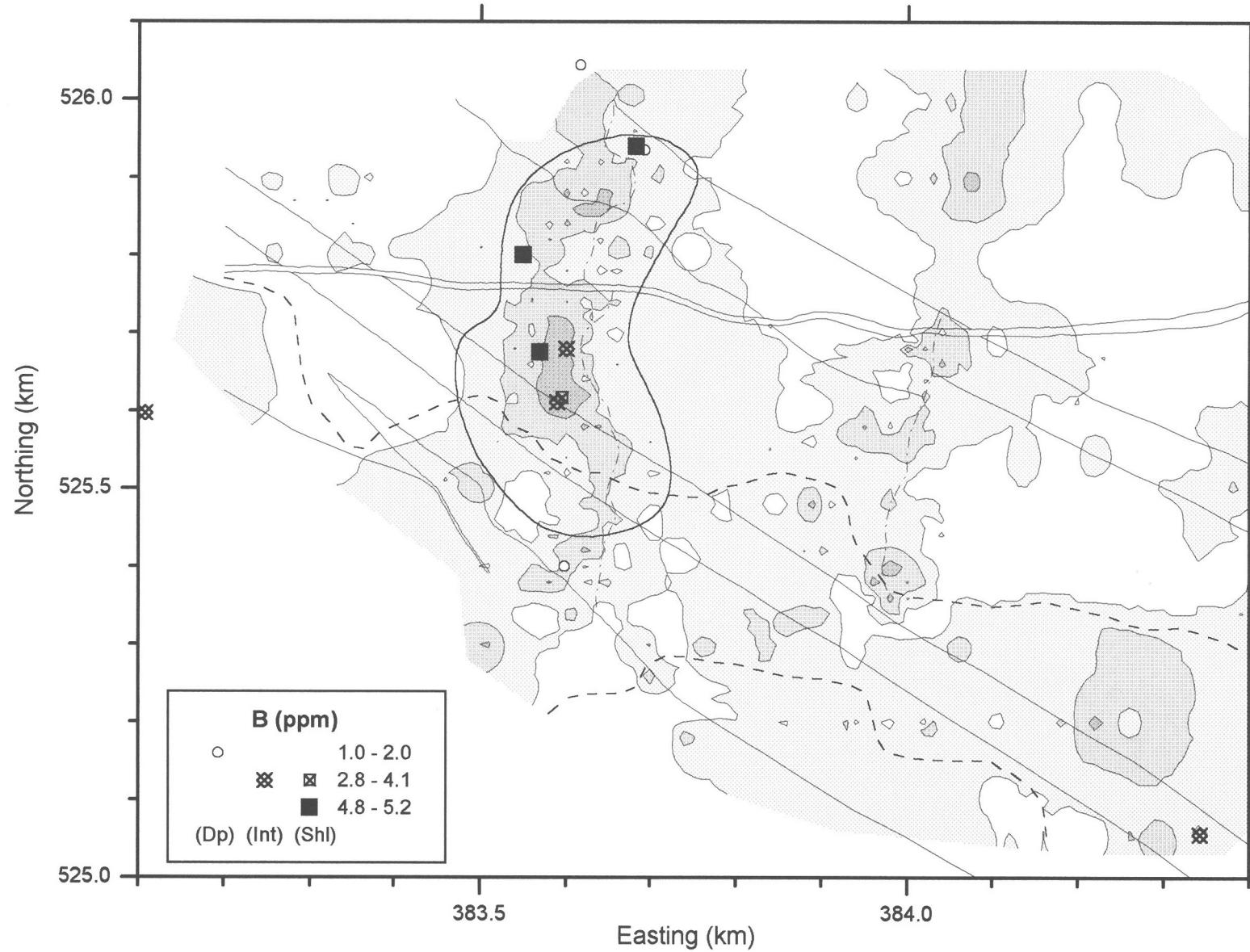


Figure A4.10: Aluminium distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

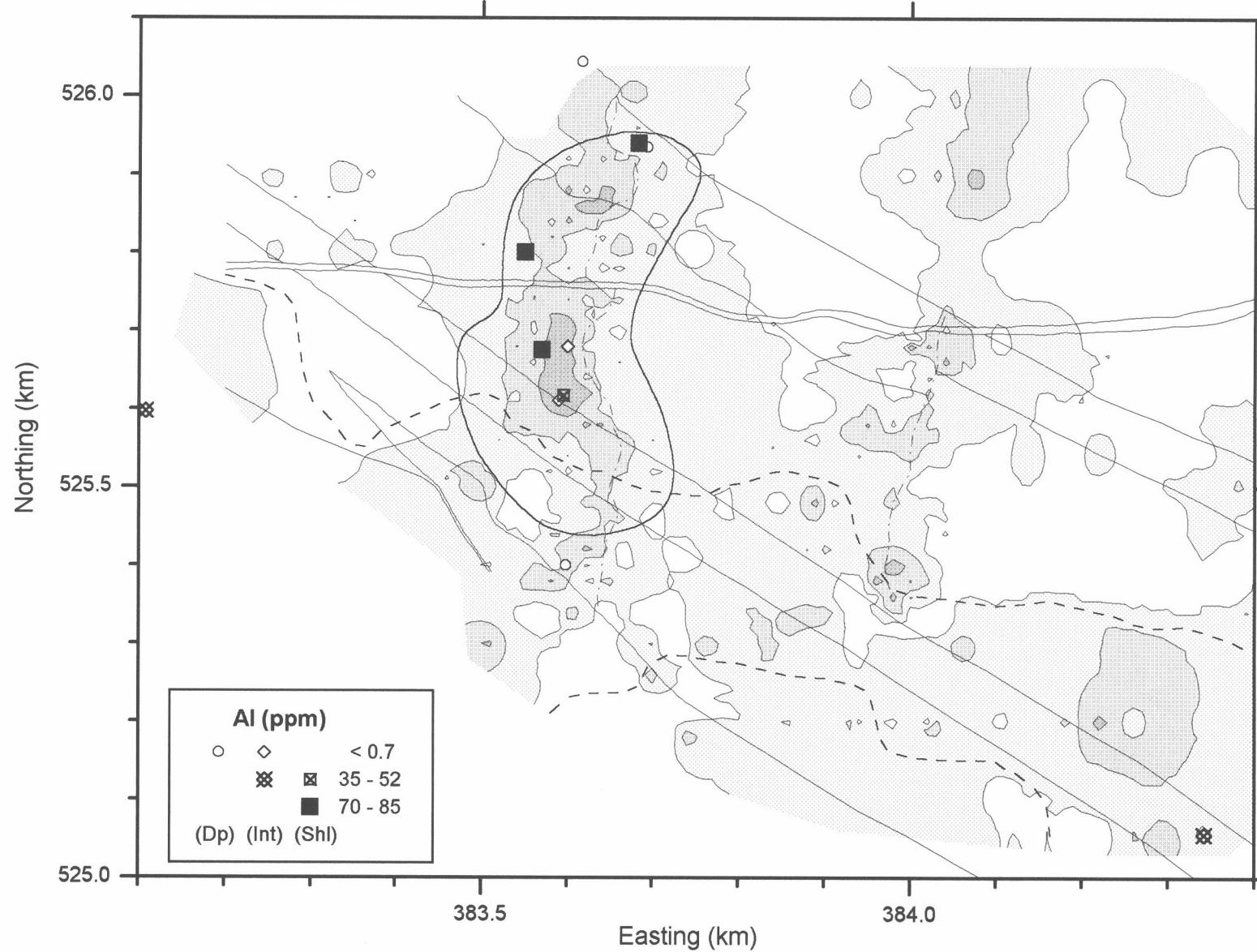
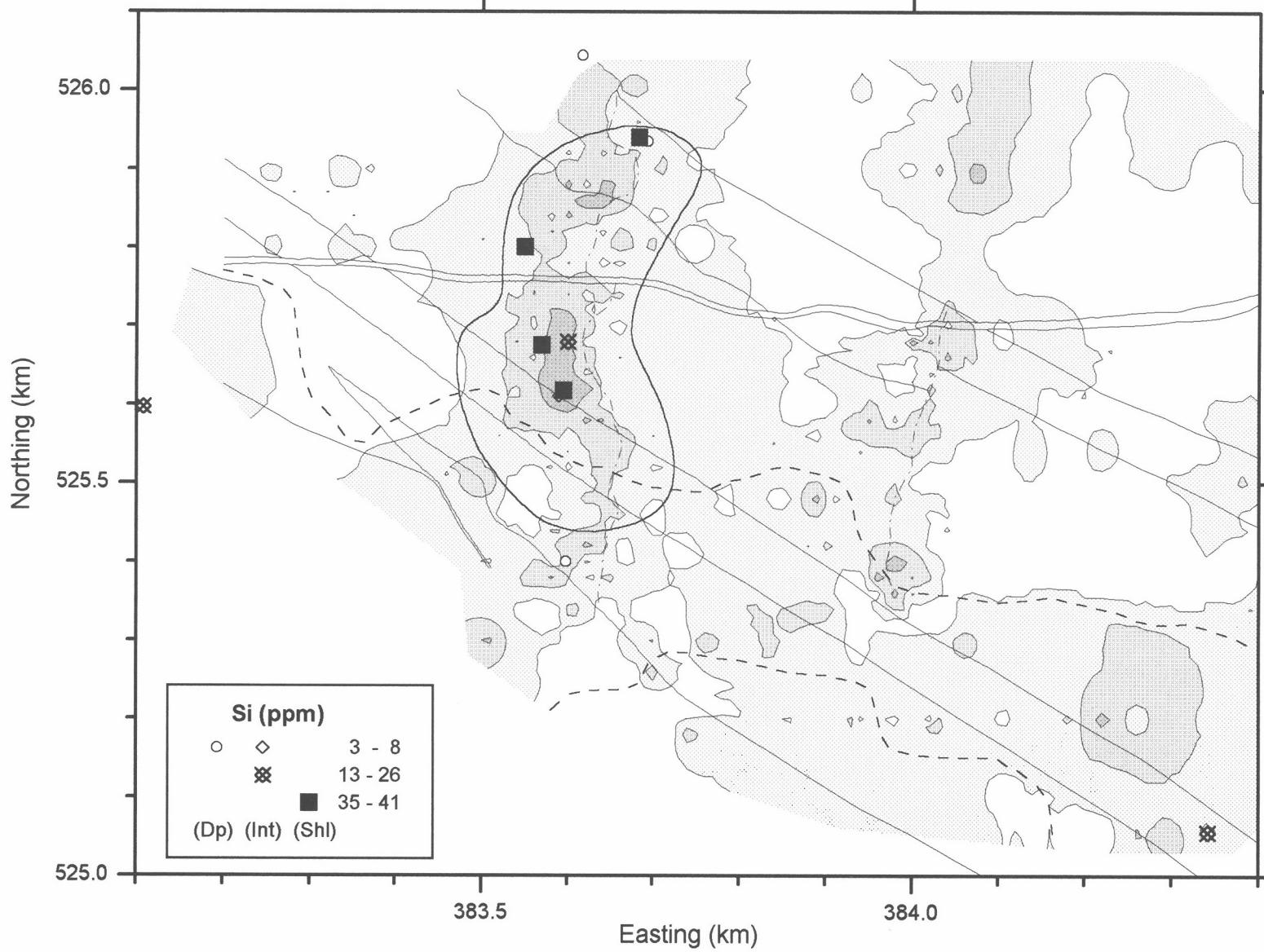


Figure A4.11: Silicon distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).



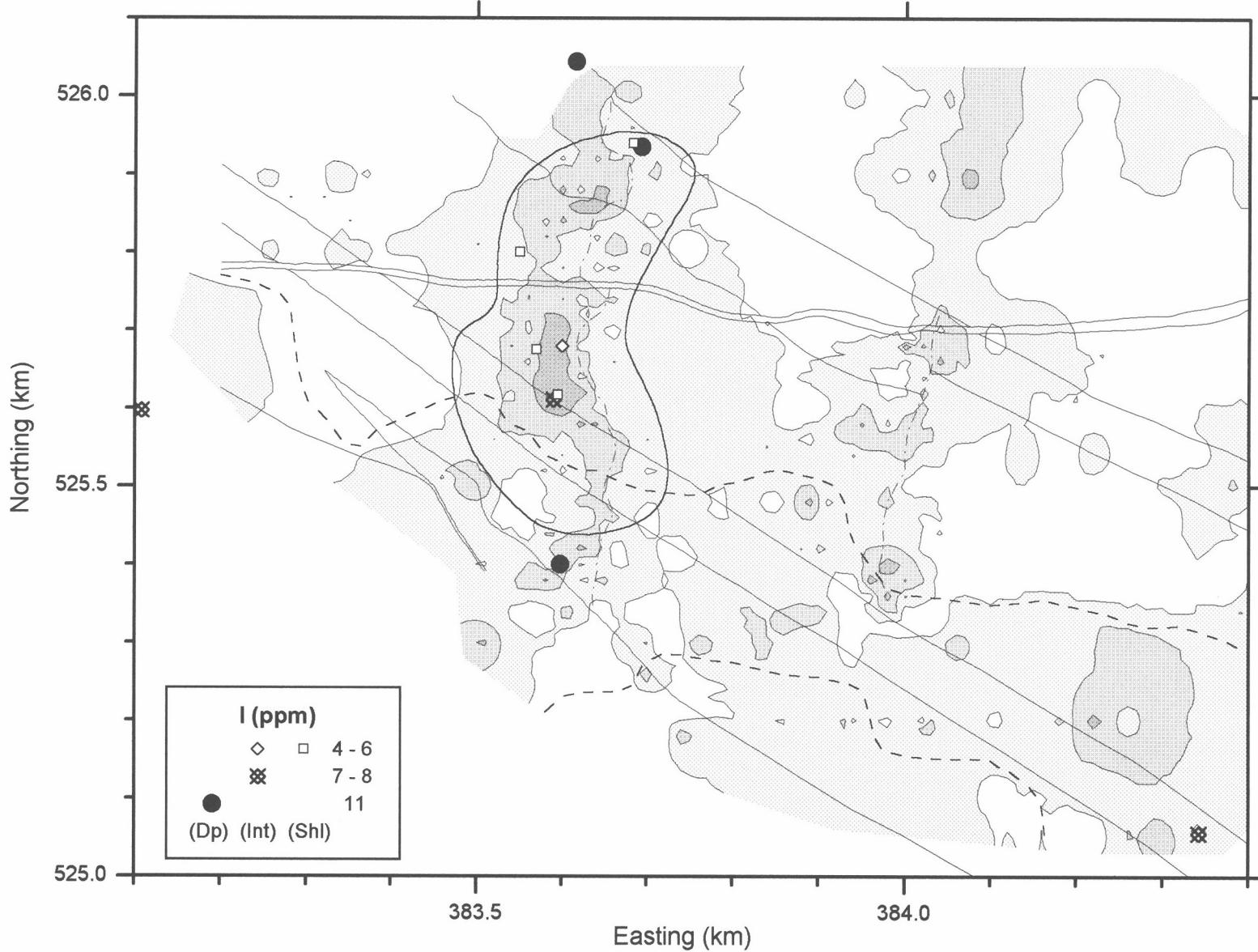


Figure A4.12: Iodine distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

Figure A4.13: Scandium distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

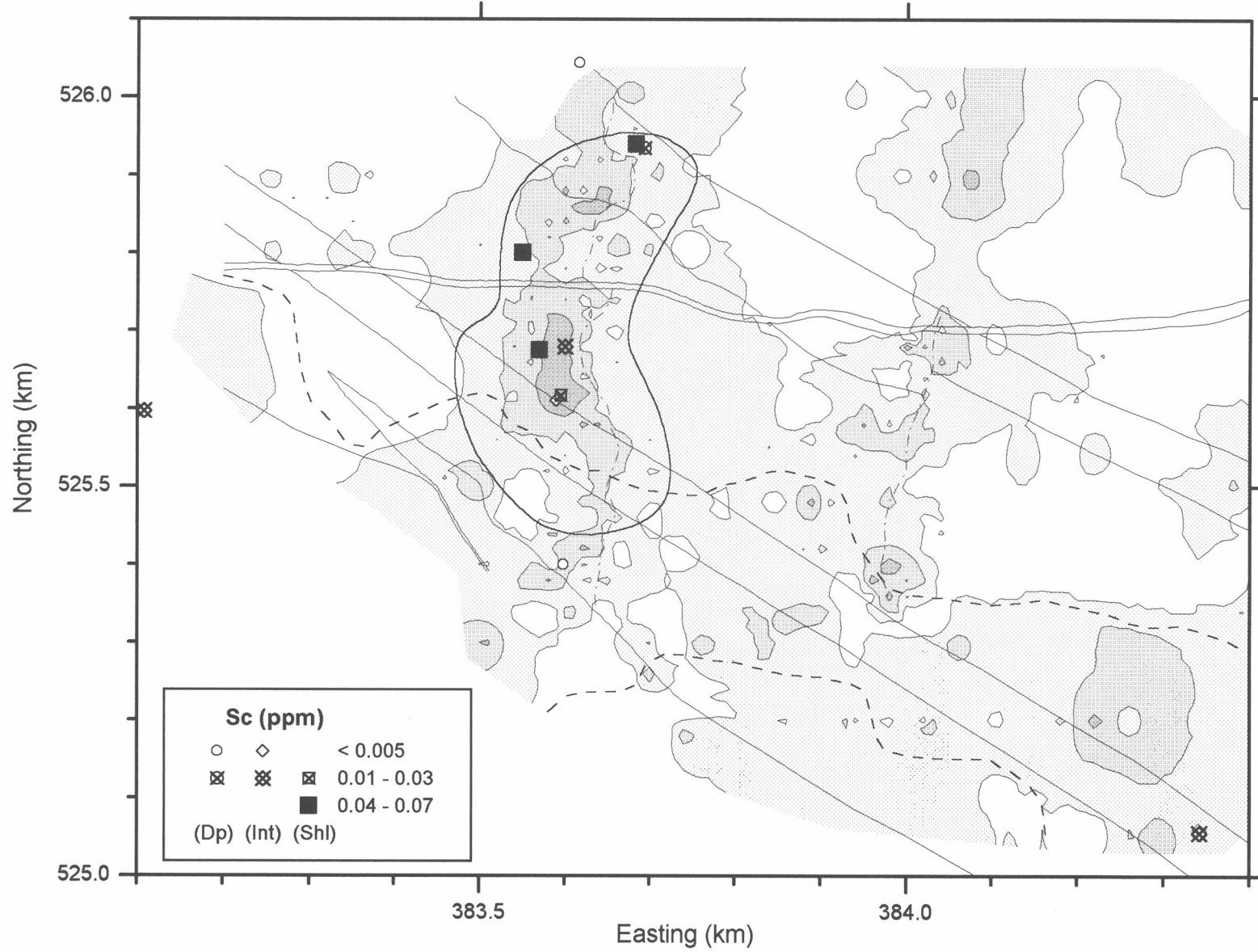


Figure A4.14: Manganese distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

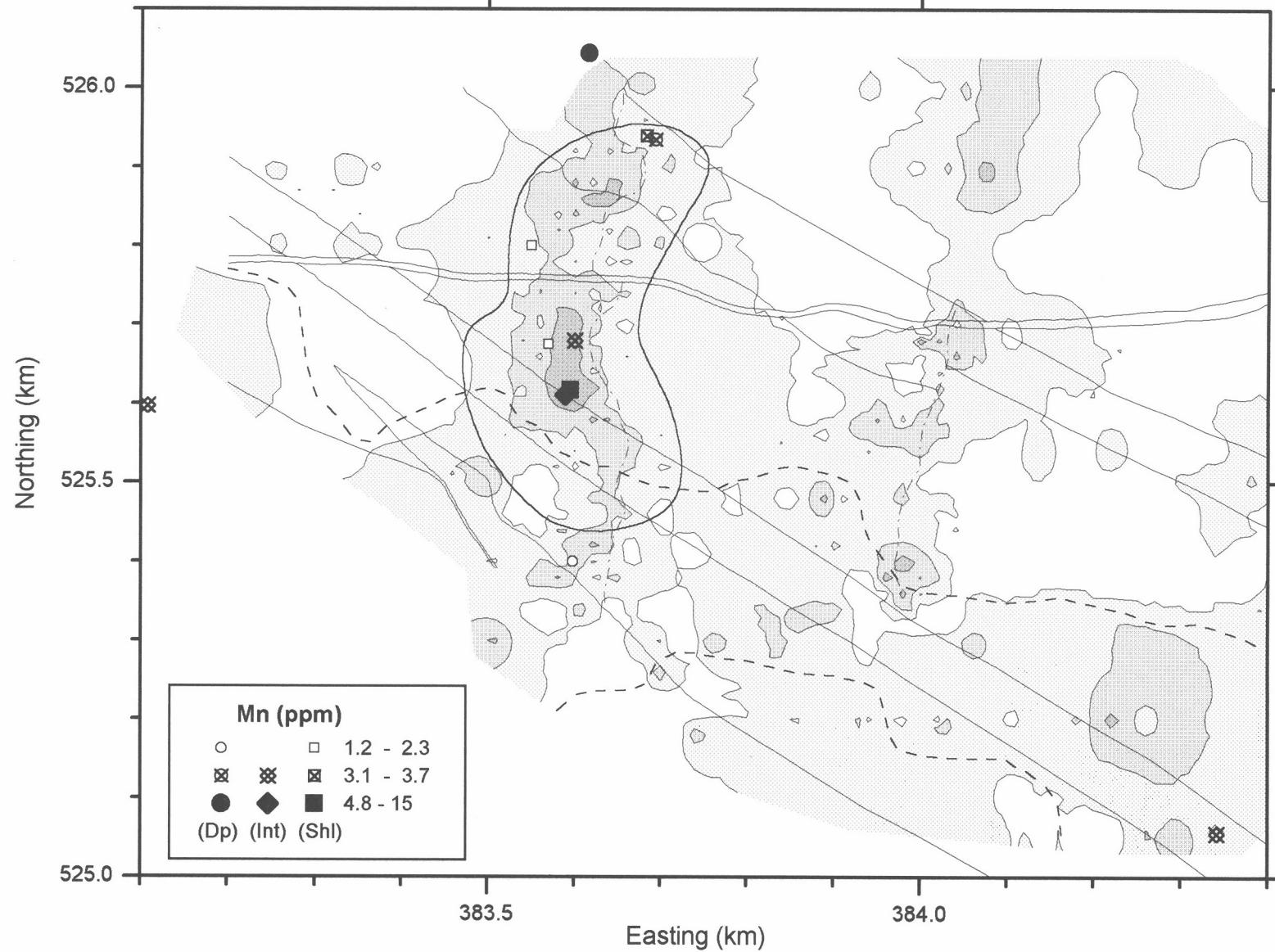


Figure A4.15: Iron distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

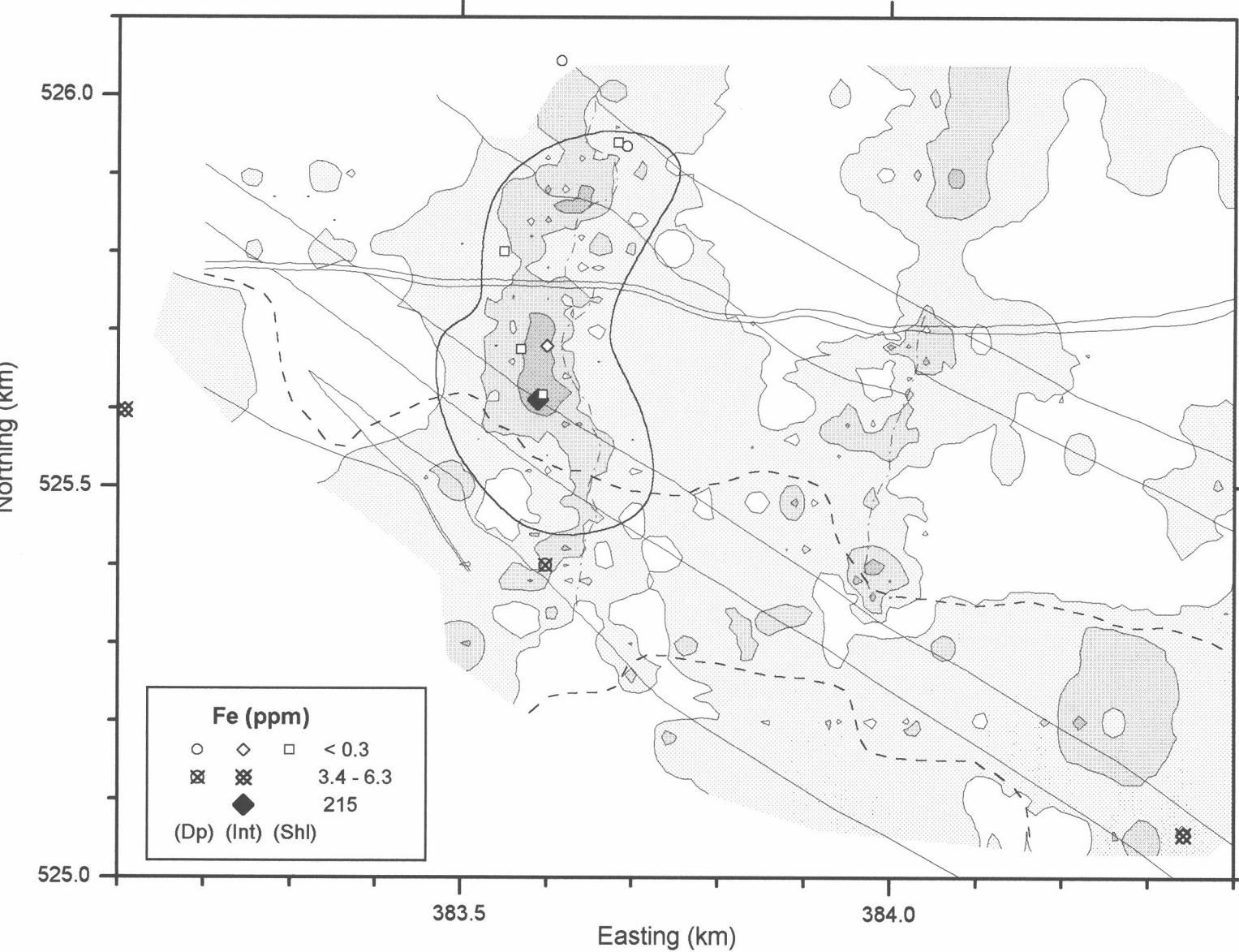
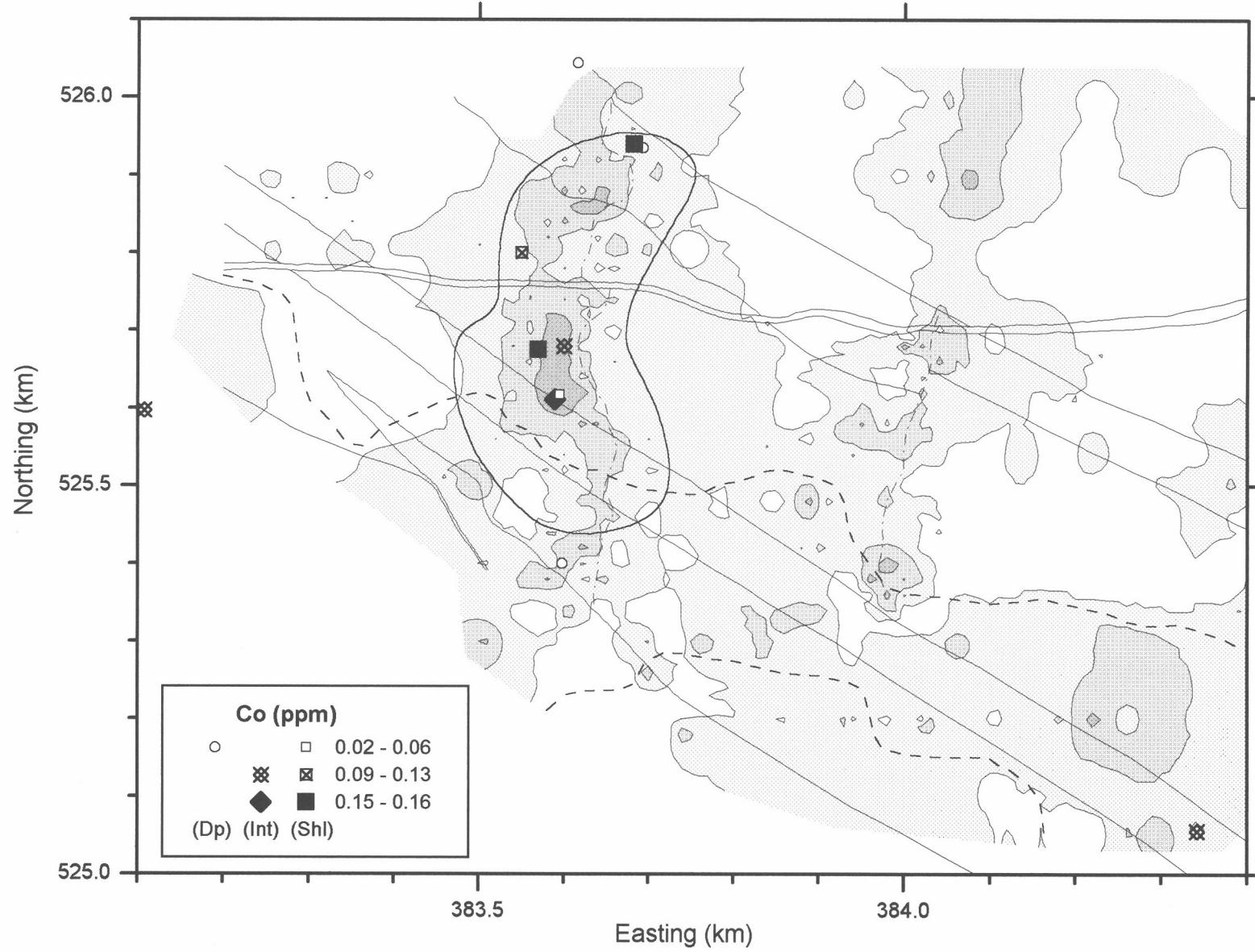


Figure A4.16: Cobalt distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).



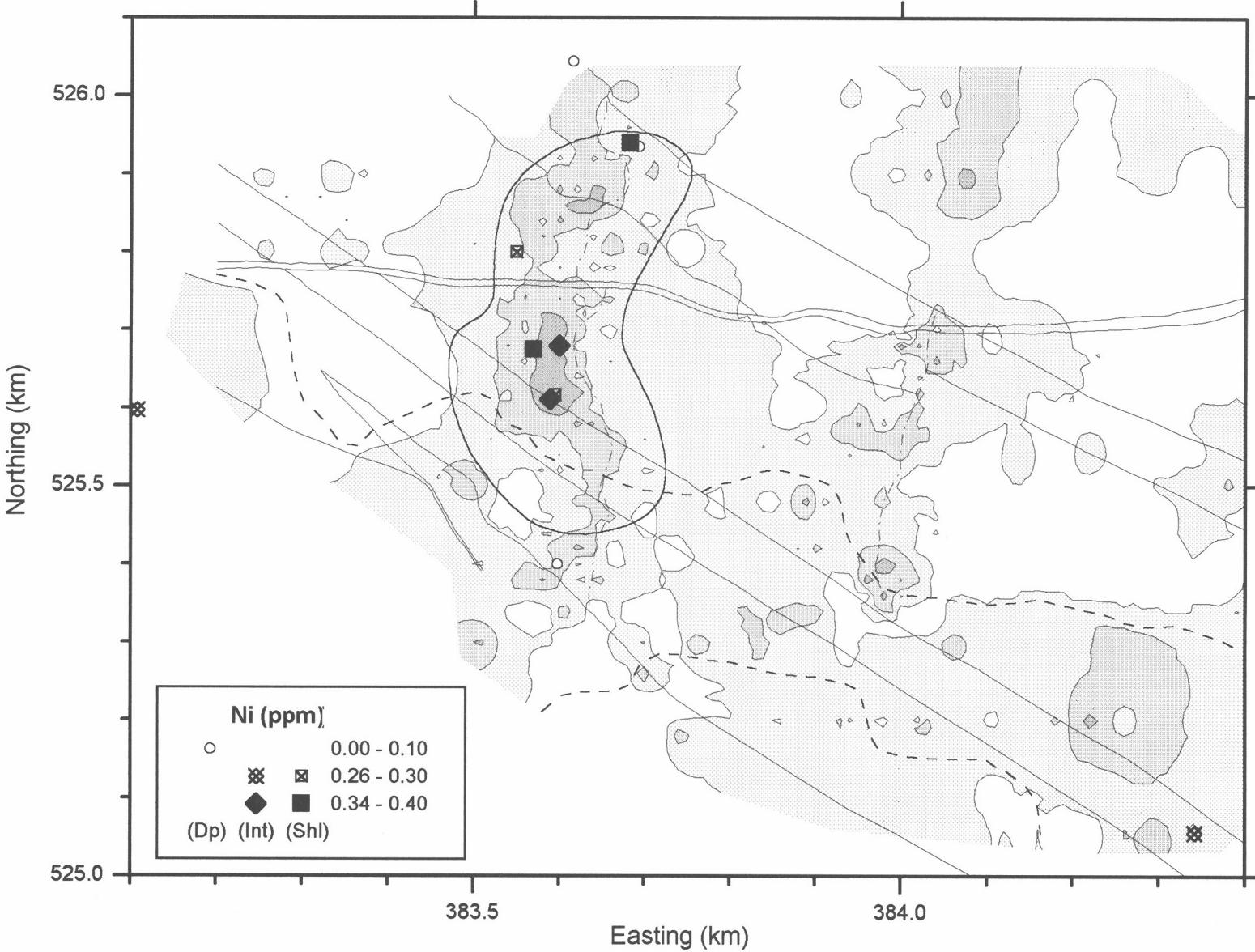
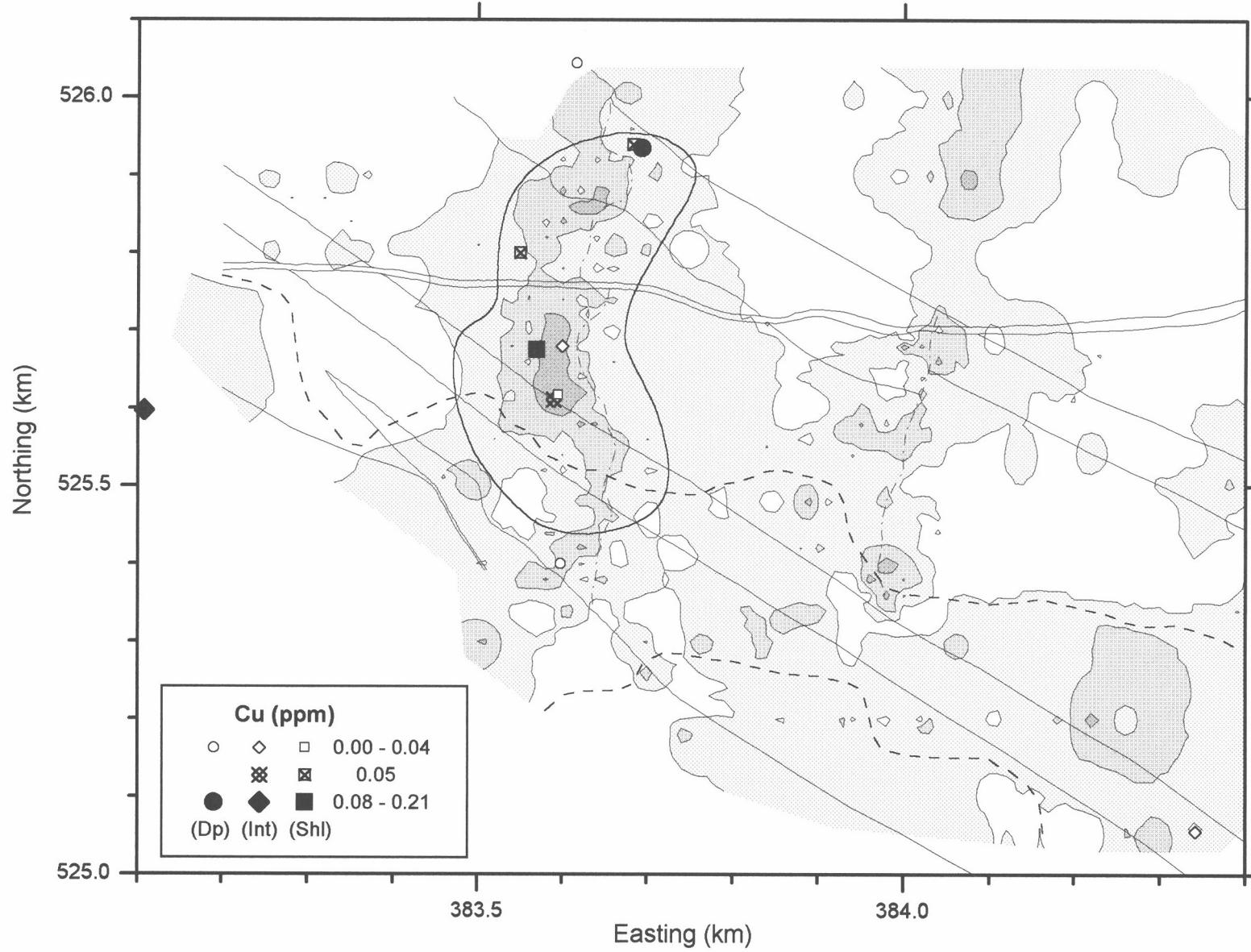


Figure A4.17: Nickel distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

Figure A4.18: Copper distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).



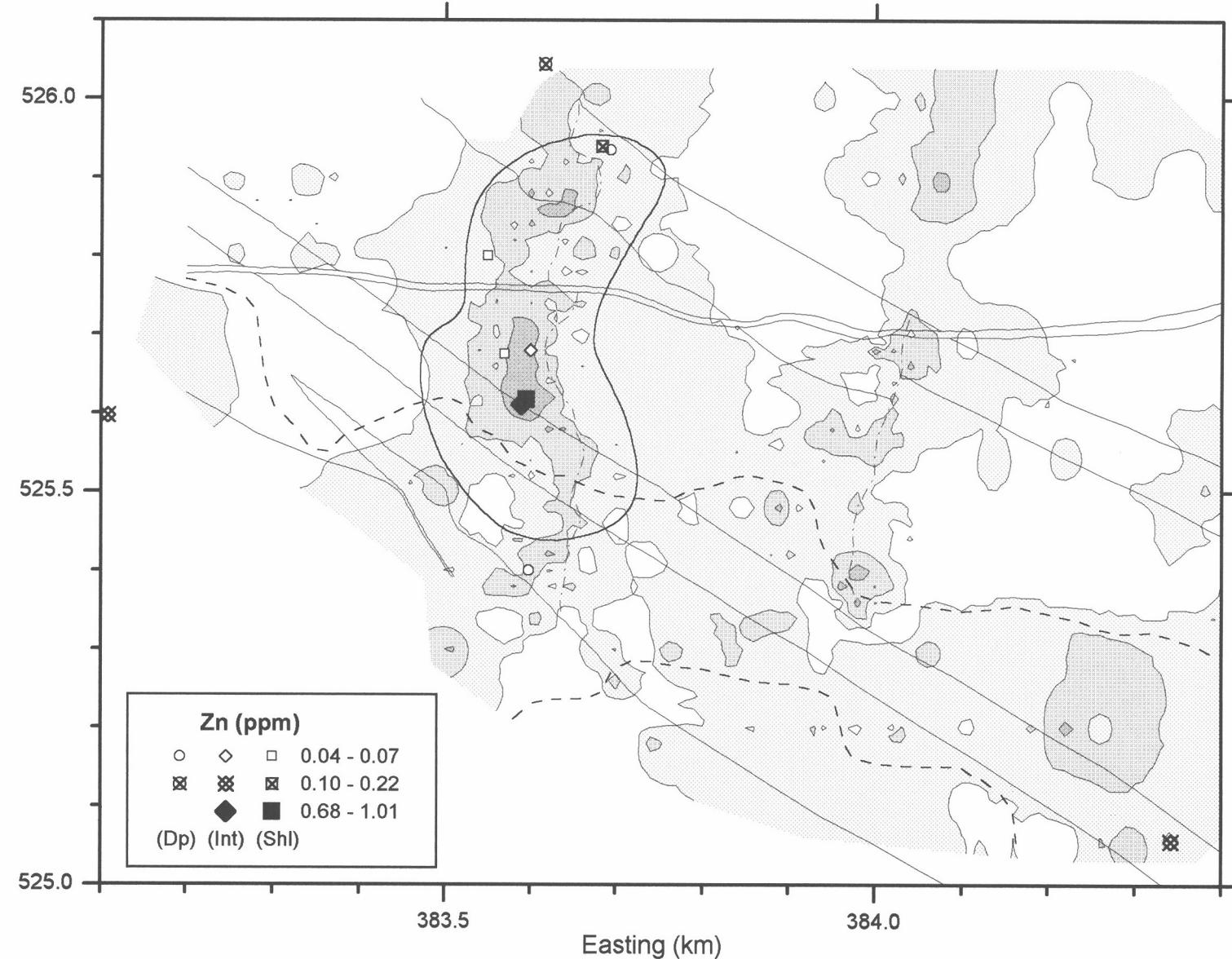


Figure A4.19: Zinc distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

Figure A4.20: Gallium distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

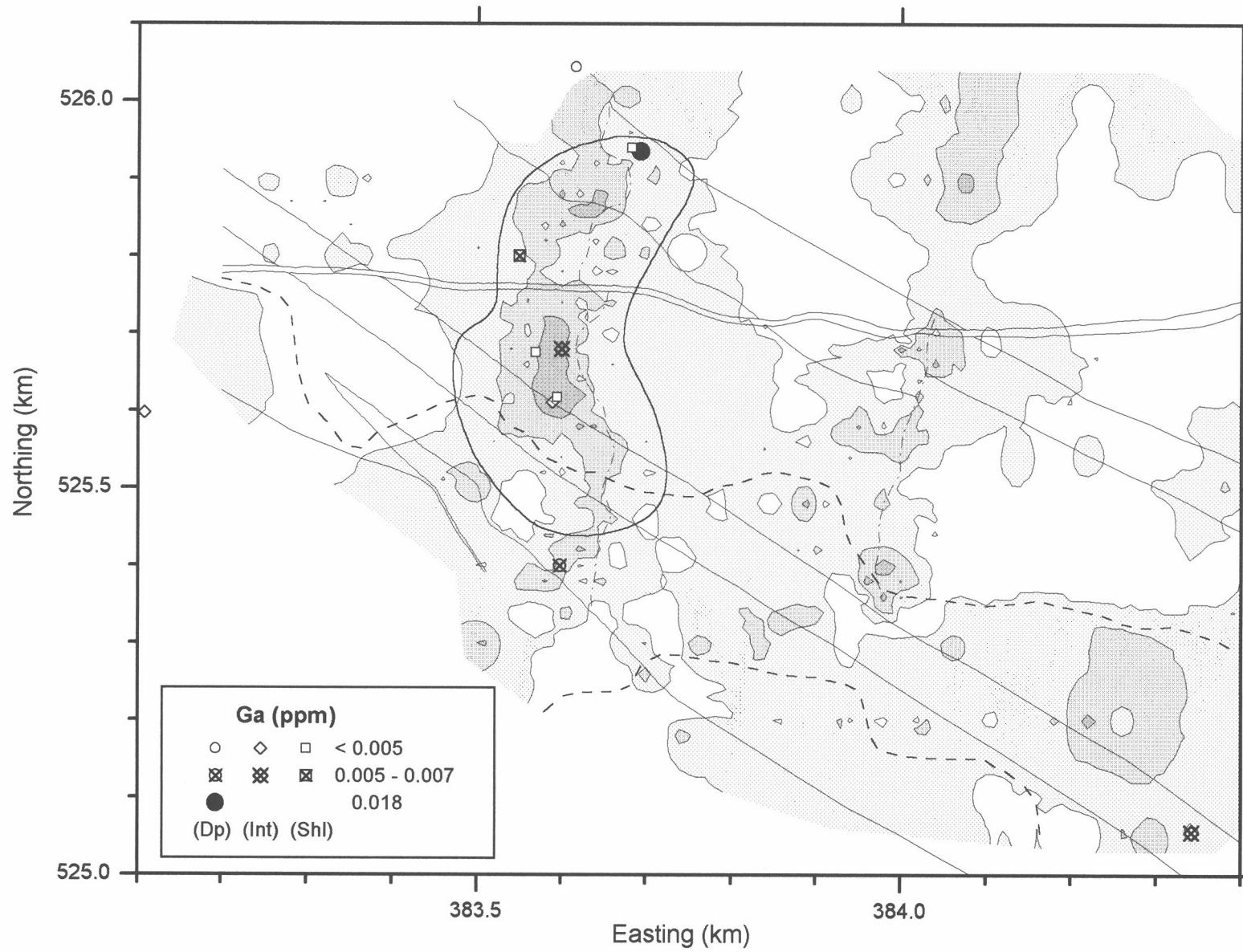
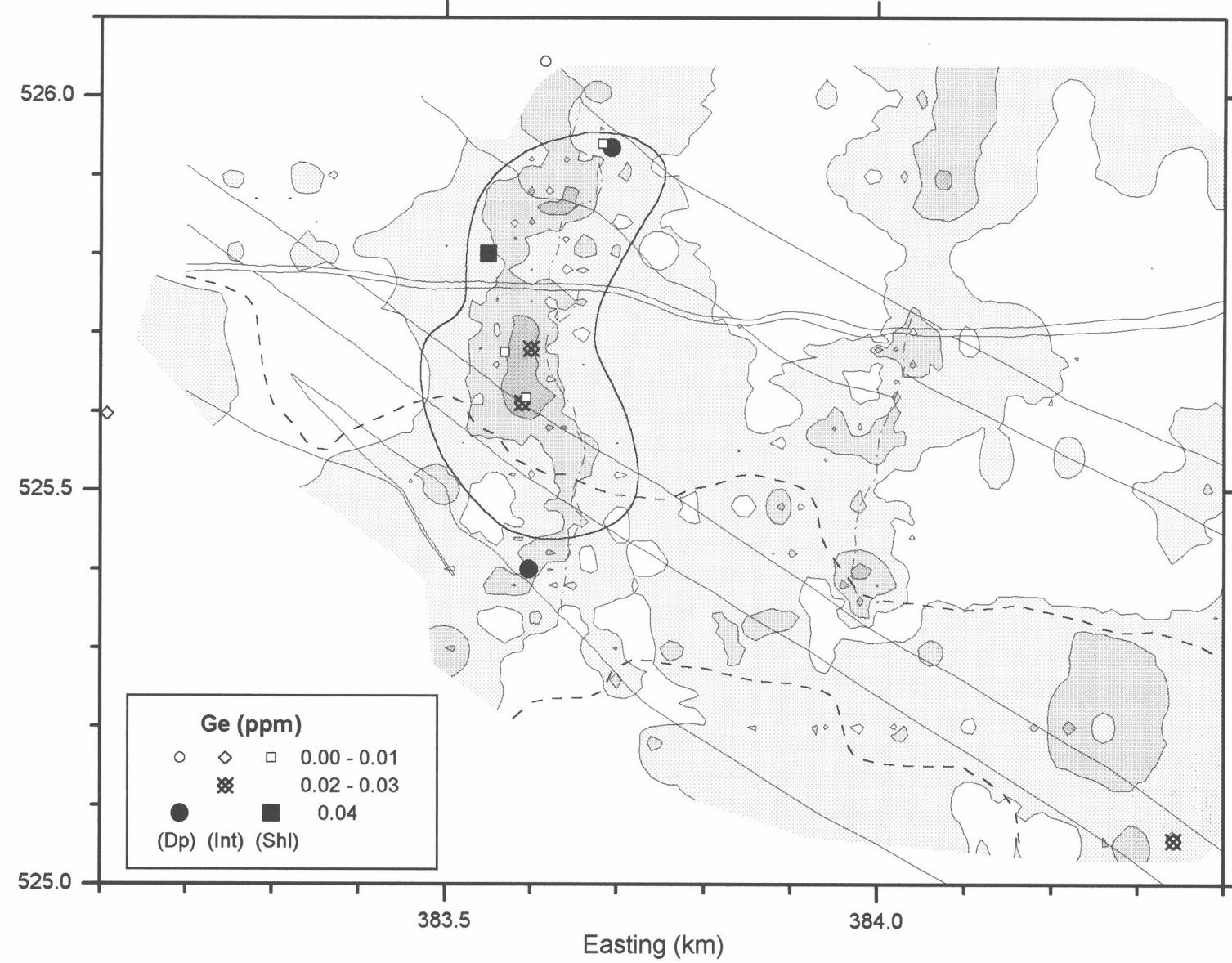


Figure A4.21: Germanium distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).



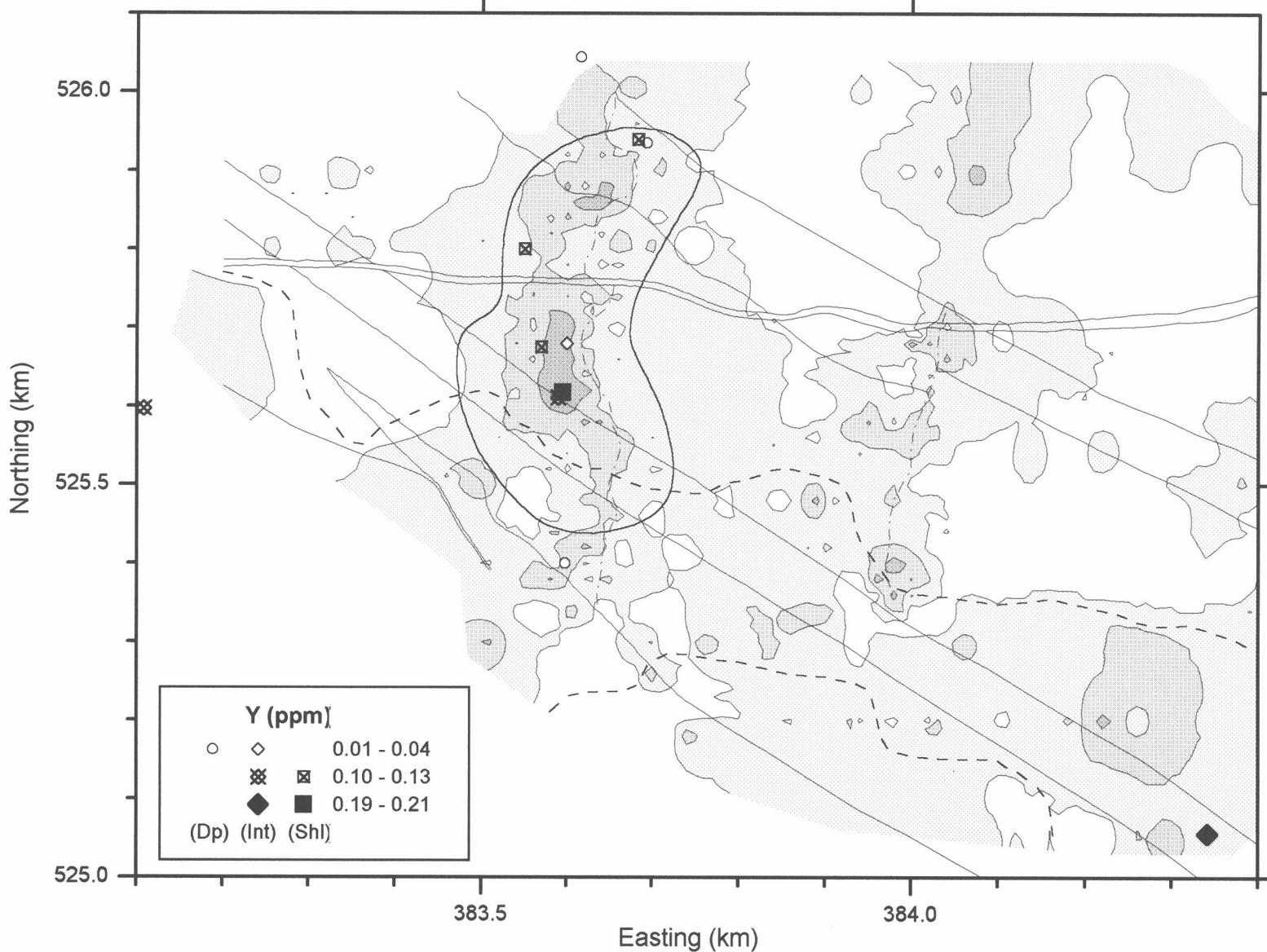
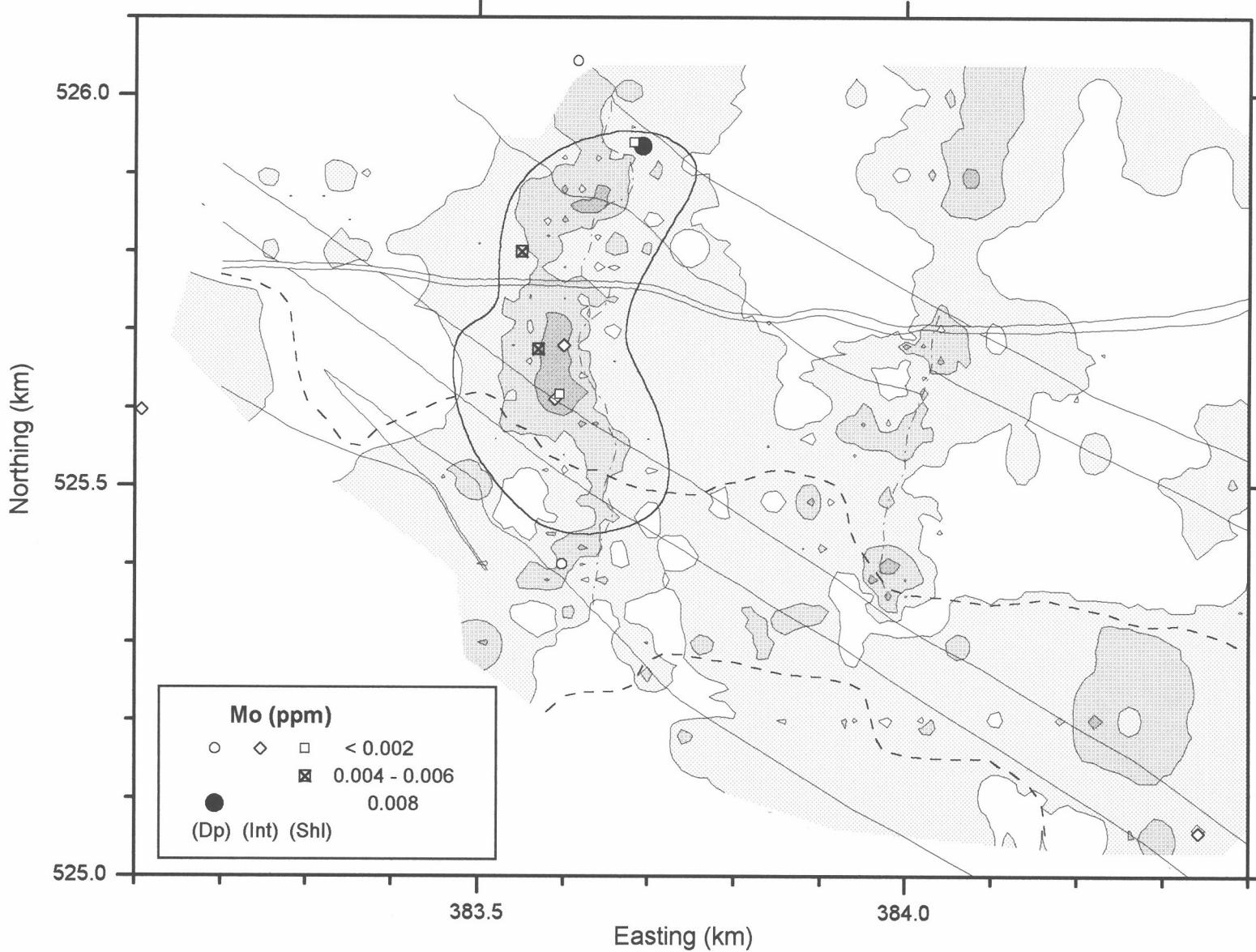


Figure A4.22: Yttrium distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

Figure A4.23: Molybdenum distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).



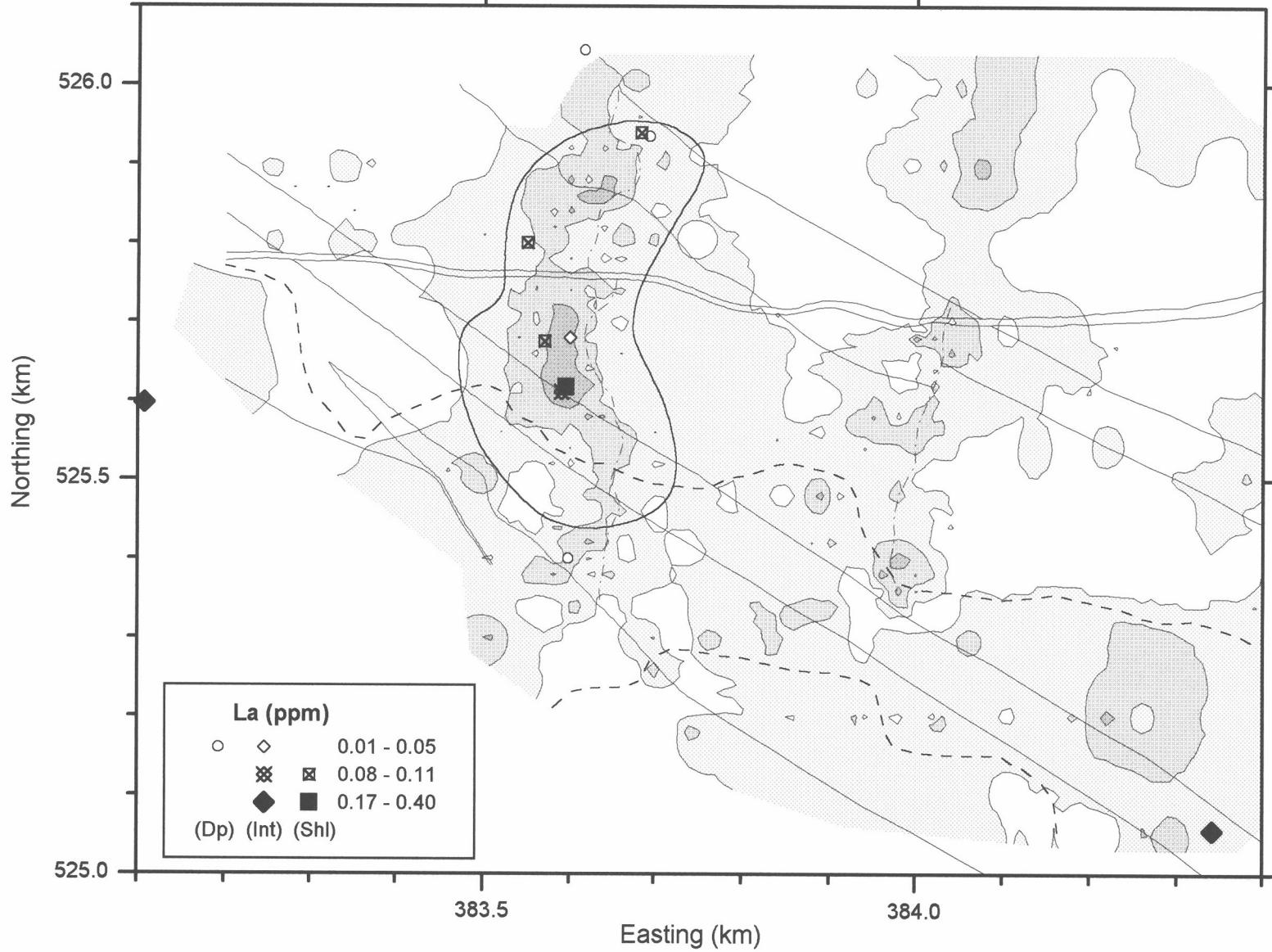
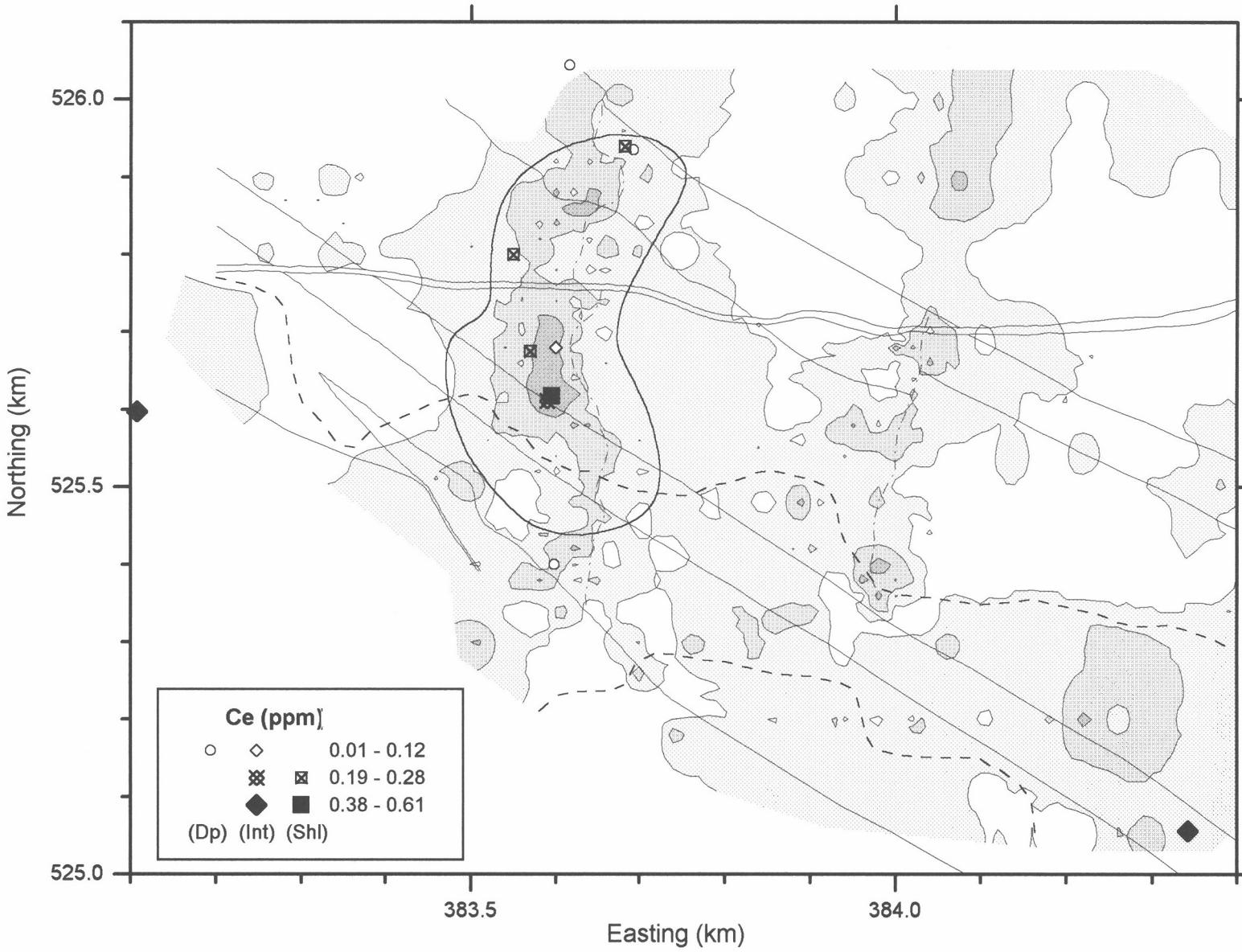


Figure A4.24. Lanthanum distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

Figure A4.25: Cerium distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).



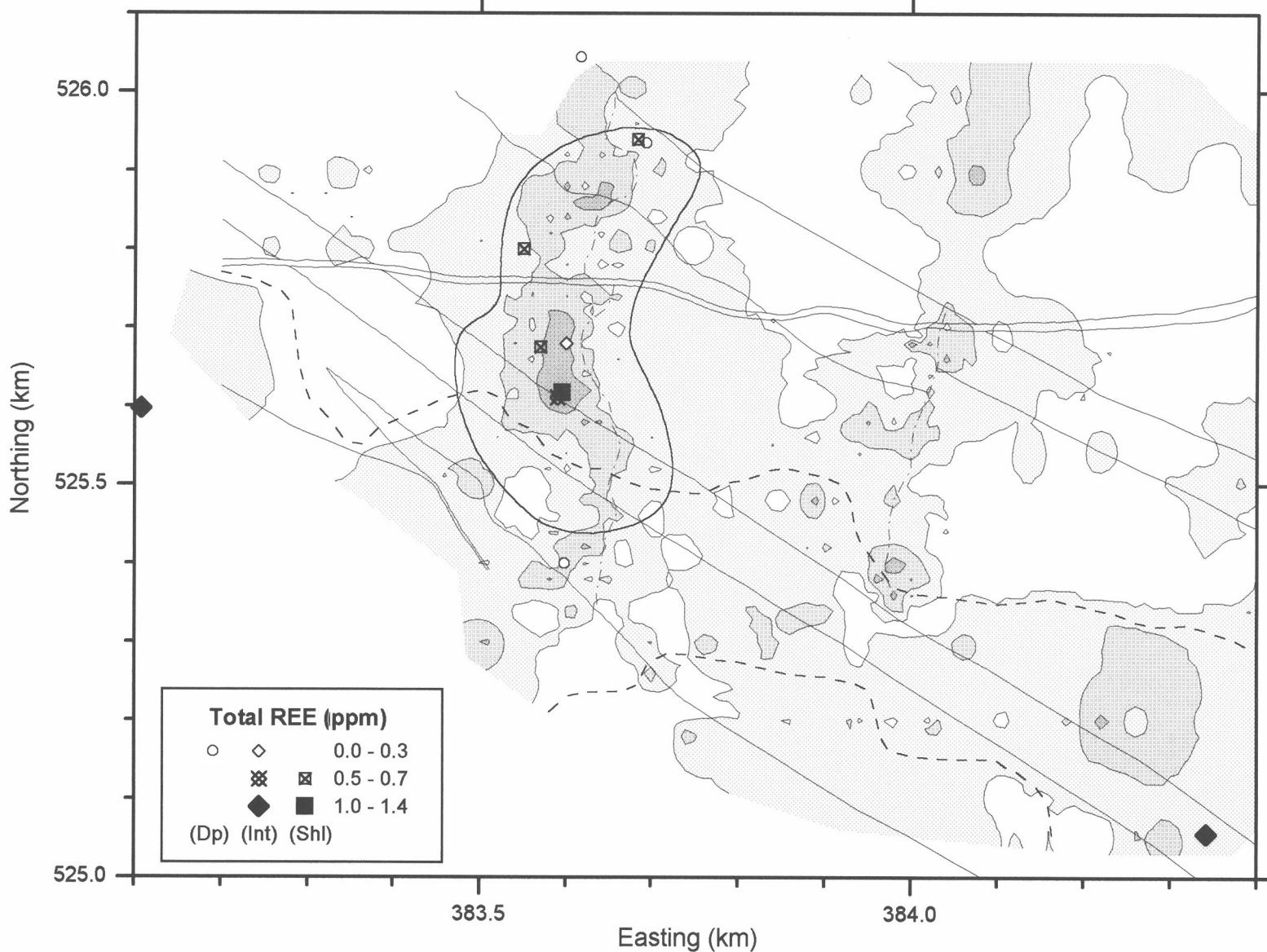


Figure A4.26: REE distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

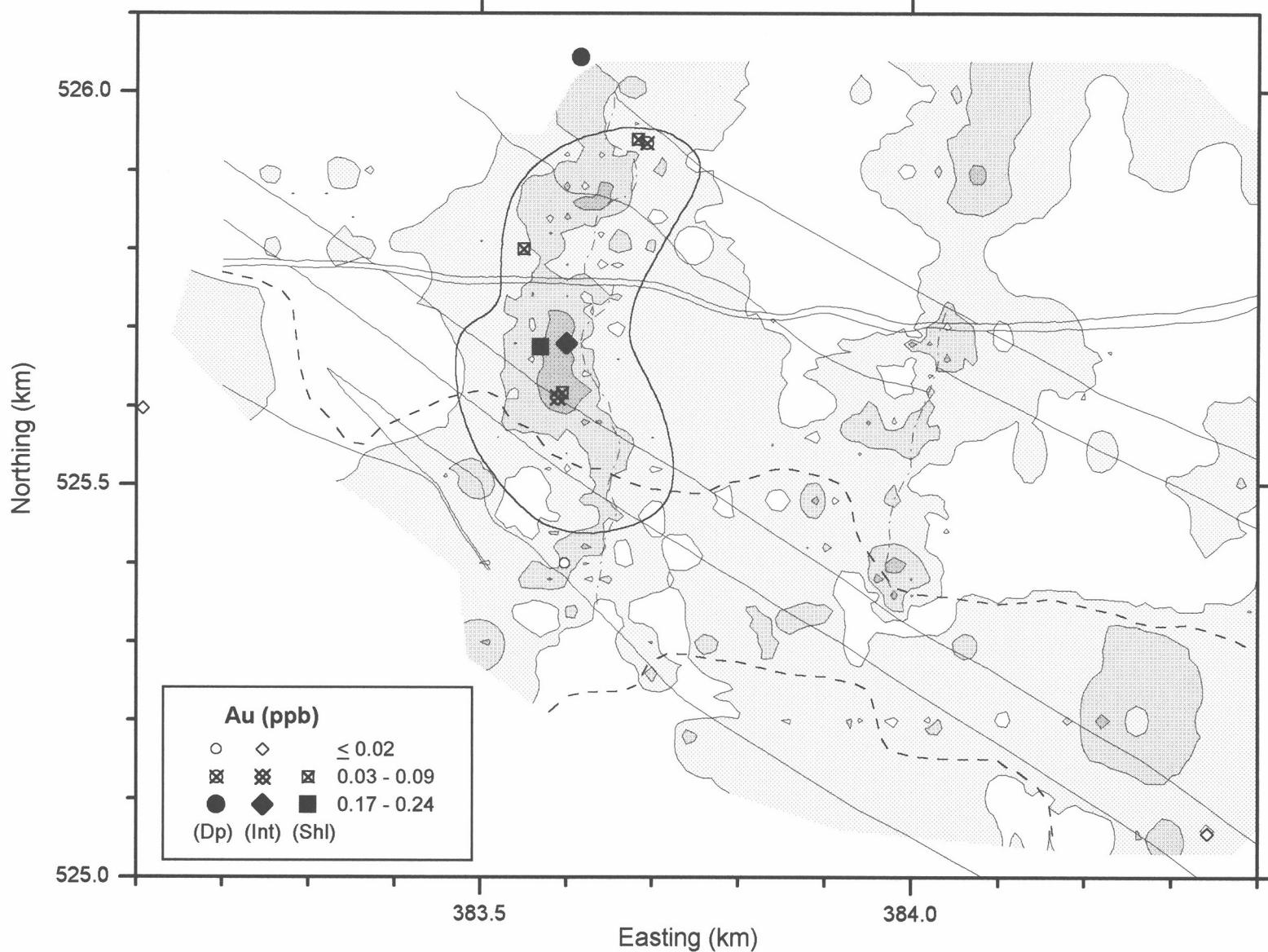


Figure A4.27: Gold distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

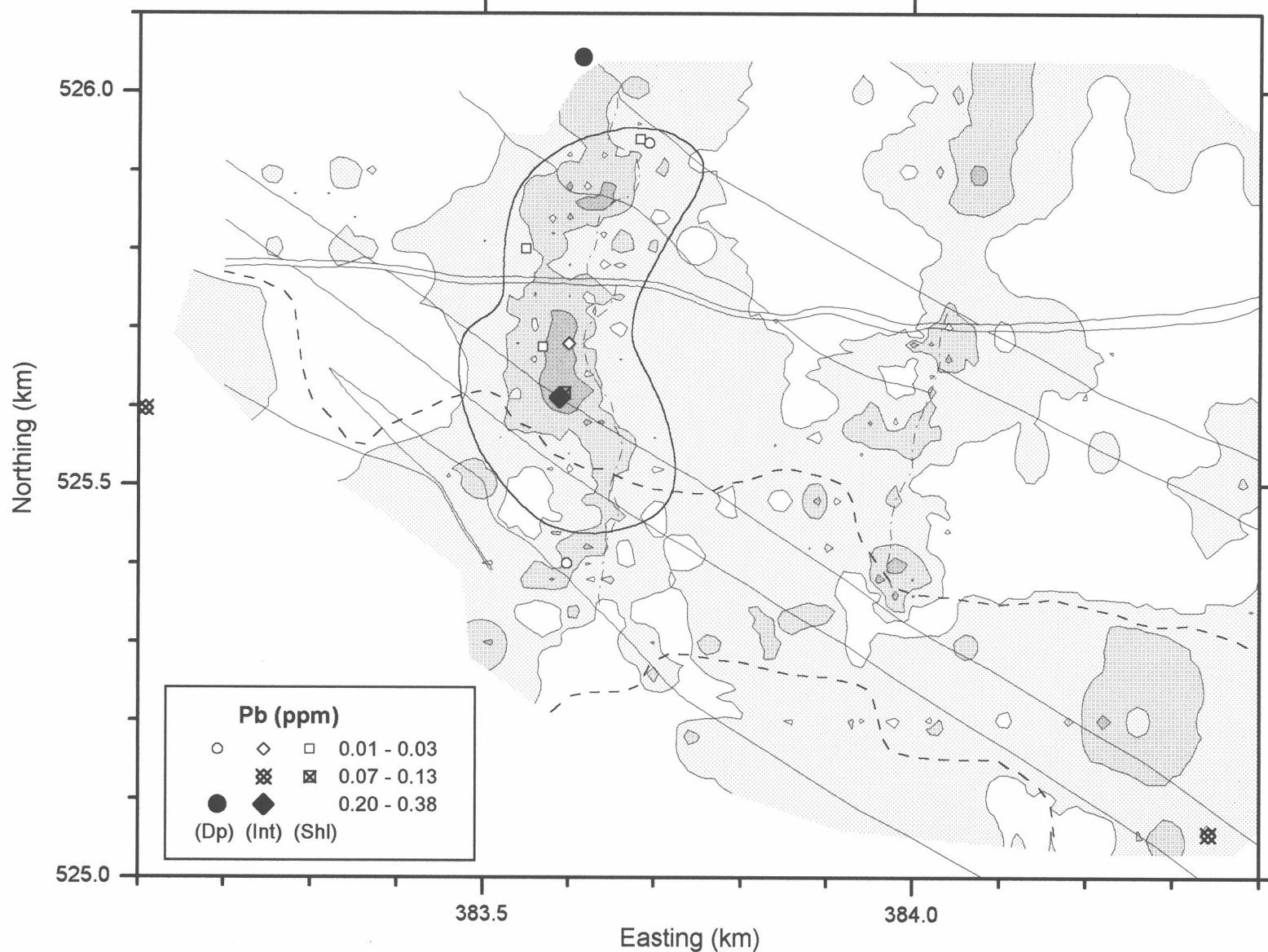
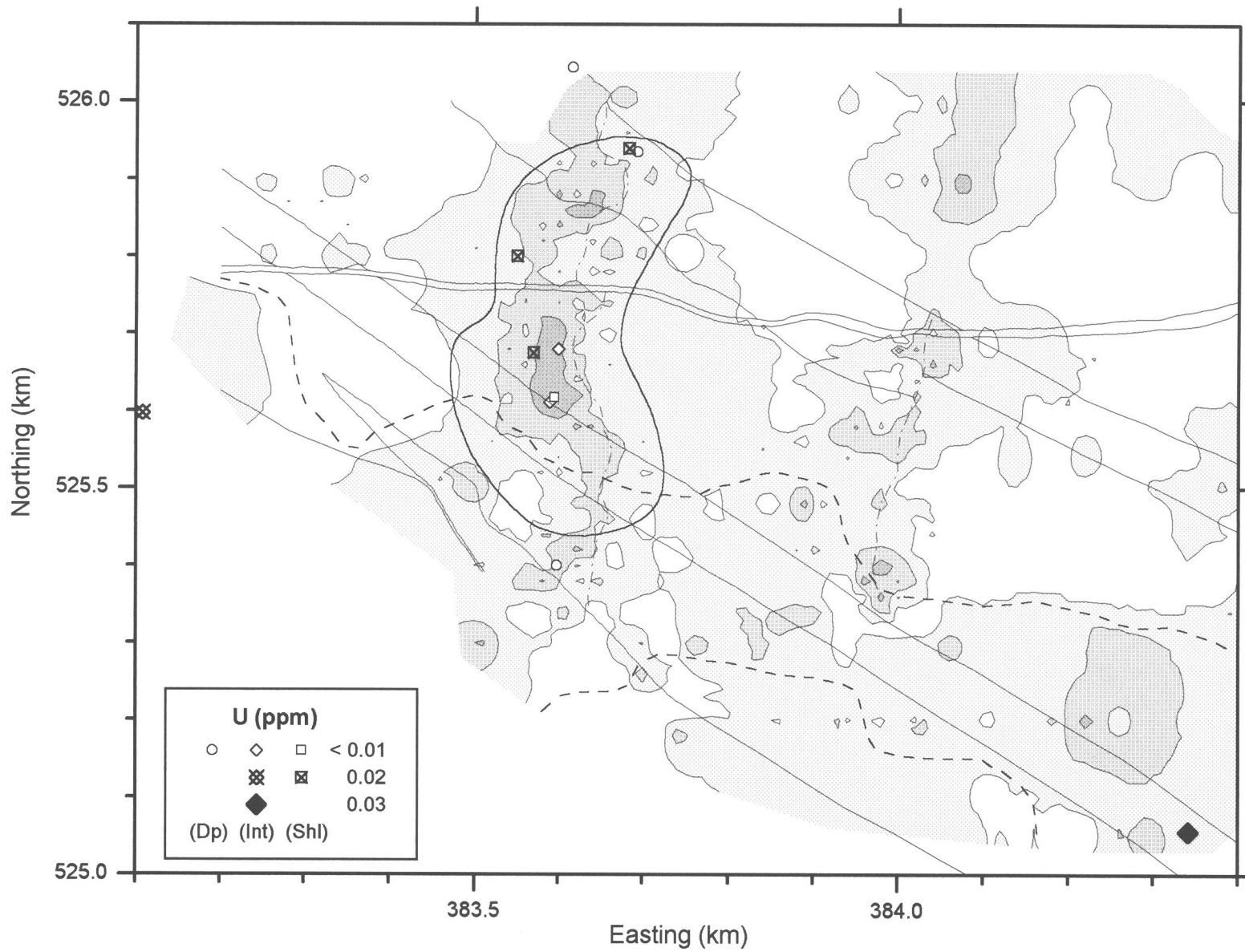


Figure A4.28: Lead distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

Figure A4.29: Uranium distribution at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).



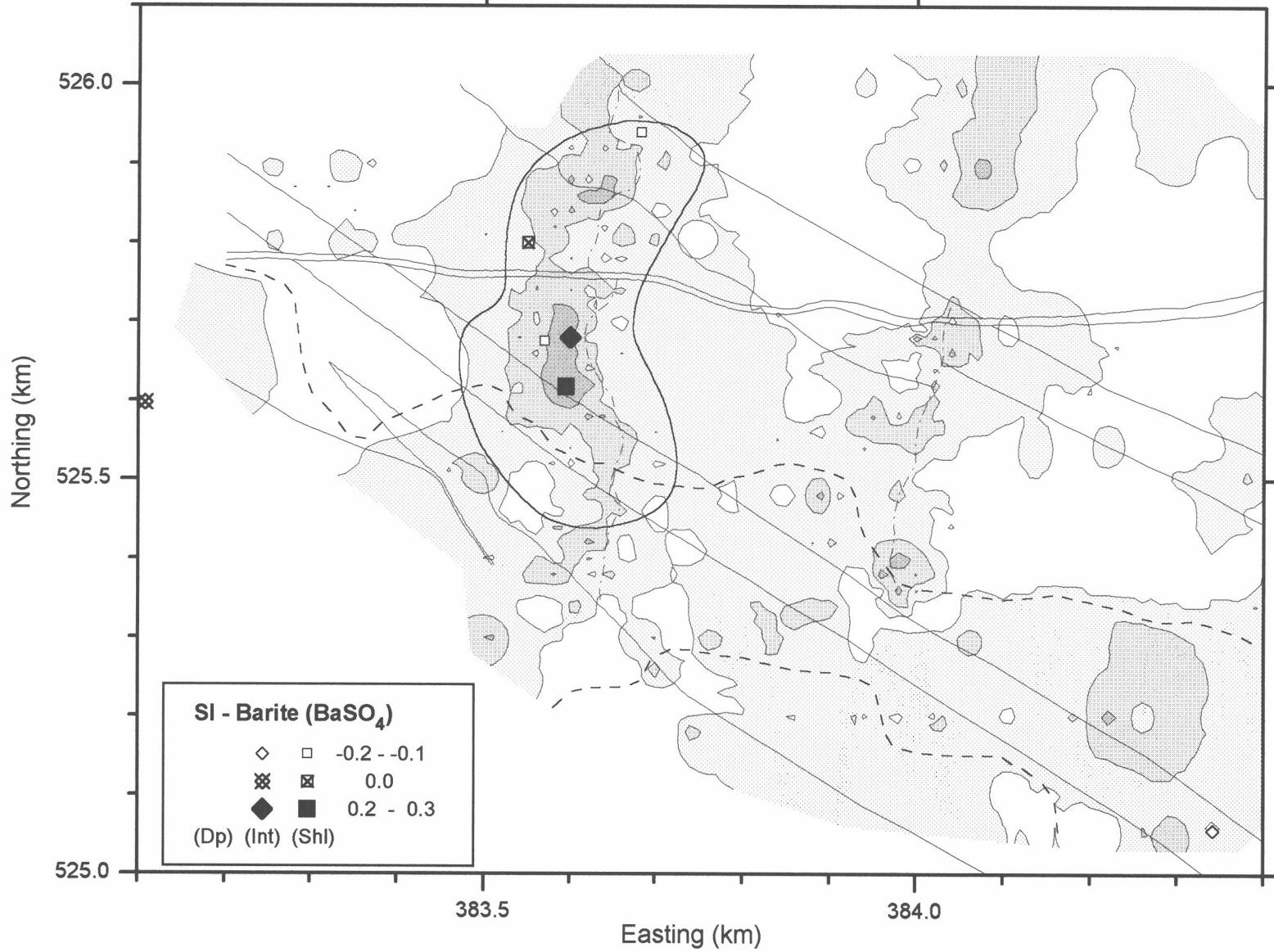


Figure A4.30: Distribution of barite SI's at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

Figure A4.31: Distribution of Au metal SIs at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).

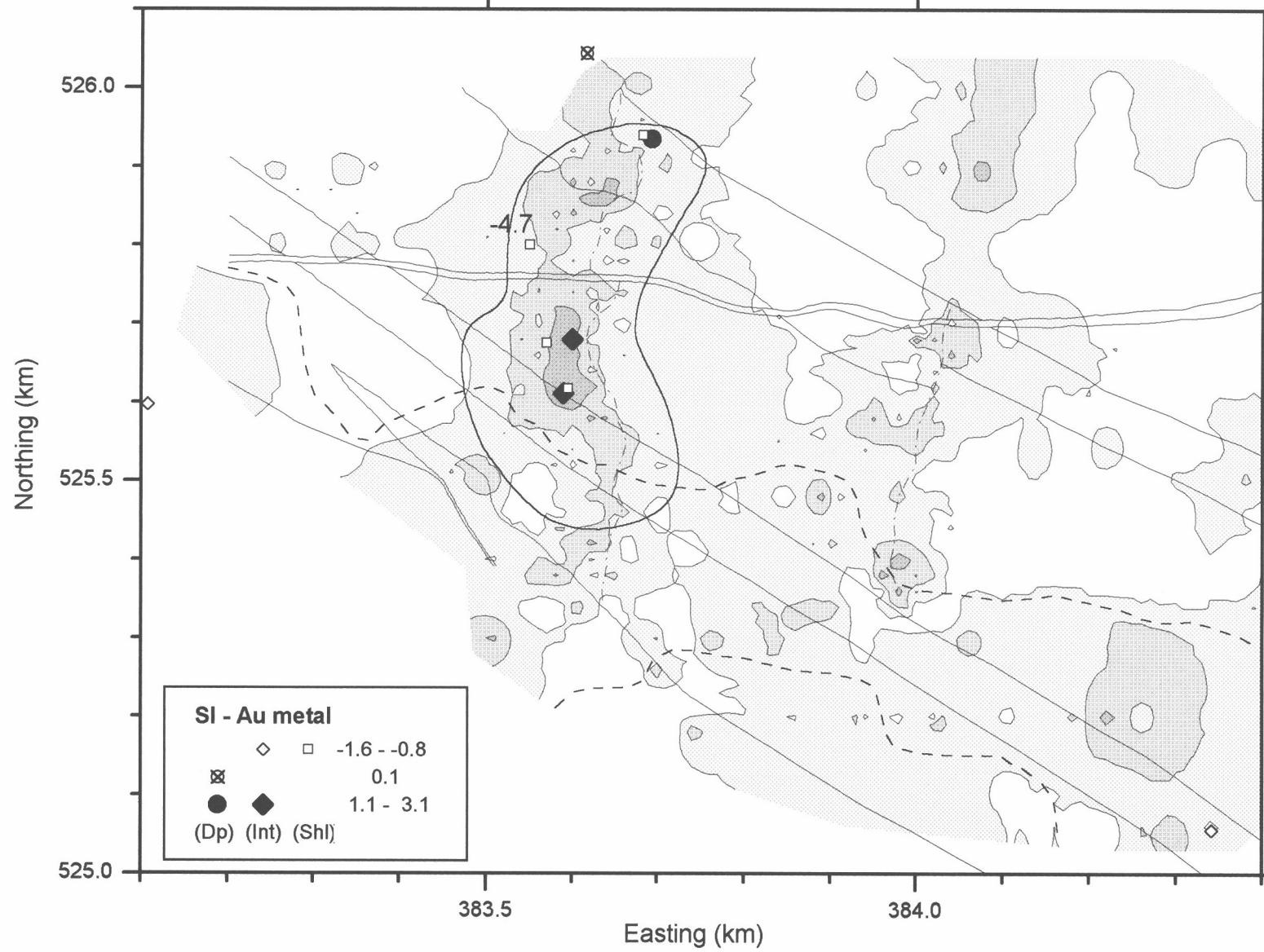
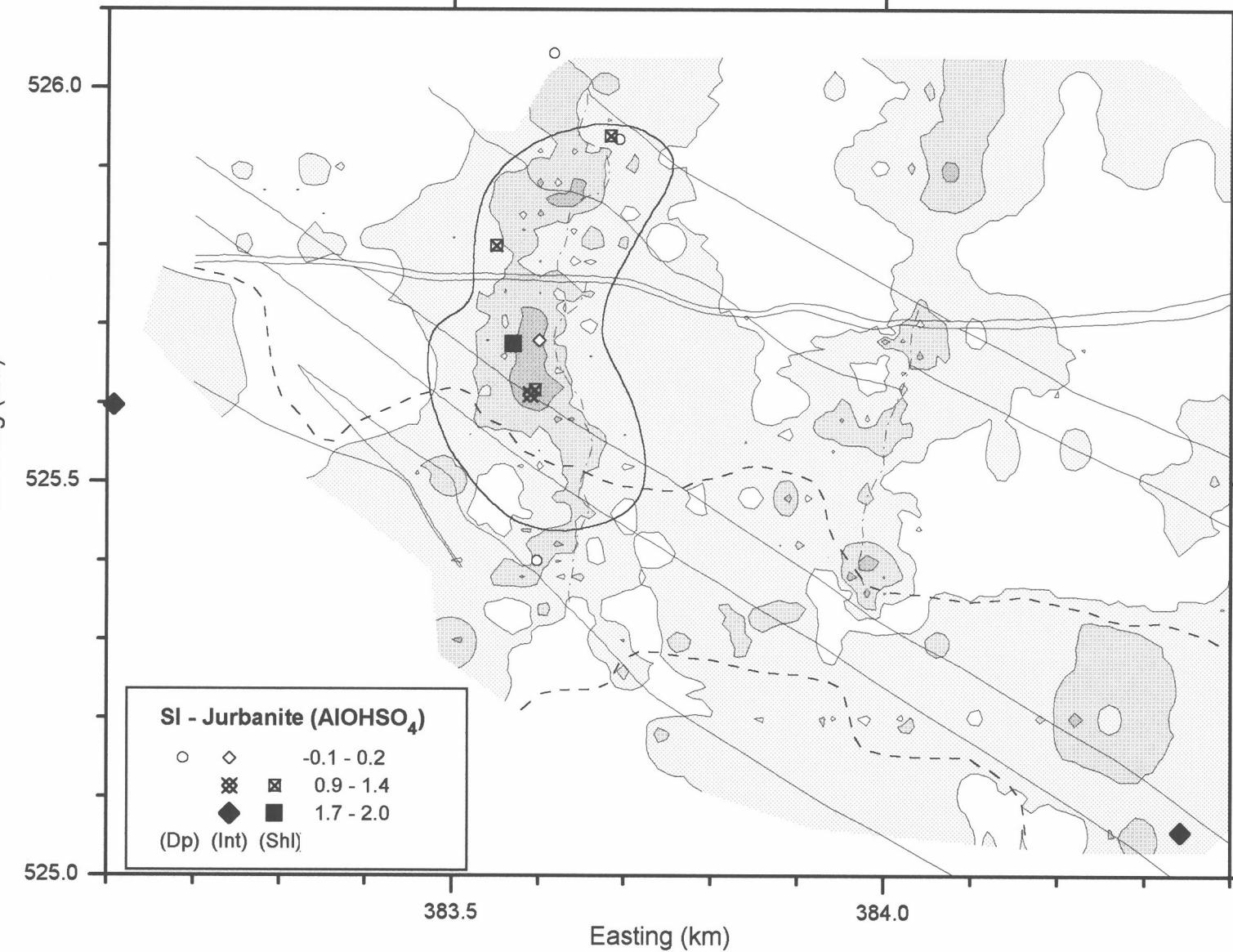


Figure A4.32: Distribution of jurbanite SI's at Argo (Dp = deep, Int = intermediate, Shl = shallow), with outlined Au grade, geology and palaeochannel (see Figures A4.1 and A4.2).



Appendix 5: Biogeochemical results - graphed

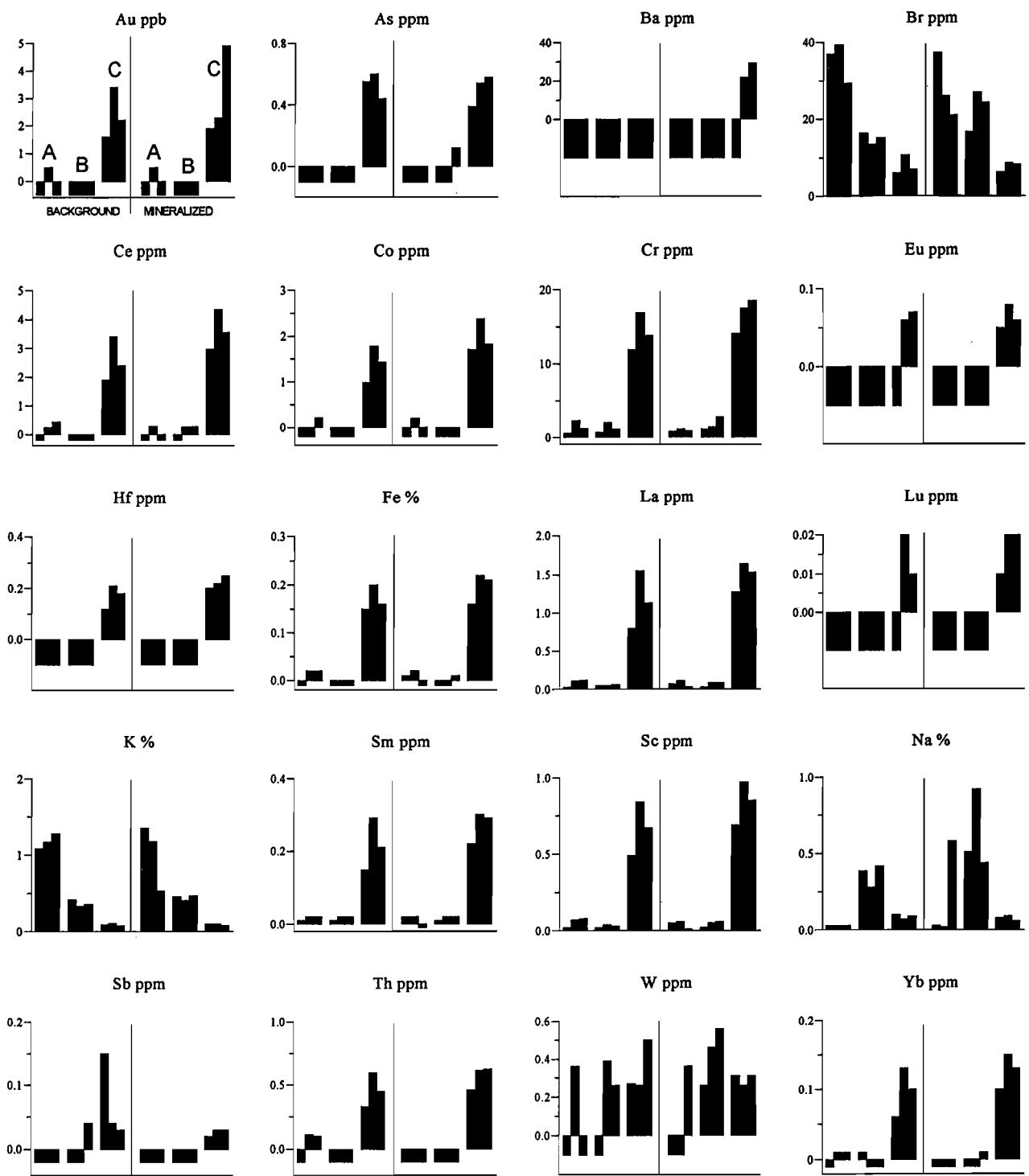


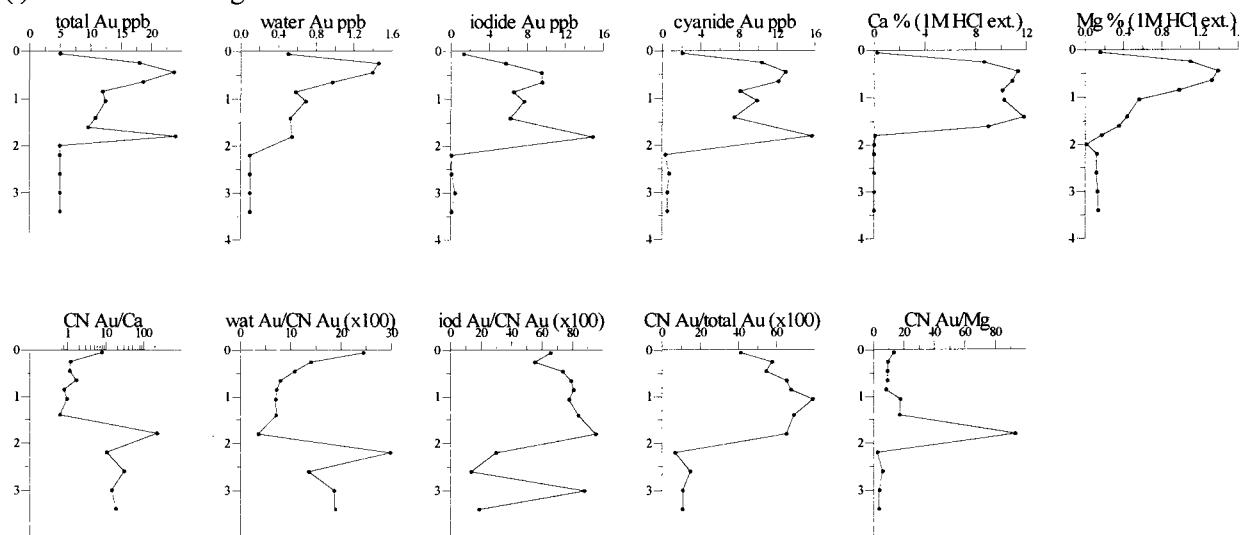
Figure A5: Elemental abundances for vegetation at Argo.
Negative data below detection limit.
A = Eremophila; B = Eucalyptus; C = Mull.

Appendix 6: Profile description and results - graphed

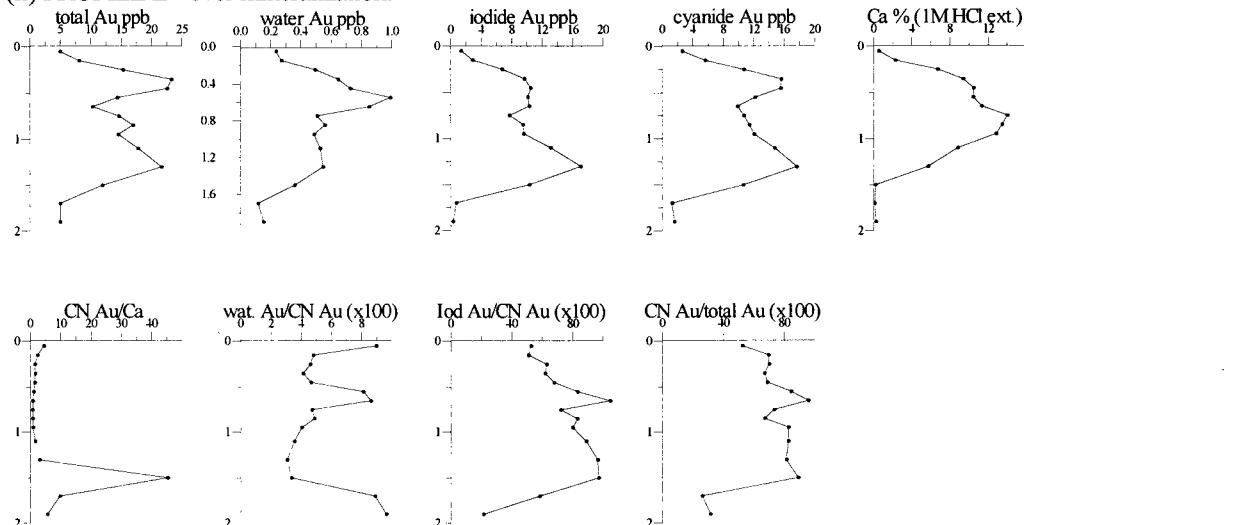
Table A6: Description of Profile E (0-2m) and Profile I (2-7m). Profile E is typical of many soil profiles in the study area.

Profile	Horizon	Depth (m)	CO ₃	Description
E	1	0 - 0.2	no	Sandy-silty clay. Red brown. Rootlets present.
	2	0.2 - 0.3	yes	Red brown clay with soft carbonate nodules.
	0.3 - 0.4	yes		As above with some speckled black staining.
	3	0.4 - 0.5	yes	Pale brown clay with soft and hard carbonate nodules. Soft nodules consist of concretions of sandy clay; hard nodules consist of partially weathered rock.
		0.5 - 0.6	yes	Pale brown clay with hard nodules coated in carbonate some with black staining.
		0.6 - 0.7	yes	As above with more nodules.
	(3i)	0.7 - 0.9	yes	As above with more nodules; sedimentary (layered) facies.
		0.9 - 1.2	yes	As above with fewer nodules.
		1.2 - 1.4	yes	As above with nodules coated with heavy black staining.
	4	1.4 - 1.6	yes	Mainly black horizon with white segregations in red clay.
	5	1.6 - 1.8	no	Red clay with speckled white marbling.
		1.8 - 2.0	no	Hard plastic massive red clay with some black staining.
	I	2.0 - 2.5	no	Hard plastic massive red clay.
		2.5 - 3.0	no	Red clay with grey mottling.
		3.0 - 3.5	no	Grey clay with red mottling.
	6	3.5 - 4.0	no	Grey clay with hard ferruginous nodules.
		4.0 - 4.5	no	Hard ferruginous material in grey clay
		4.5 - 5.0	no	Grey clay with yellow and red mottling; indurated ferruginous material going into massive moist grey clay
		5.0 - 5.5	no	Grey clay with red and yellow mottles and large boulders of indurated ferruginous material
		5.5 - 6.5	no	Grey and red mottled clay with hard ferruginous segregations
	7	6.5 - 7.0	no	Gravelly horizon with more red and grey mottled clay.

(i) PROFILE B - background.



(ii) PROFILE E - over mineralization.



(iii) PROFILE J - over mineralization.

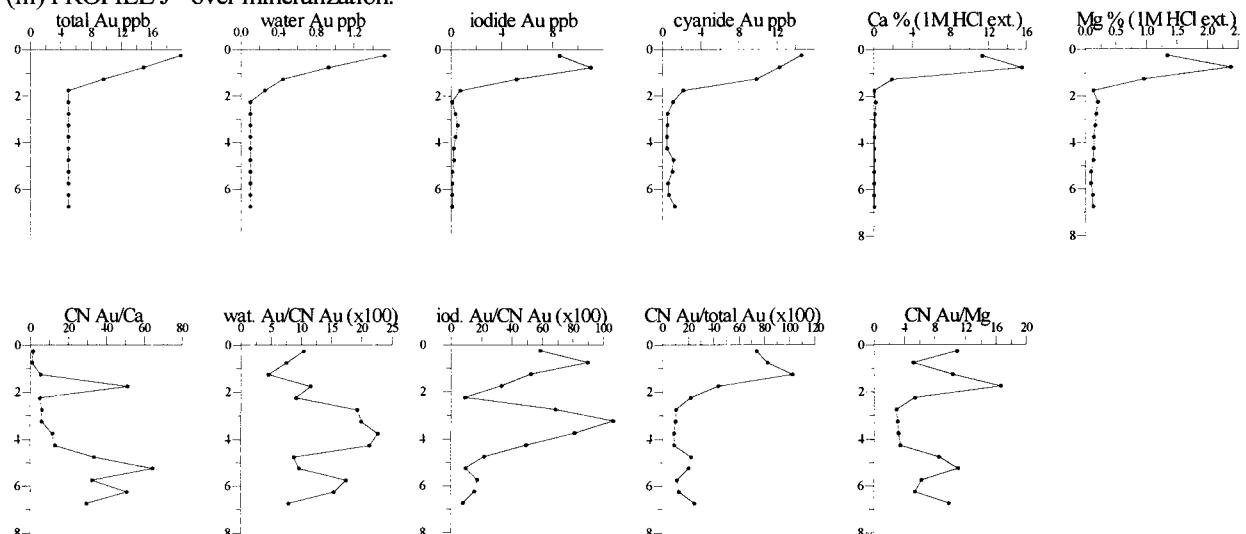


Figure A6.1: Elemental abundances and partial extractions for selected profiles at Argo.

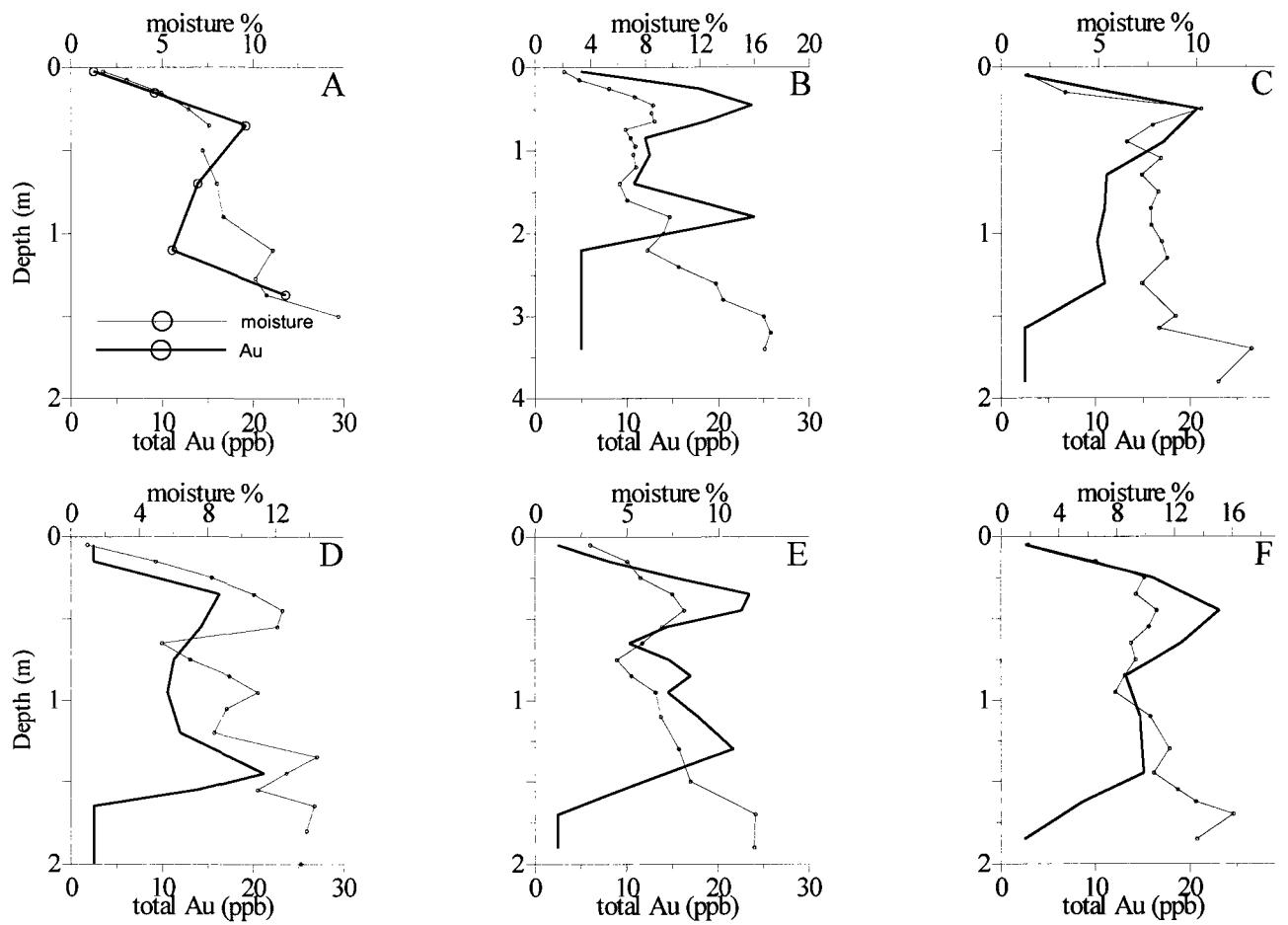


Figure A6.2: Gold and moisture abundances for profiles A-F at Argo.

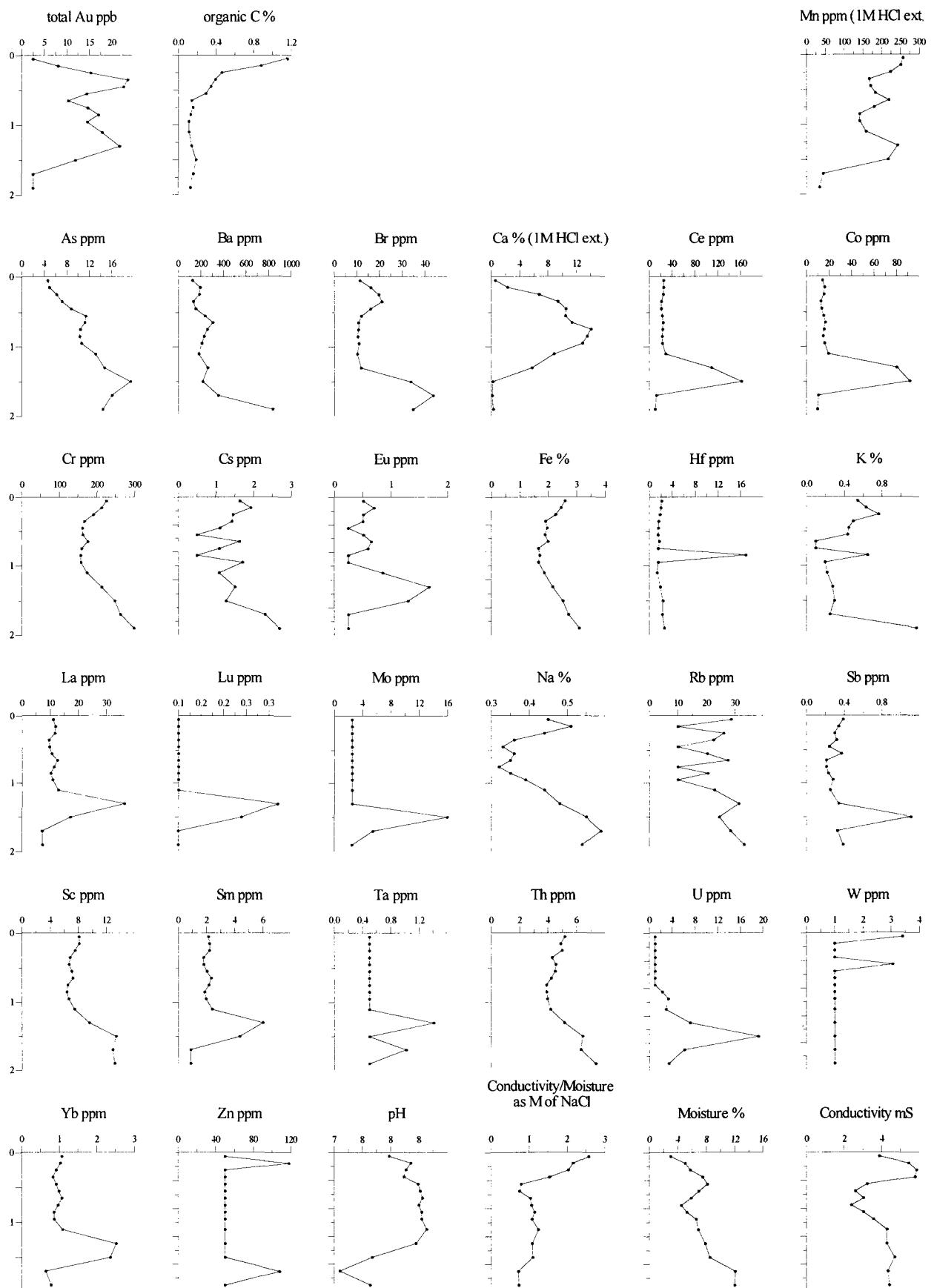


Figure A6.3: Elemental abundances for Profile E at Argo.

For all samples, Ag (5 ppm), Ir (20 ppb) and Se (5 ppm) were below detection indicated in brackets.
Y axis is Depth (m)

Appendix 7: 0 - 1m samples - graphed

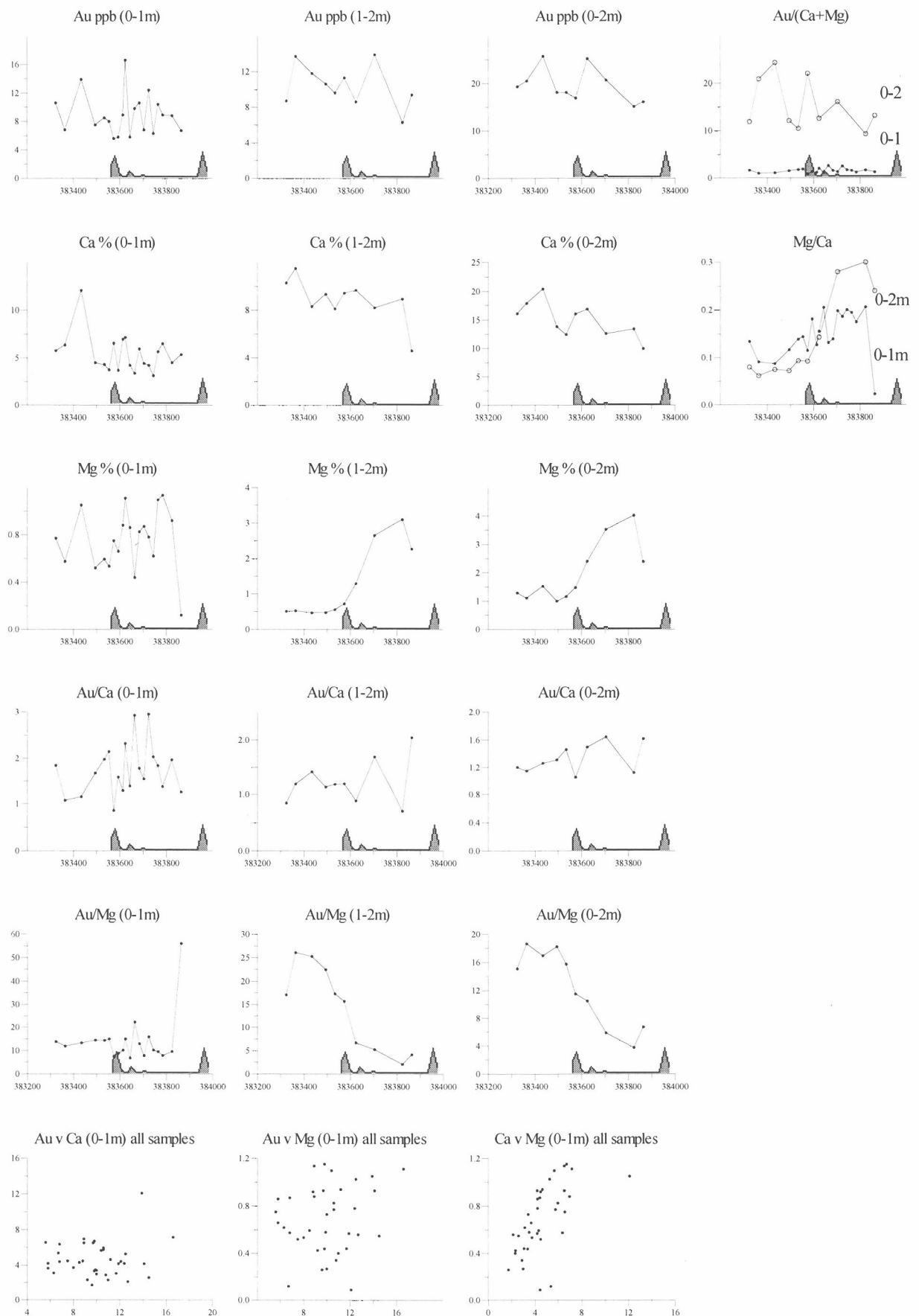


Figure A7.1: Elemental abundances for samples collected by auger on 5380N at Argo.
Hatched area indicates position of mineralization.
For scatter plots, first element in header is X axis, otherwise X axis is Easting (m).

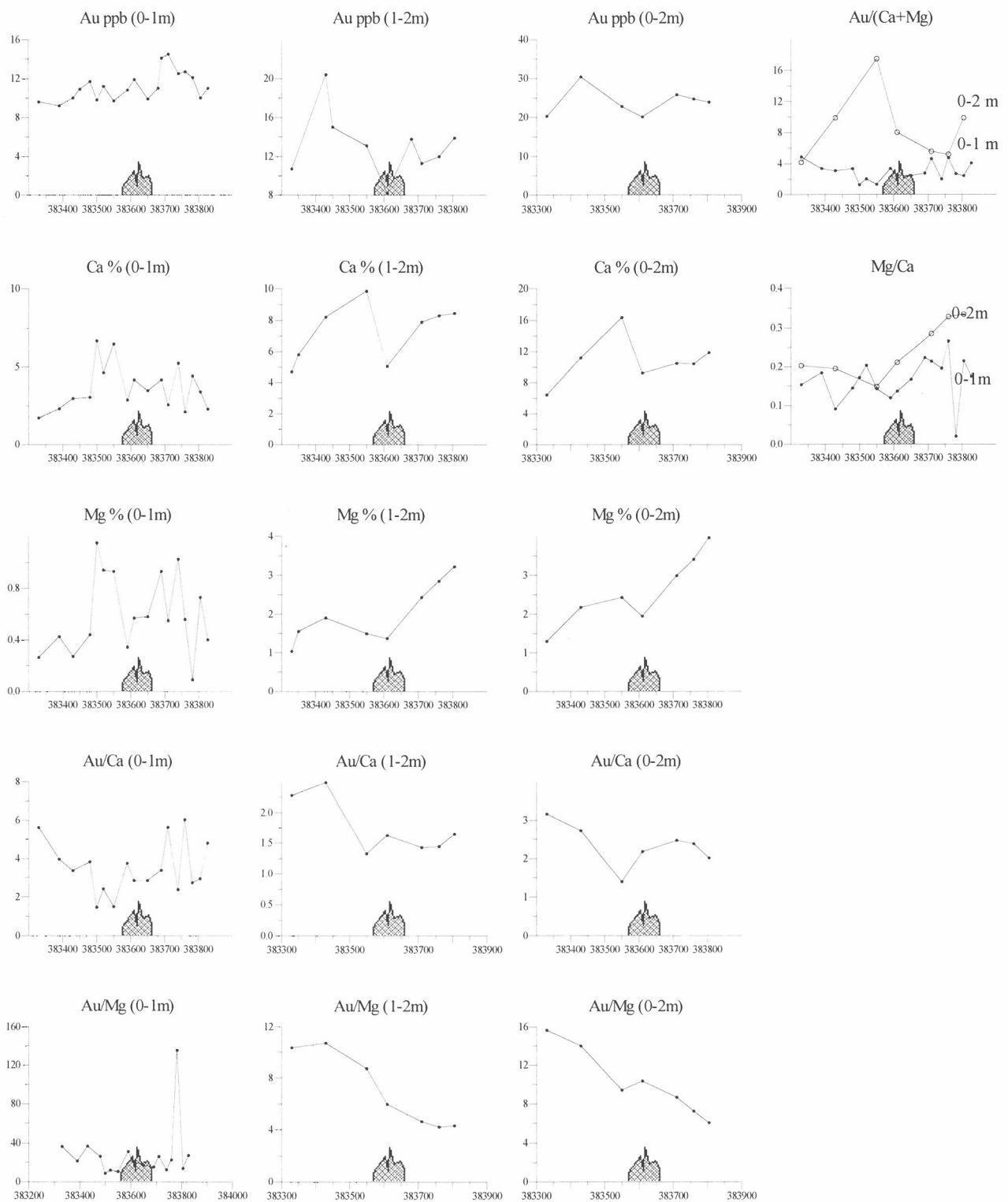


Figure A7.2: Elemental abundances for samples collected by auger on and near to 6030N at Argo. Hatched area indicates position of mineralization. X axis is Easting (m).

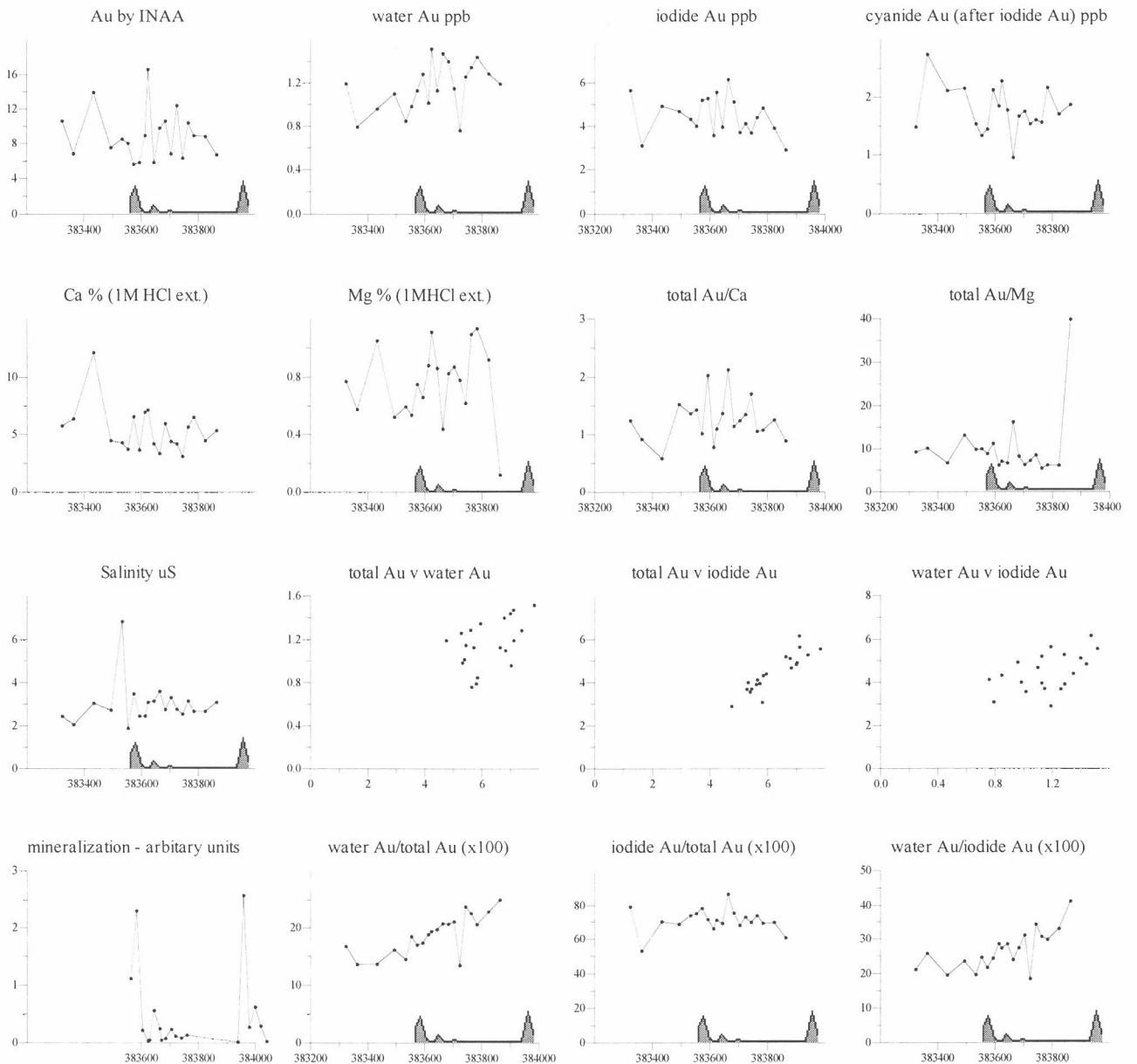


Figure A7.3: Elemental abundances and partial extraction data for 0 - 1m samples from 5380N at Argo.
Hatched area indicates position of mineralization.

For scatter plots, first element in header is the X axis, otherwise X axis is Easting.

"total Au" for this figure refers to iodide and cyanide Au partial extraction results combined.

"Au by INAA" refers to Au (ppb) in the solid sample.

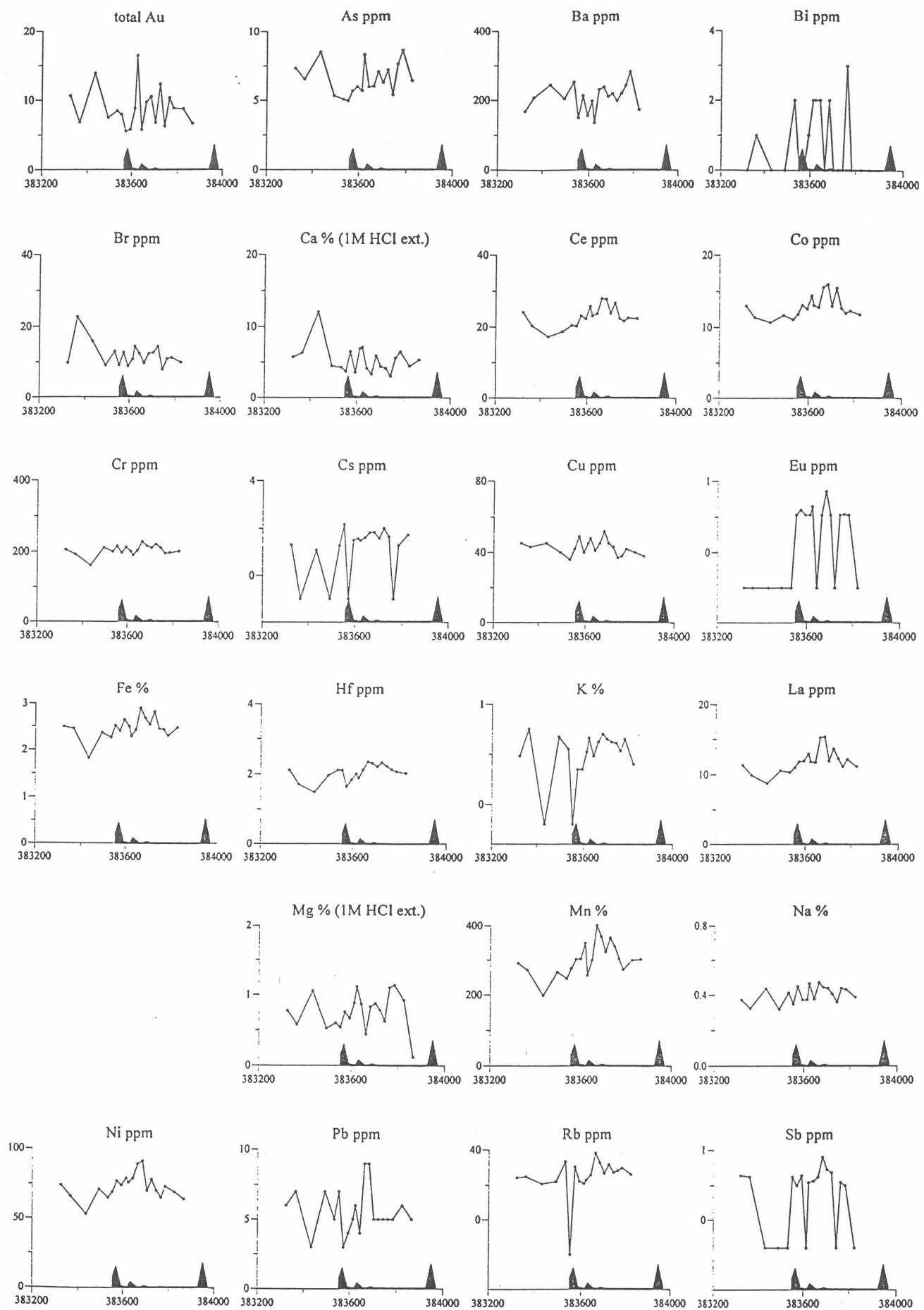


Figure A7.4: Elemental abundances for 0 - 1m samples from 5380N at Argo.
 Hatched area indicates position of mineralization. X axis is Easting (m).
 For all samples, Ag(5 ppm), Ir (20 ppb), Lu (0.2 ppm), Mo (5 ppm), Se (5 ppm)
 and W (2 ppm) were below detection indicated in brackets. Negative data is below detection.

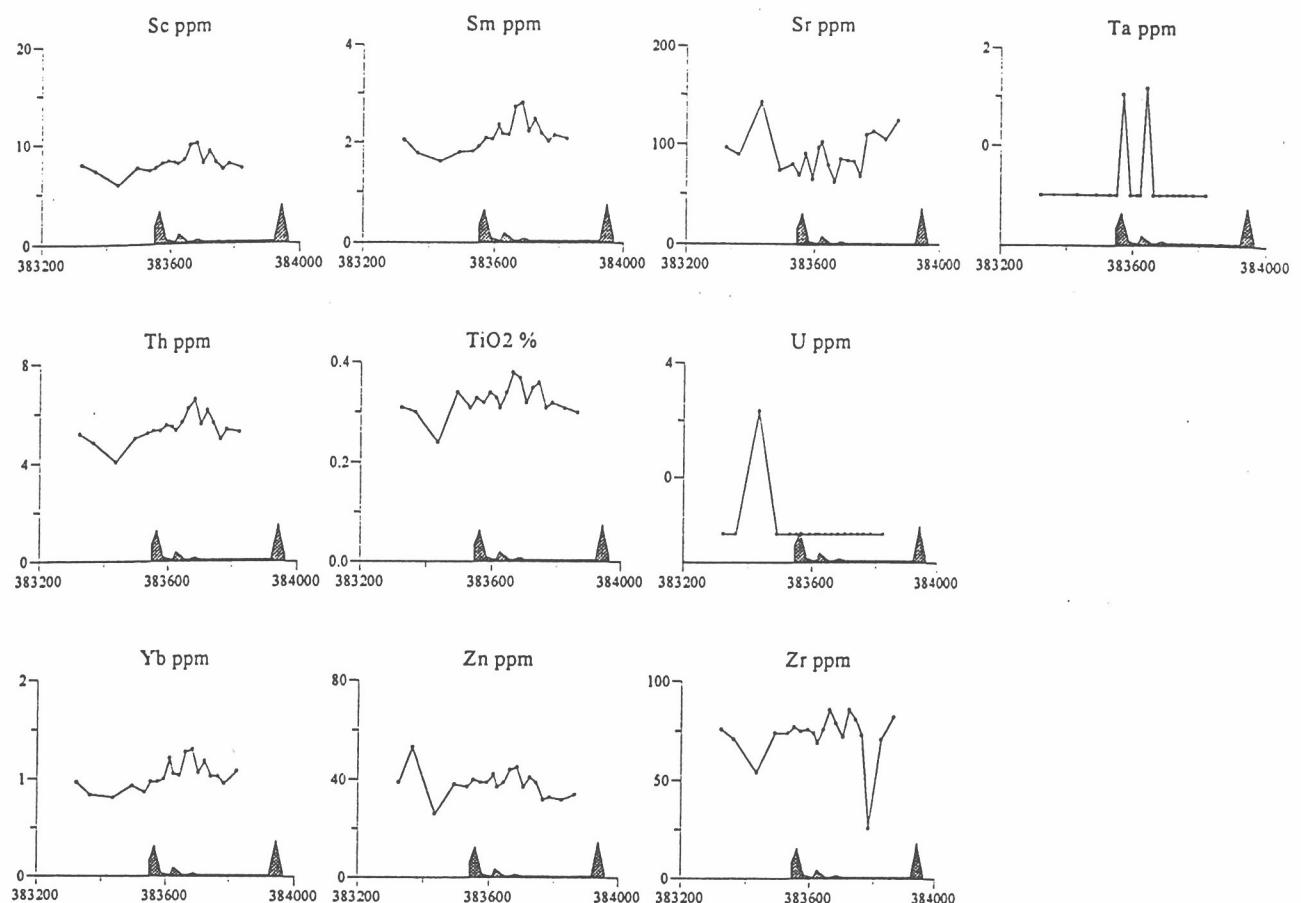


Figure A7.4 (continued).

**Appendix 8: Ferruginous and lignitic material separated
from transported overburden - graphed**

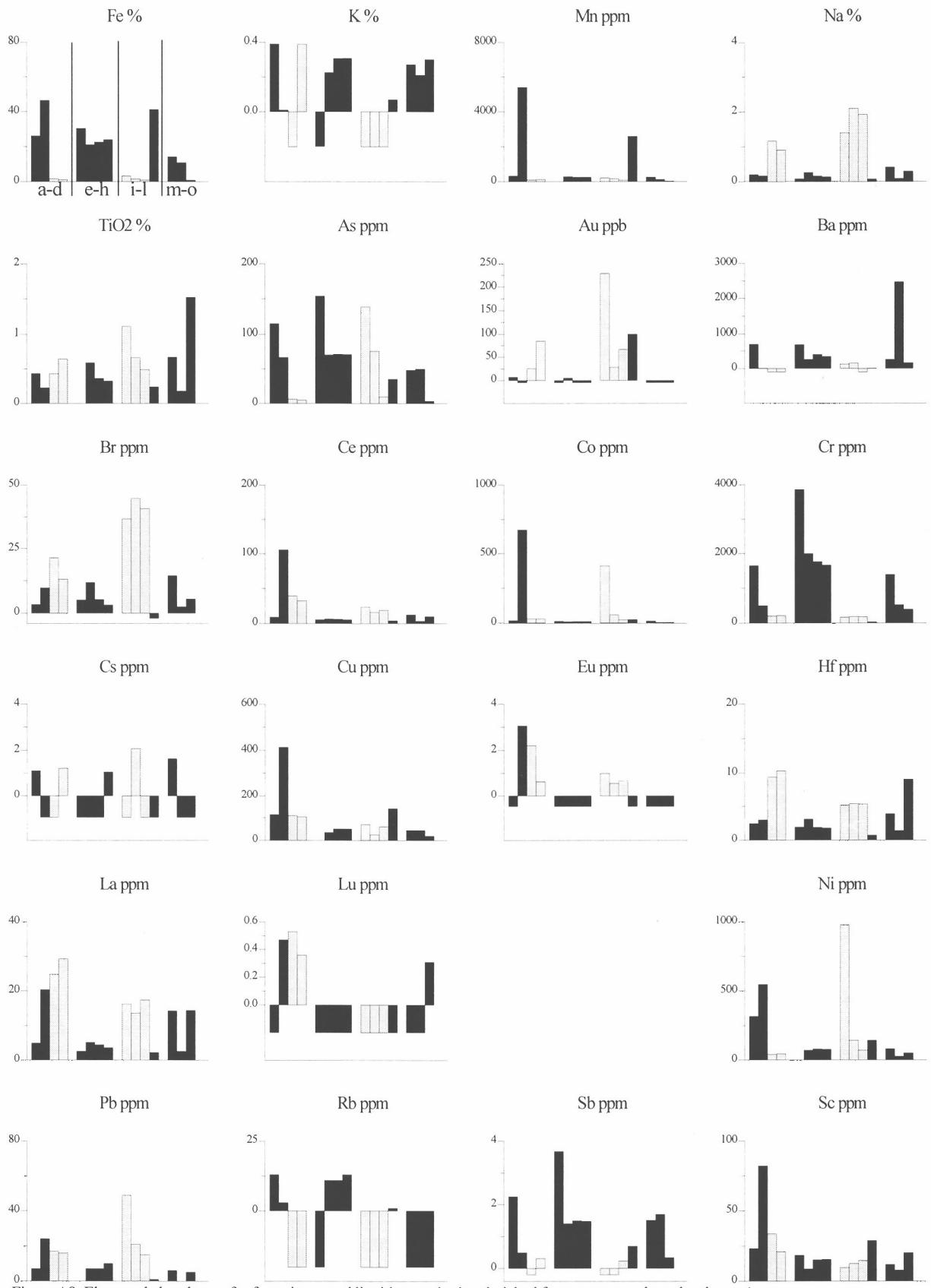


Figure A8: Elemental abundances for ferruginous and lignitic samples hand-picked from transported overburden at Argo.
See Appendix 11 for sample locations. Negative data are below detection.

Samples a-d : furthest from mineralization; samples e-h : superadjacent to high mineralization
samples i-l : adjacent to high mineralization; samples m-o: above high mineralization.
For all samples, Ag (5 ppm), Bi (2 ppm), Ir (20 ppb), Mo (5 ppm), and Se (5 ppm) are below detection indicated in brackets.

Samples with lignitic material

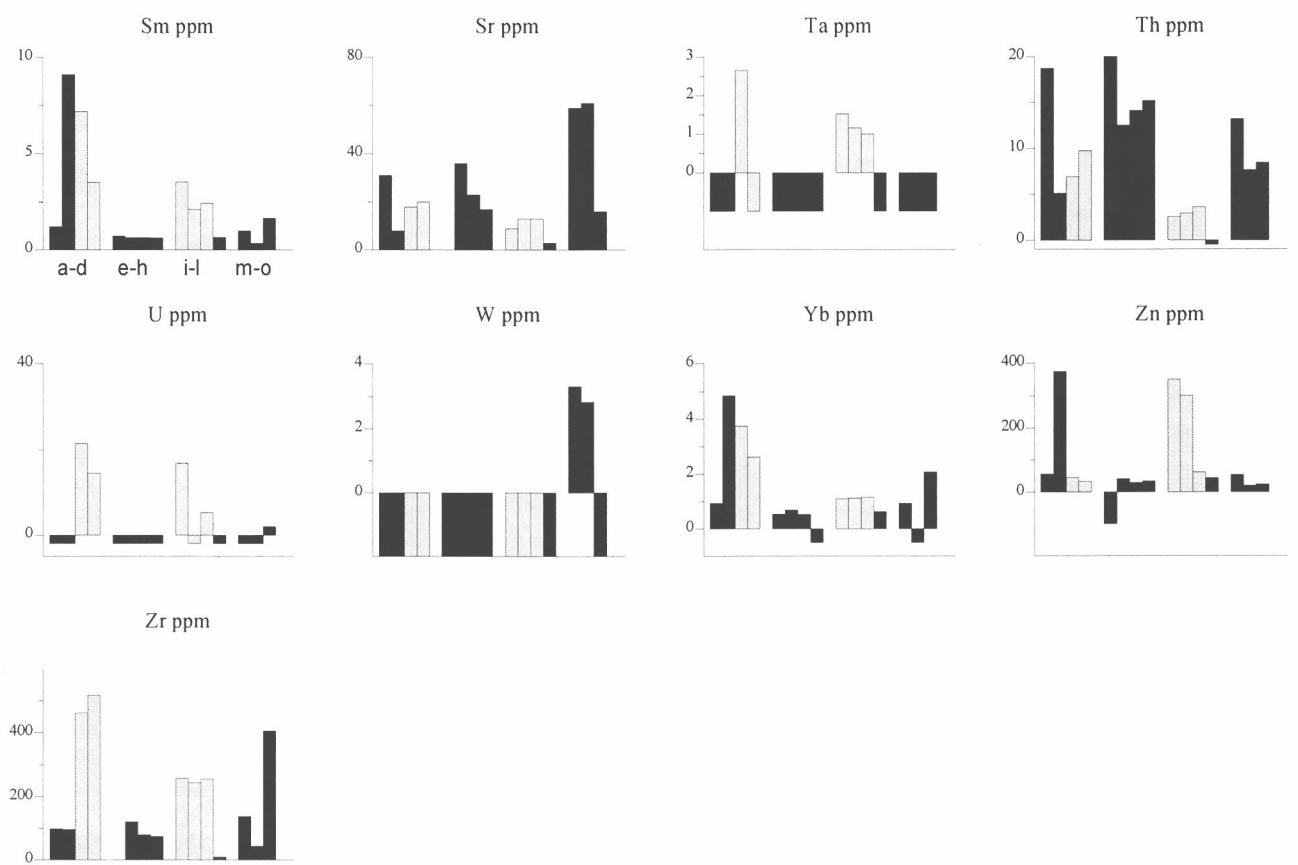


Figure A8 (continued).

Appendix 9: Saprolite and bedrock - graphed

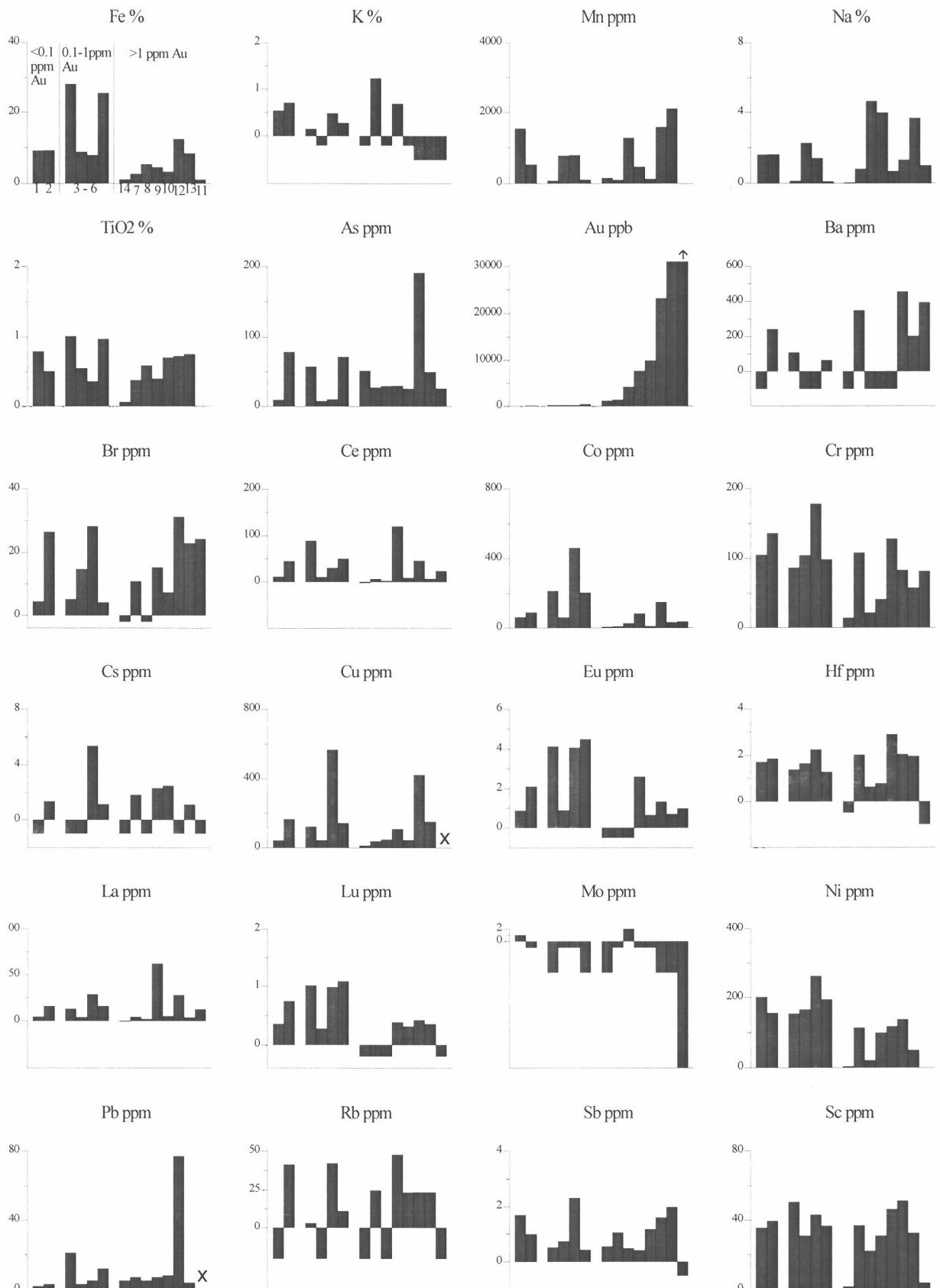


Figure A9: Elemental abundances for selected saprolite and bedrock samples from Argo. See Appendix 11 for locations. X indicates sample not analysed for this element. Samples grouped into 3 according to Au content (<0.1 ppm, 0.1-1 ppm and >1 ppm). Negative data below detection.

Ag (5 ppm), Bi (1 ppm), Ir (20 ppb), Se (5 ppm) and U (2 ppm) are below detection indicated in brackets.

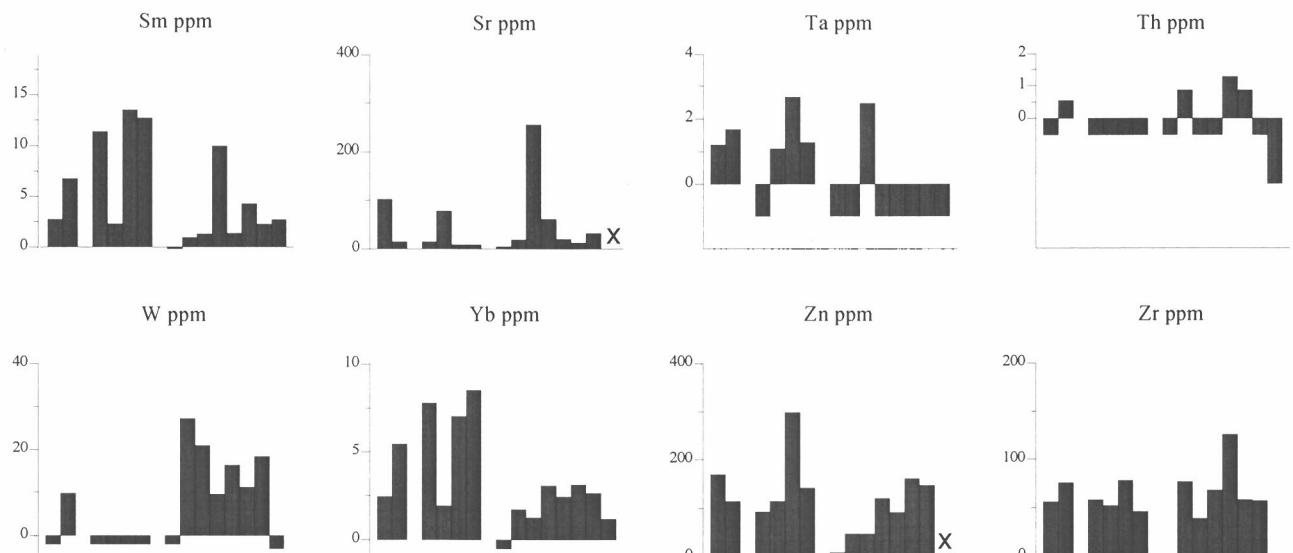


Figure A9 (continued).

Appendix 10: Selected scatter plots

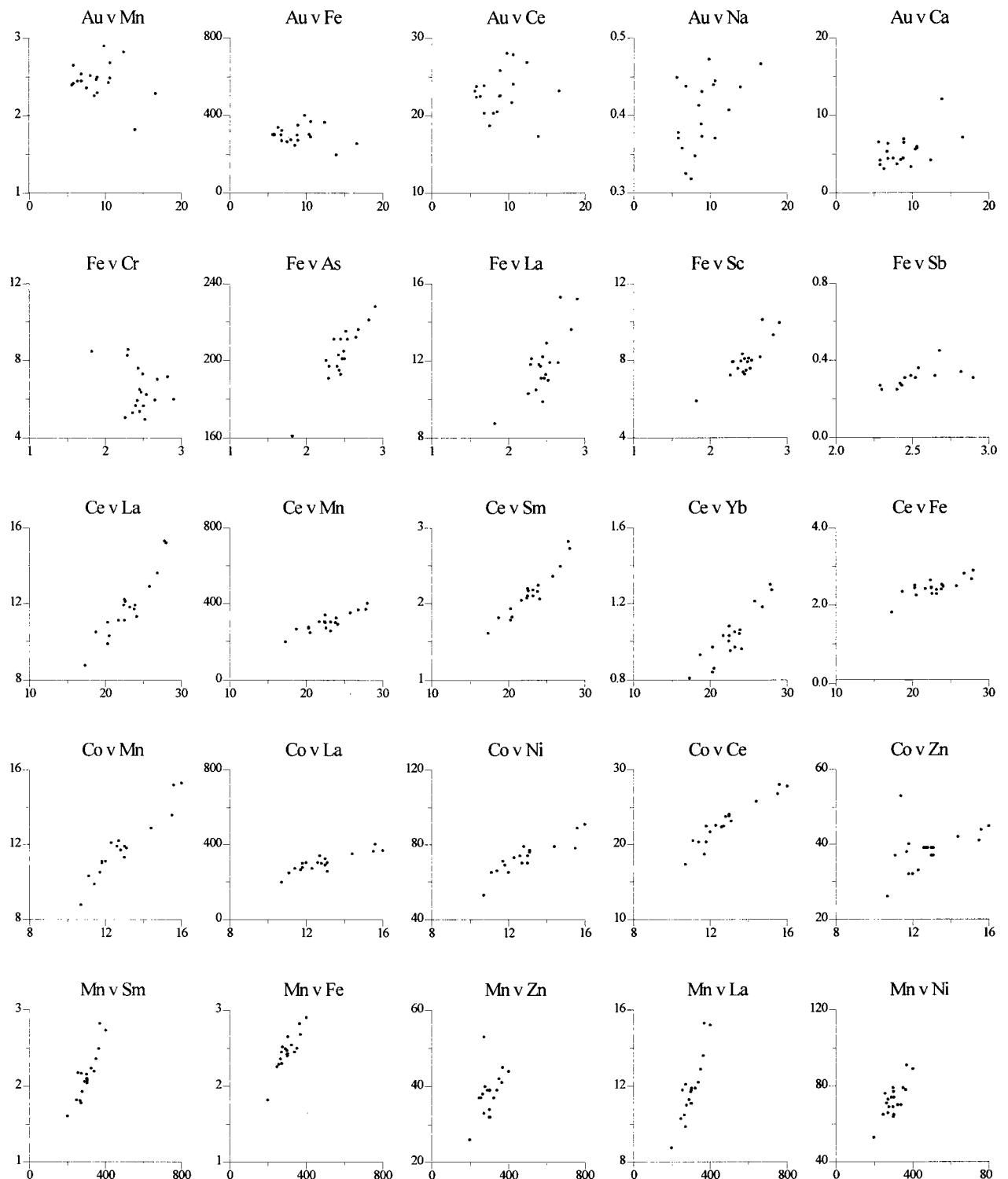


Figure A10.1: Selected element v element abundance plots for 0 - 1 m bulk samples from 5380N at Argo.
 First element in header is the x axis.
 Major eleents in %, trace elements in ppm, Au in ppb.

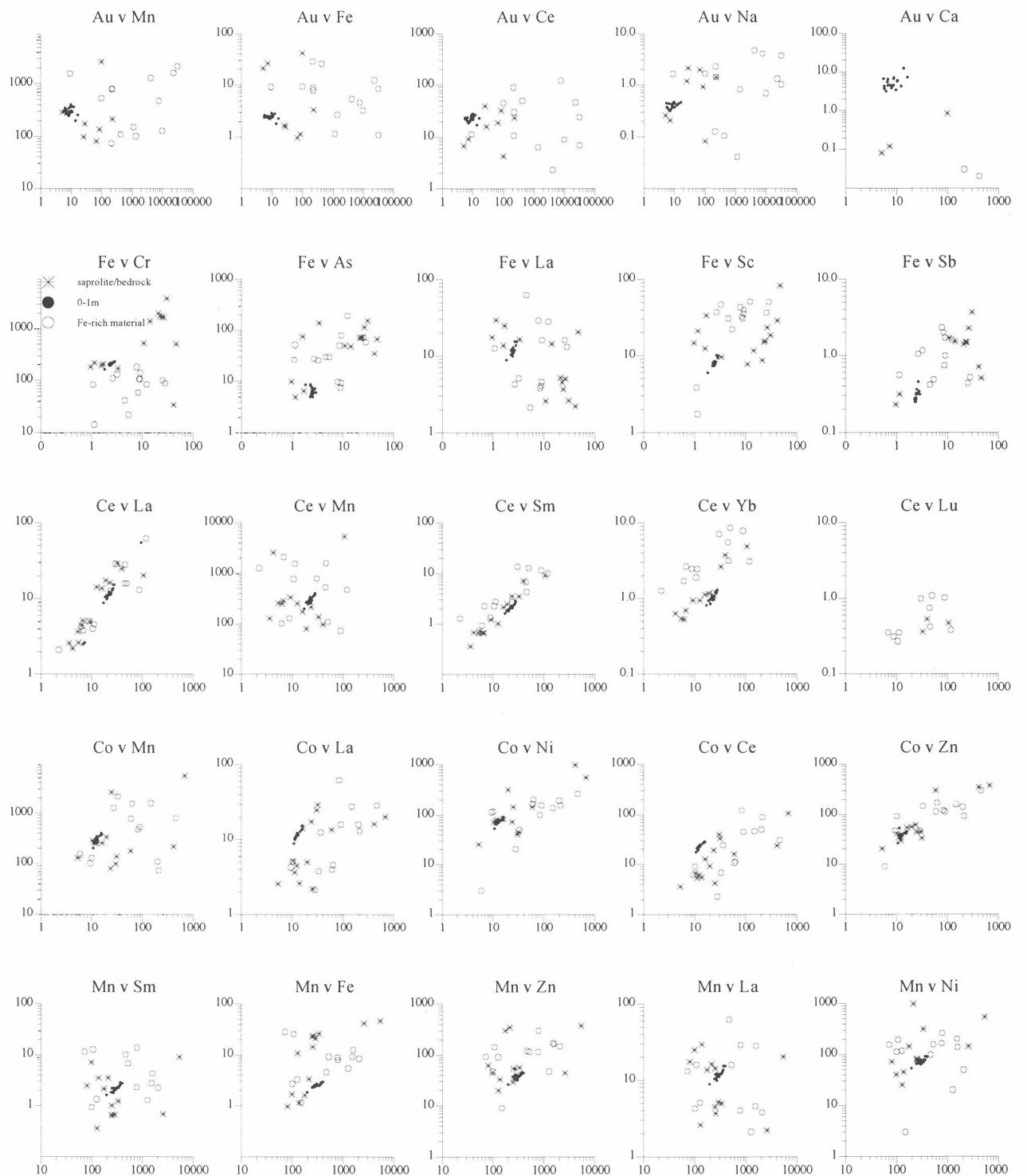


Figure A10.2: Selected element v element abundance plots for 0 - 1m bulk samples, Fe- and lignitic-rich material hand-picked from the overburden, and saprolite and bedrock material at Argo.
 Major elements in %, trace elements in ppm, Au in ppb.
 First element in header is the x axis.

Appendix 11: Sections

Key

- Calcareous red-brown sandy clay.
- Puggy lacustrine clays of various colours (yellow, red and/or grey).
- Spongolite.
- Saprolitic clays with some partially weathered rock.
- Fresh rock/saprock dominated by dolerite.
- Lignite.
- Moderately mineralized (Au 1-10 ppm).
- Strongly mineralized (Au >10 ppm).
- ⑦ Sample points (see Appendices 8 and 9 for graphed elemental abundances).

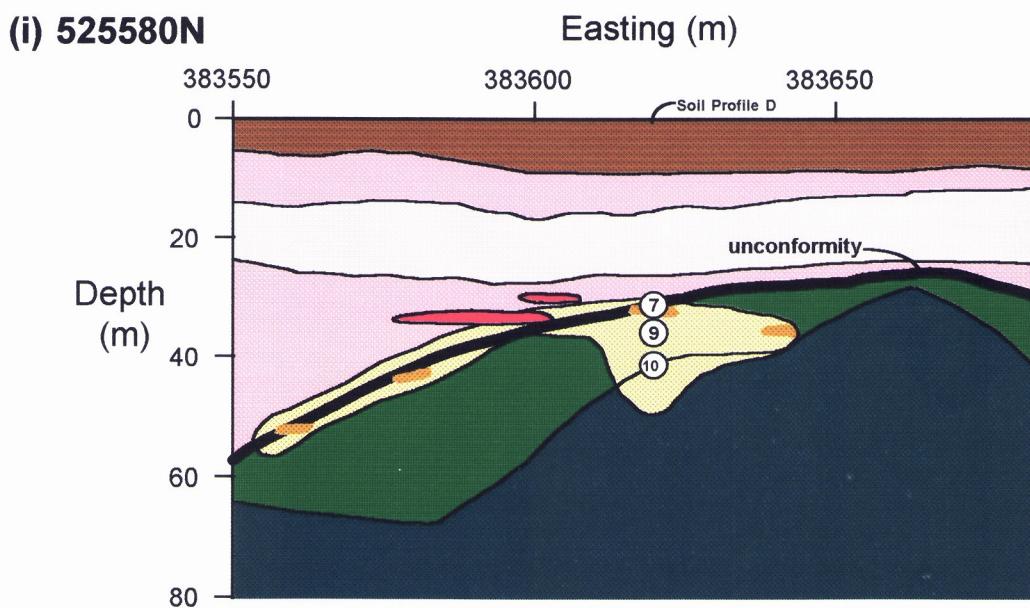
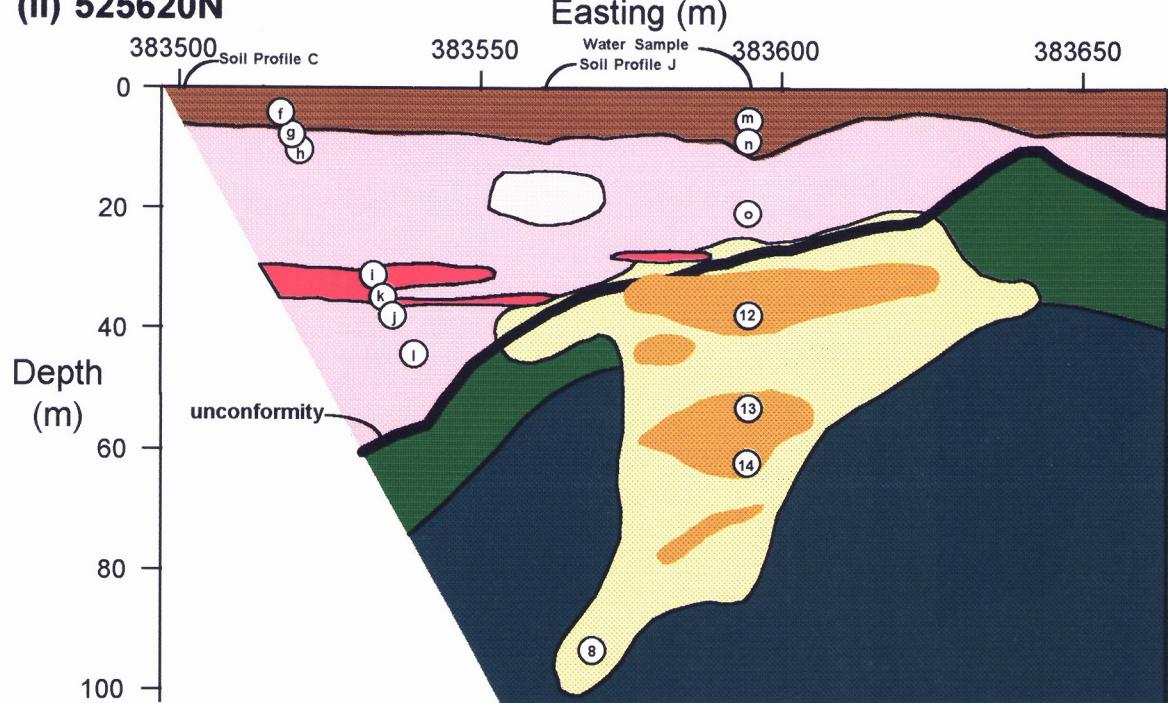
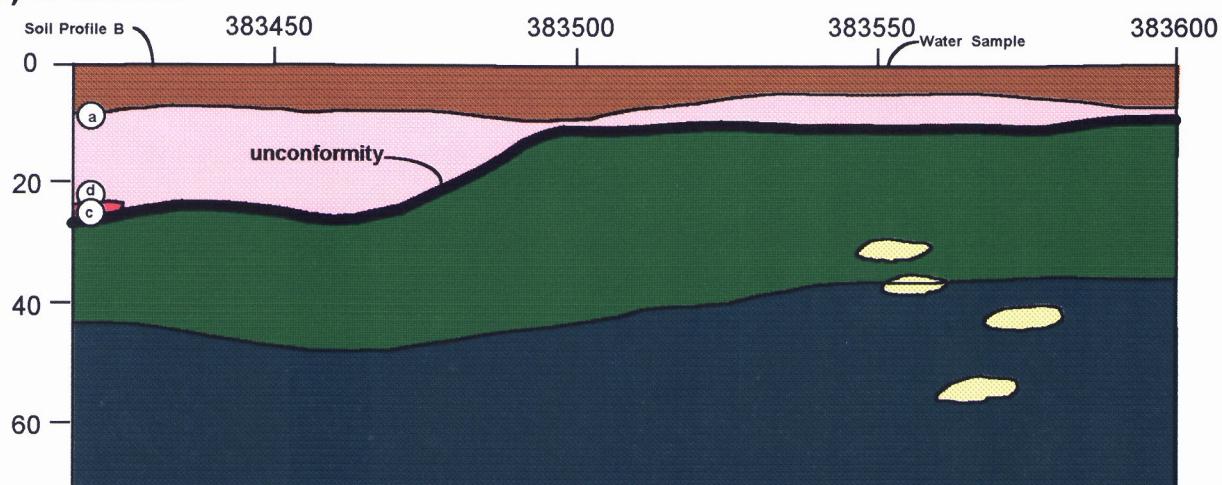


Figure A11: Regolith stratigraphy and Au abundance for (i) 525580N, (ii) 525620N, (iii) 525800N, (iv) 525840N, (v) 525860N, (vi) 525880N, (vii) 525900N at Argo. After data supplied by WMC Ltd.

(ii) 525620N



(iii) 525800N



(iv) 525840N

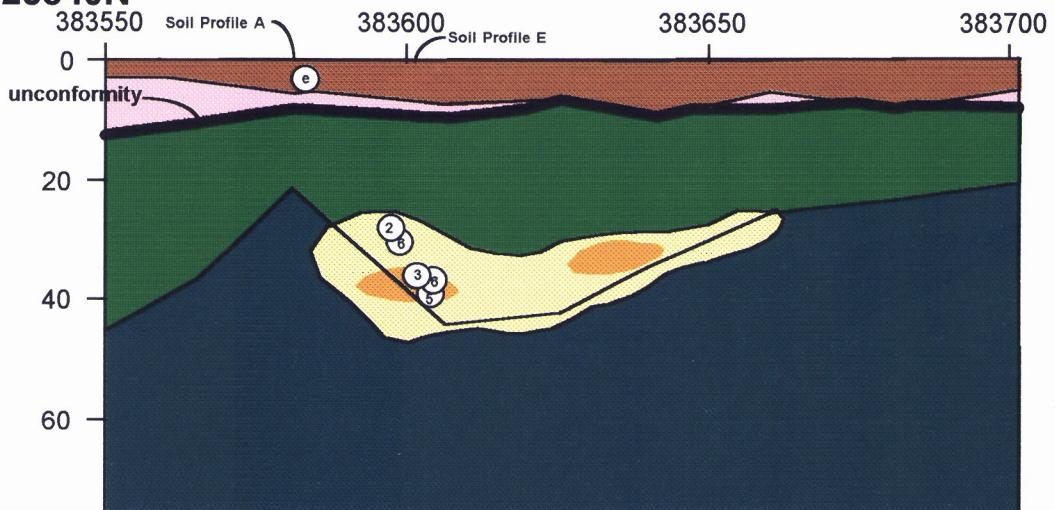
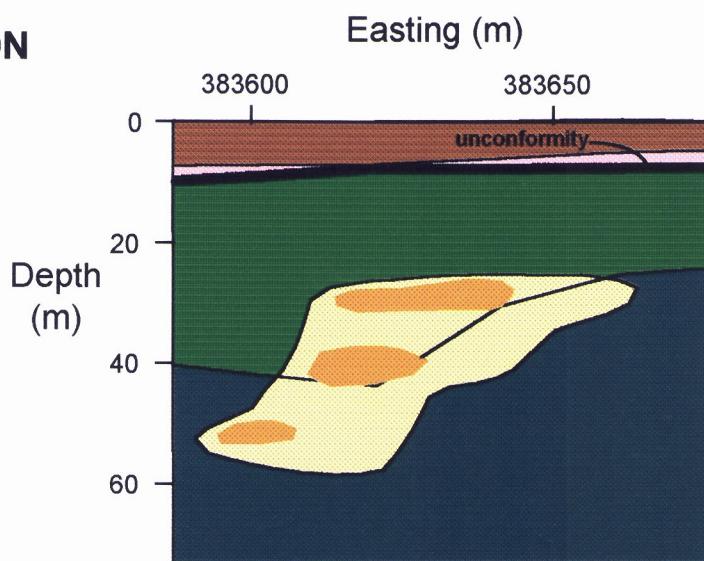
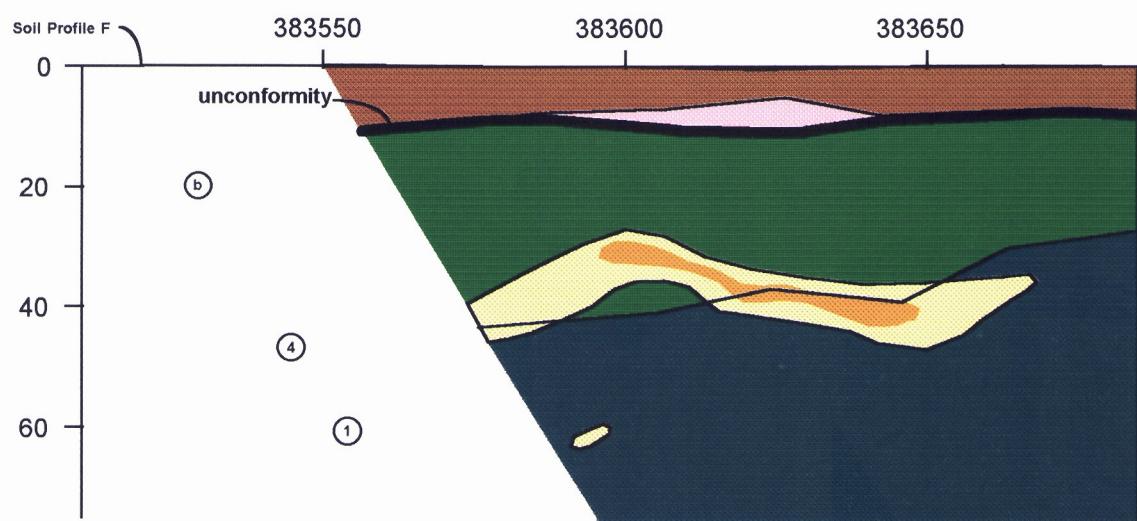


Figure A11 (continued).

(v) 525860N



(vi) 525880N



(vii) 525900N

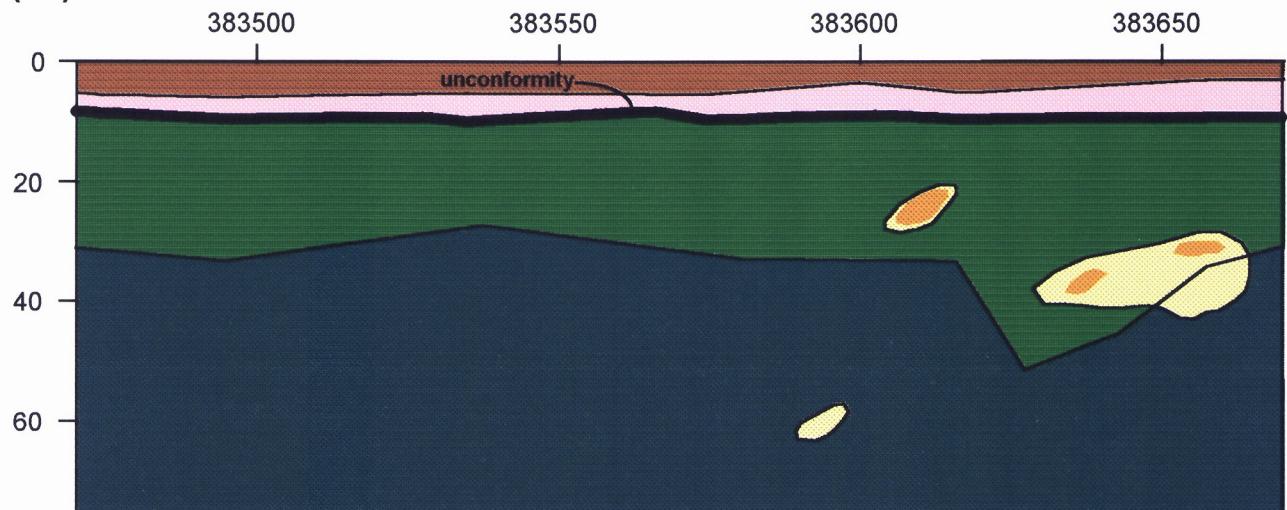


Figure A11 (continued).

Appendix 12: Plans

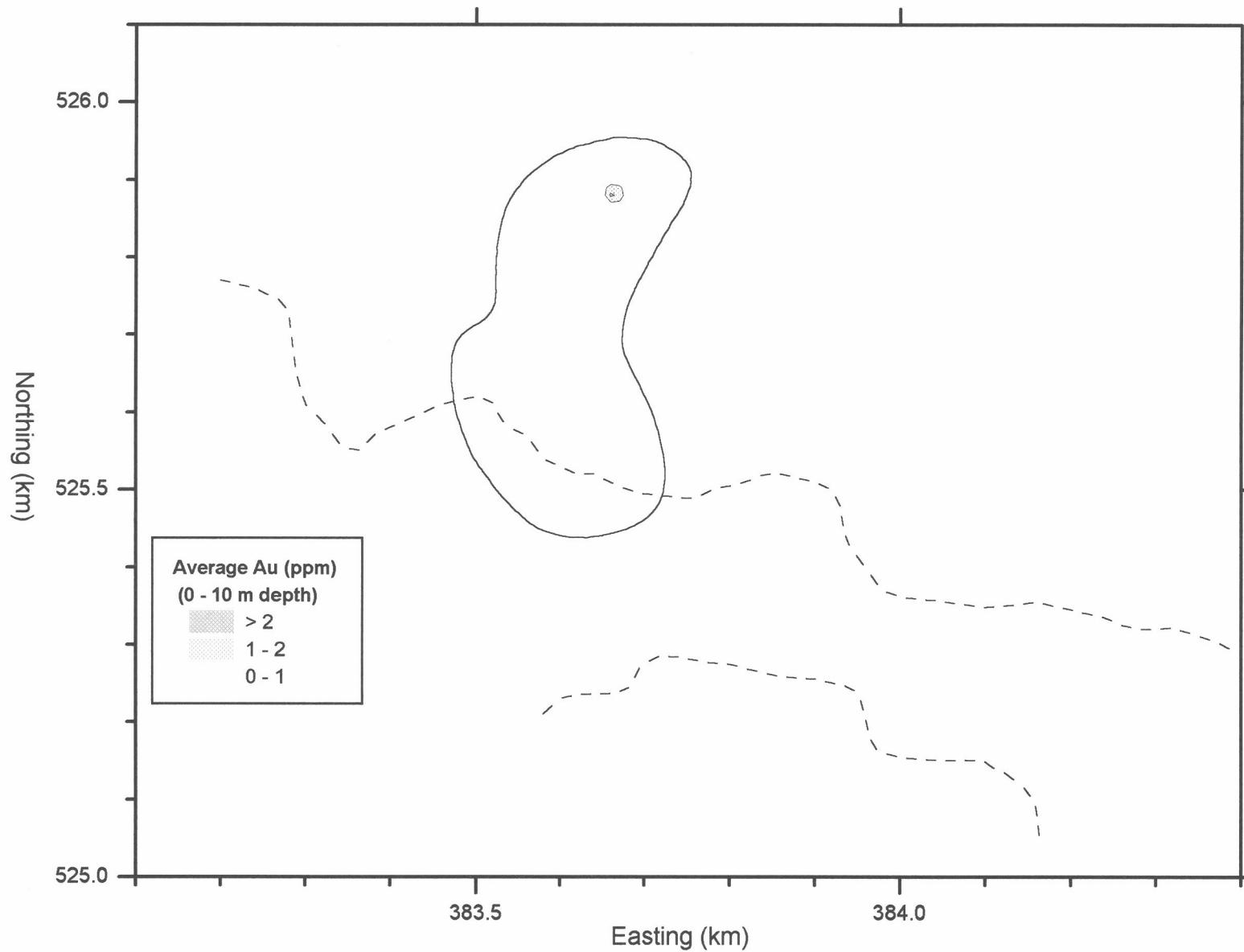


Figure A12.1: Plan showing contoured average Au grade (0 - 10 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)

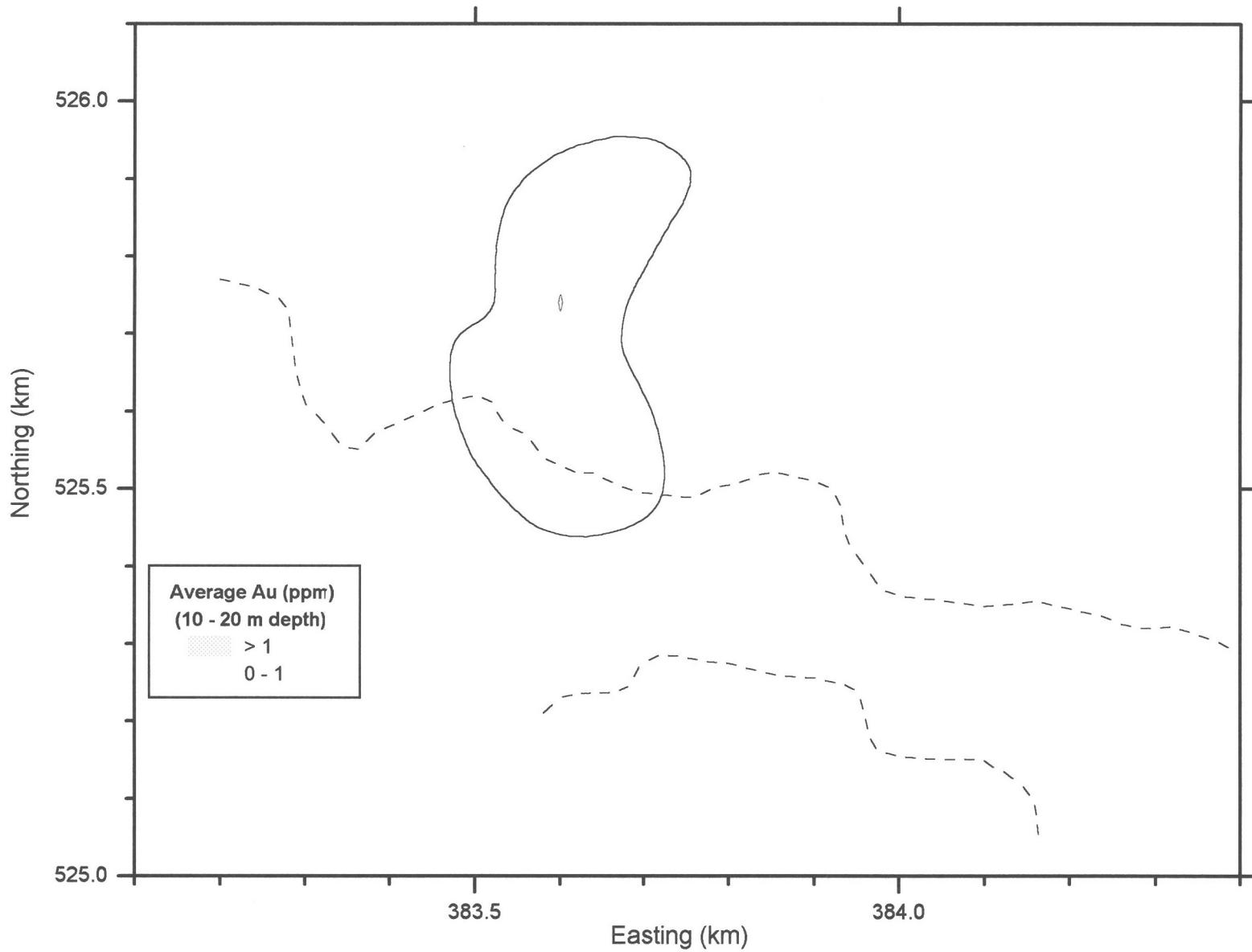


Figure A12.2: Plan showing contoured average Au grade (10 - 20 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)

Figure A12.3: Plan showing contoured average Au grade (20 - 30 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)

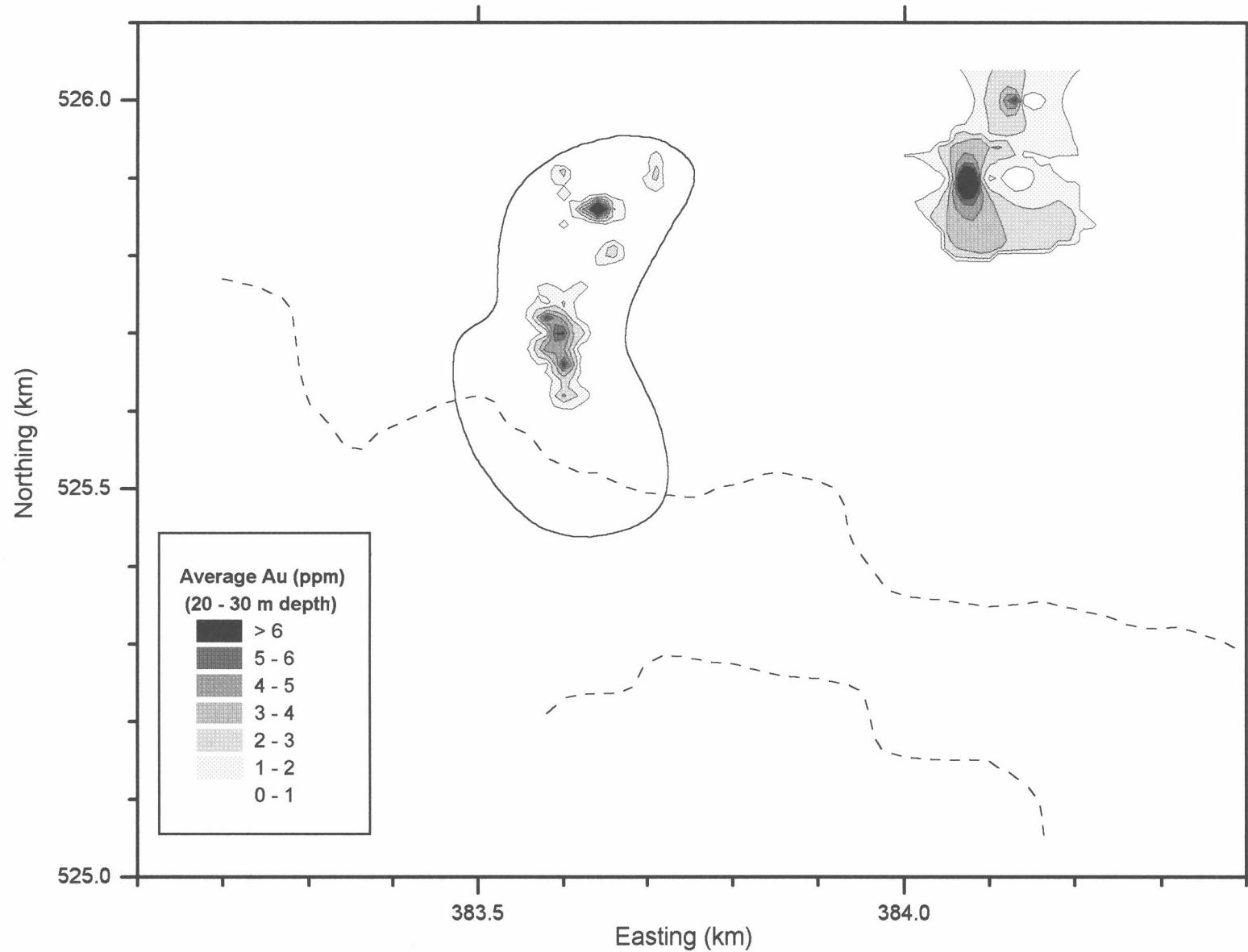


Figure A12.4: Plan showing contoured average Au grade (30 - 40 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)

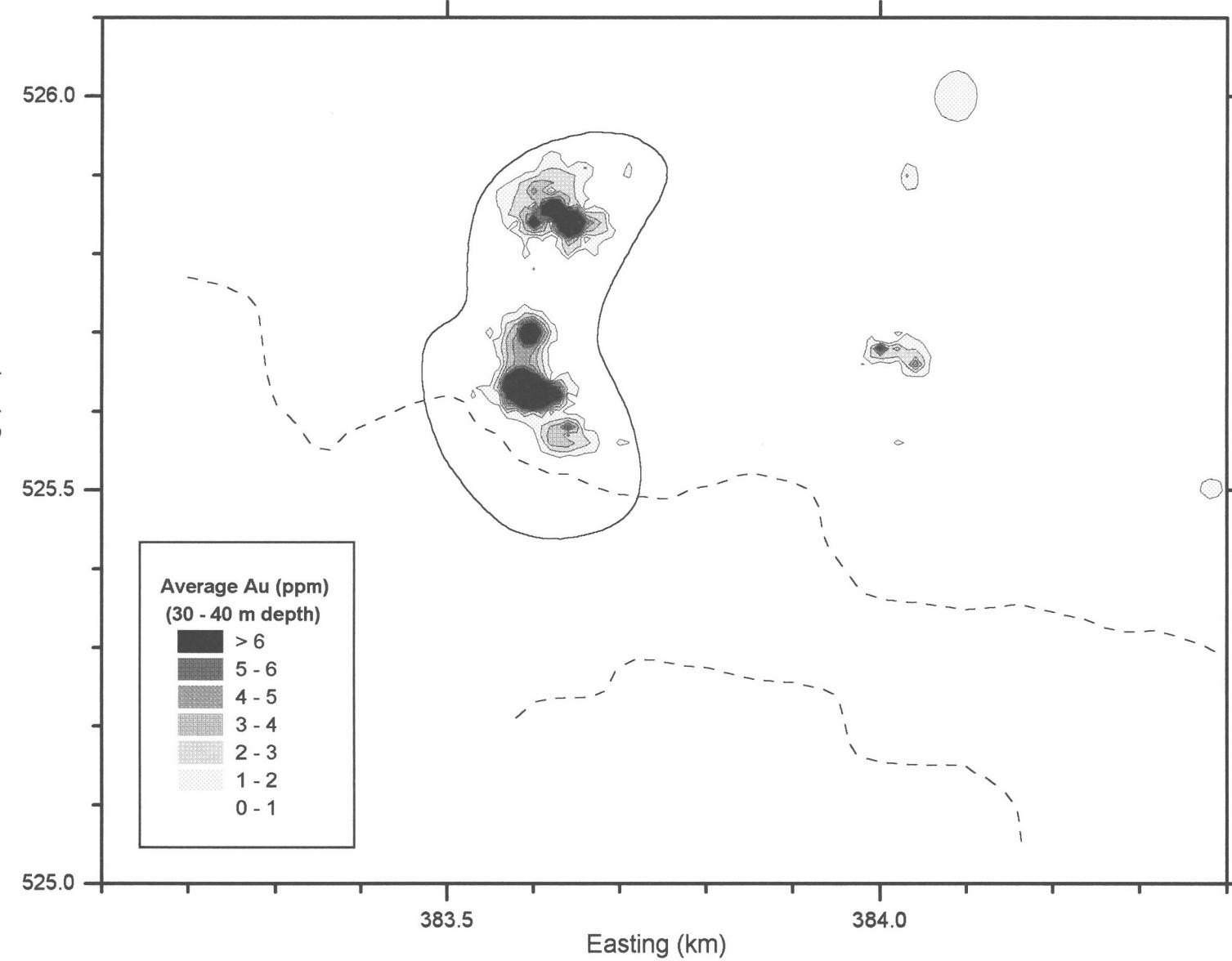


Figure A12.5: Plan showing contoured average Au grade (40 - 50 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)

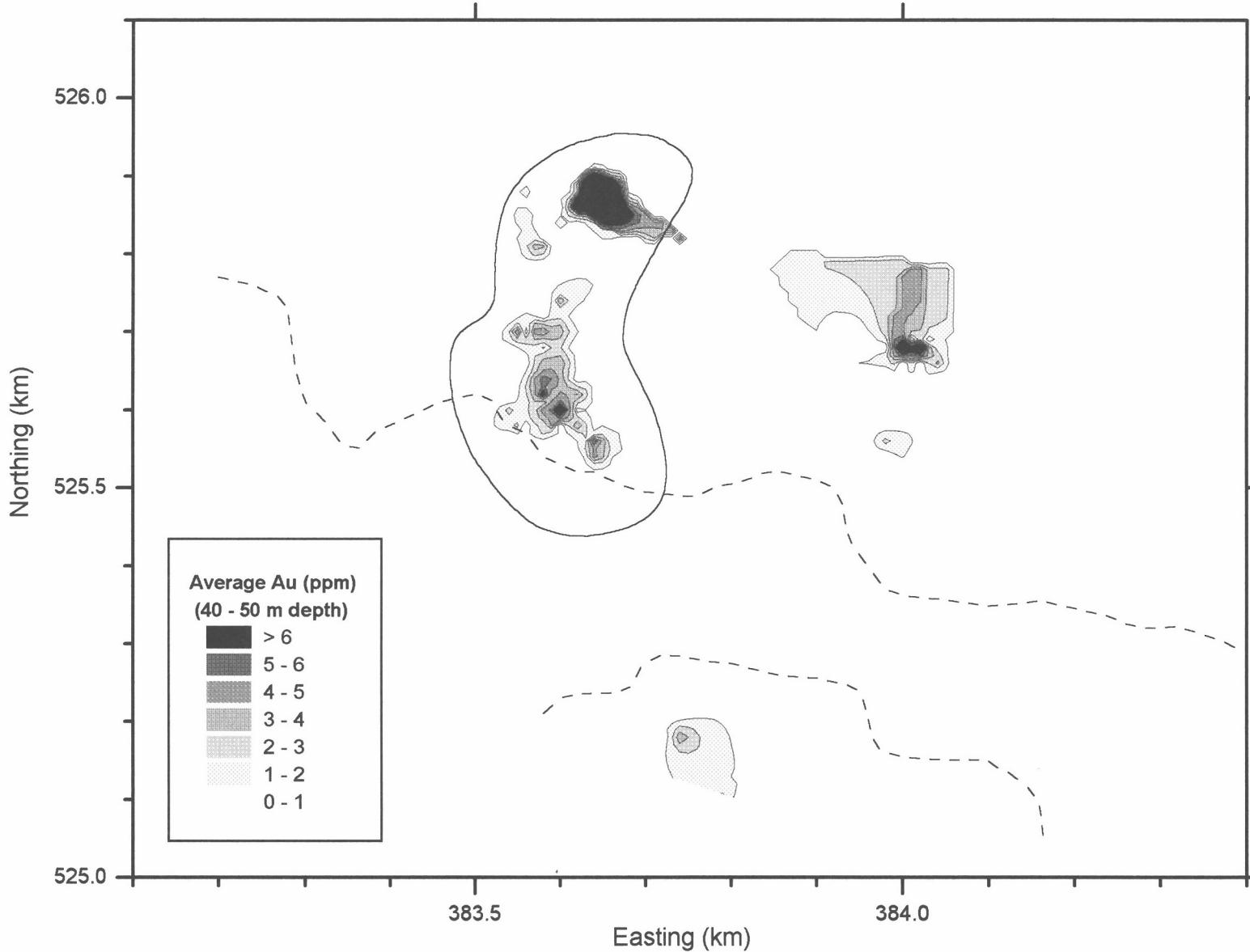
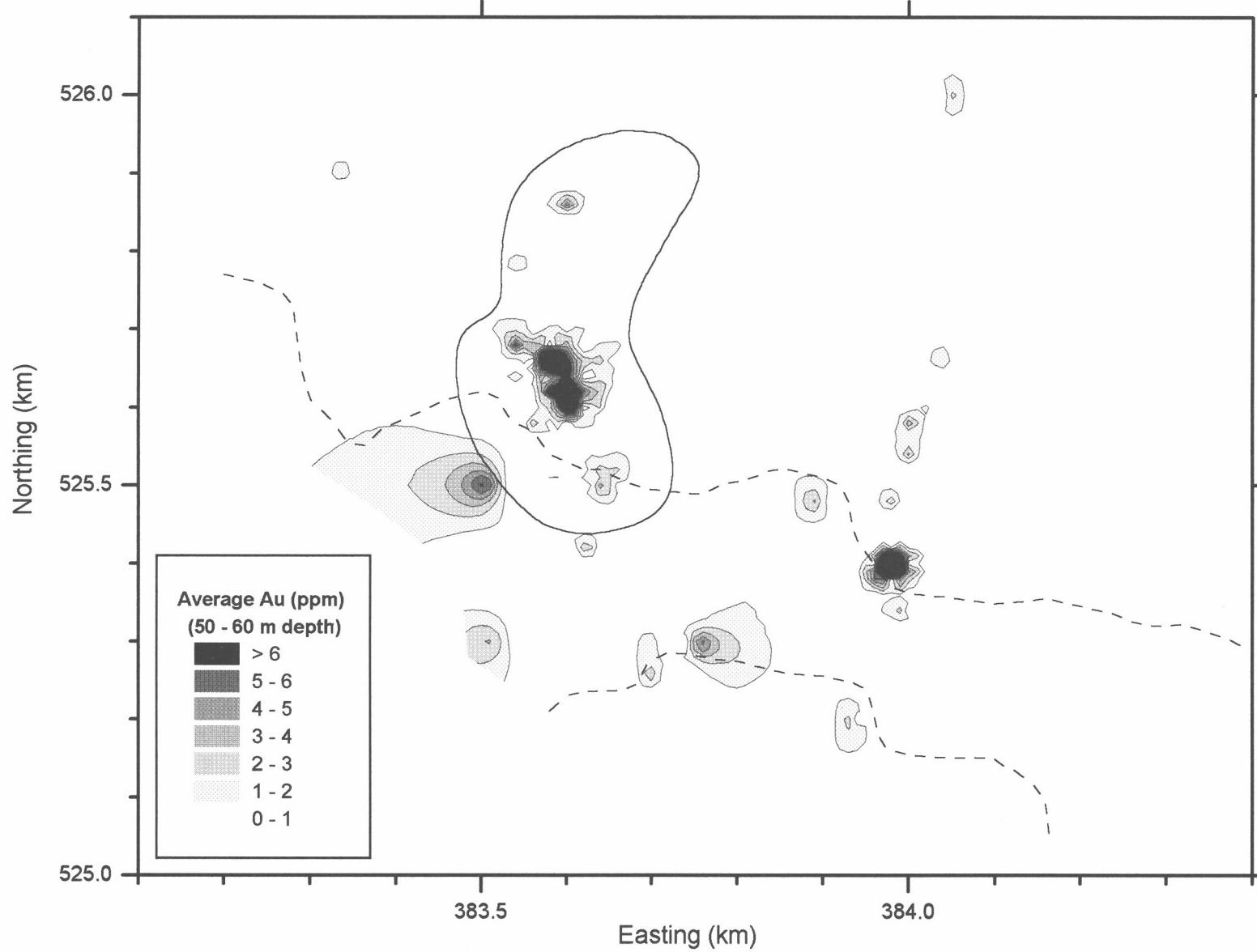


Figure A12.6: Plan showing contoured average Au grade (50 - 60 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)



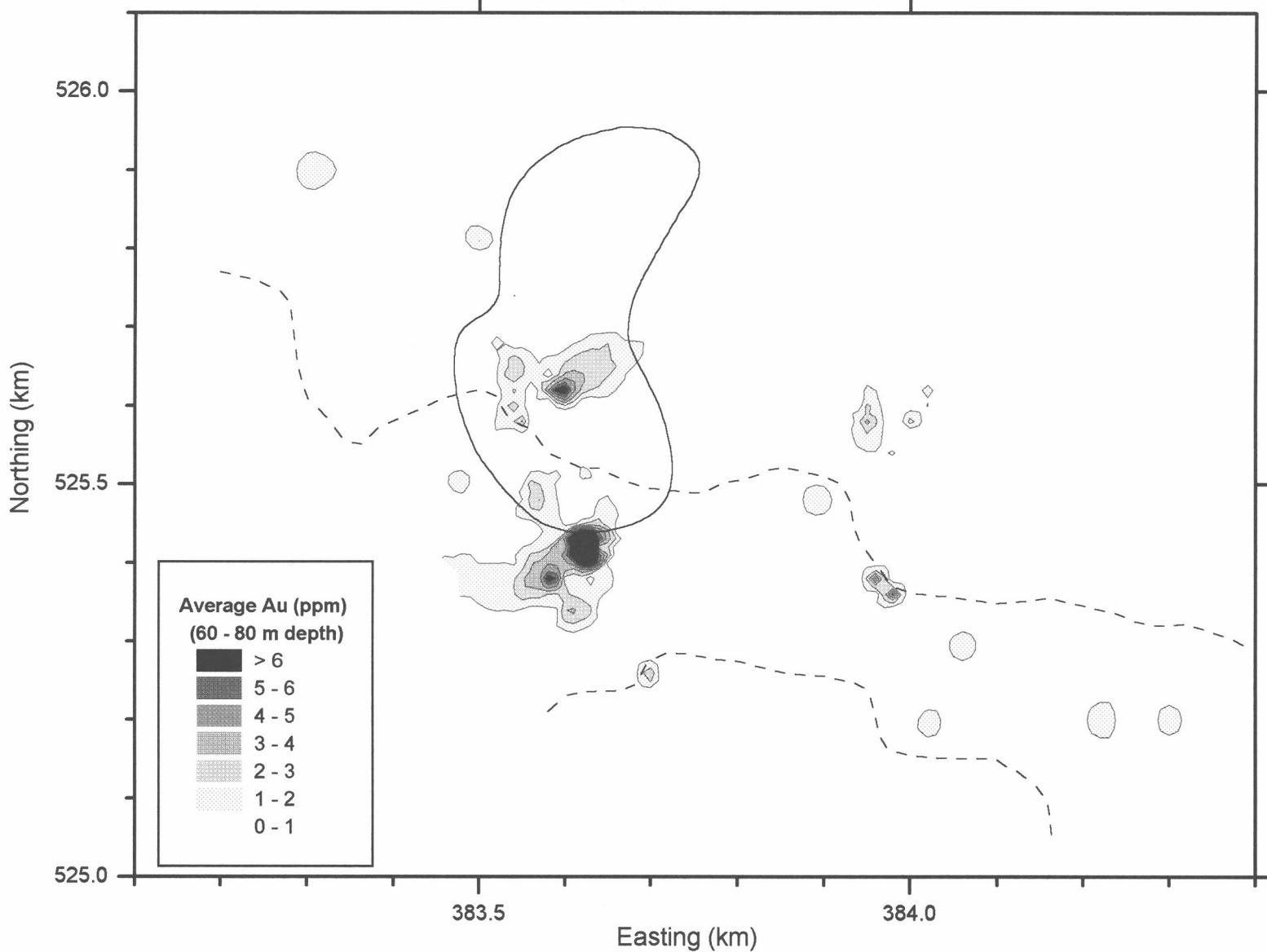


Figure A12.7: Plan showing contoured average Au grade (60 - 80 m depth), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)

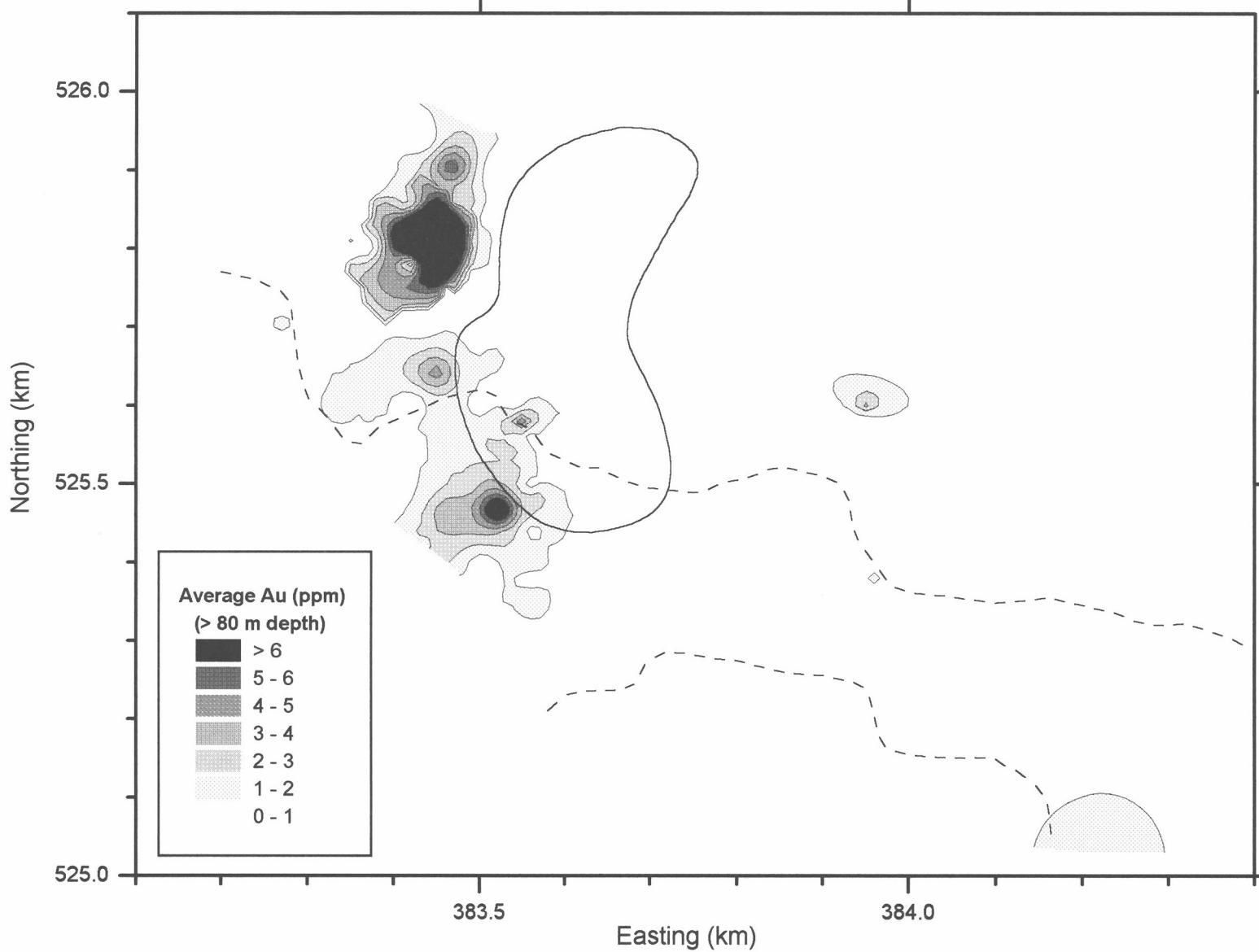


Figure A12.8: Plan showing contoured average Au grade (> 80 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)

Figure A12.9: Plan showing contoured average Au grade (0 - 70 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.)

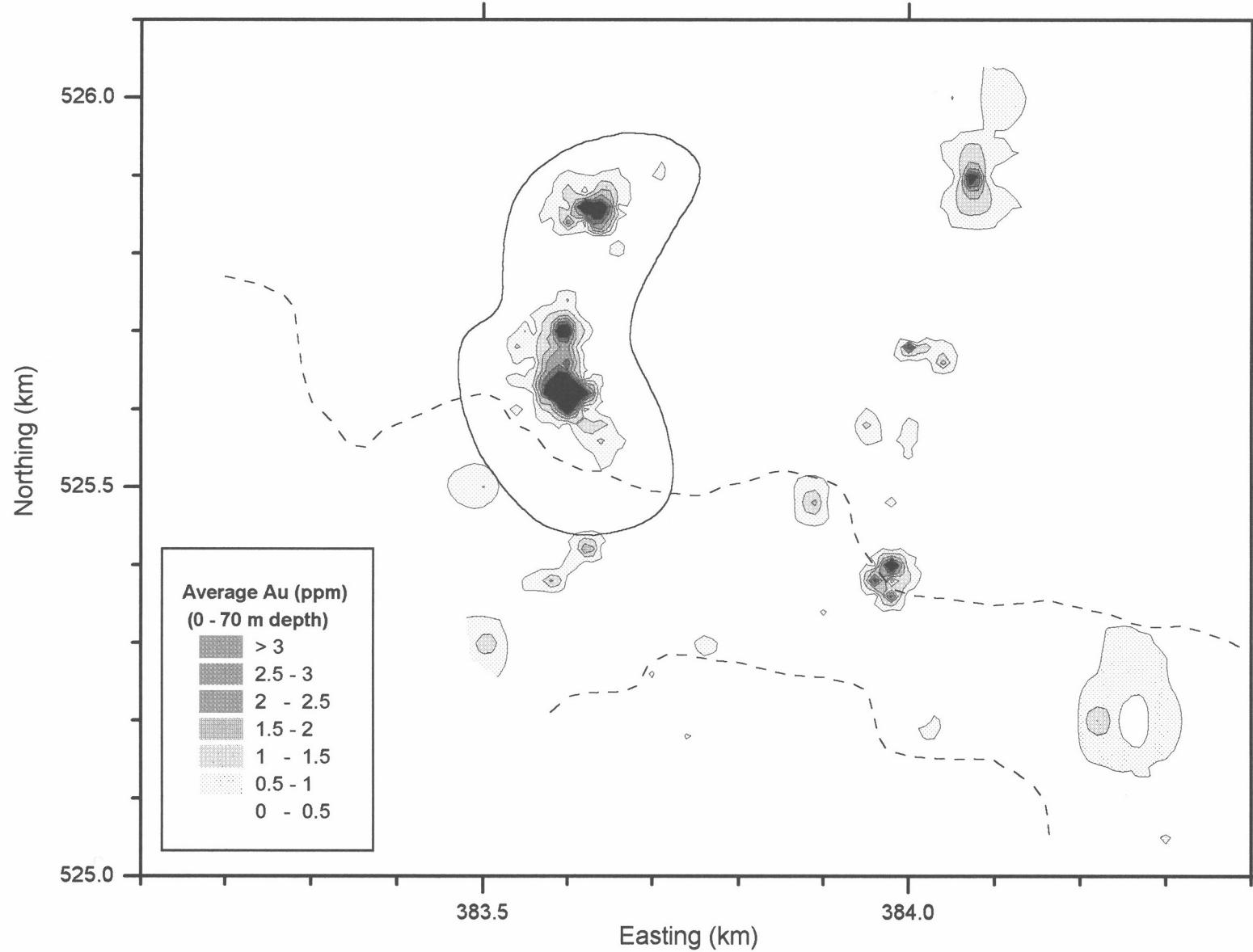
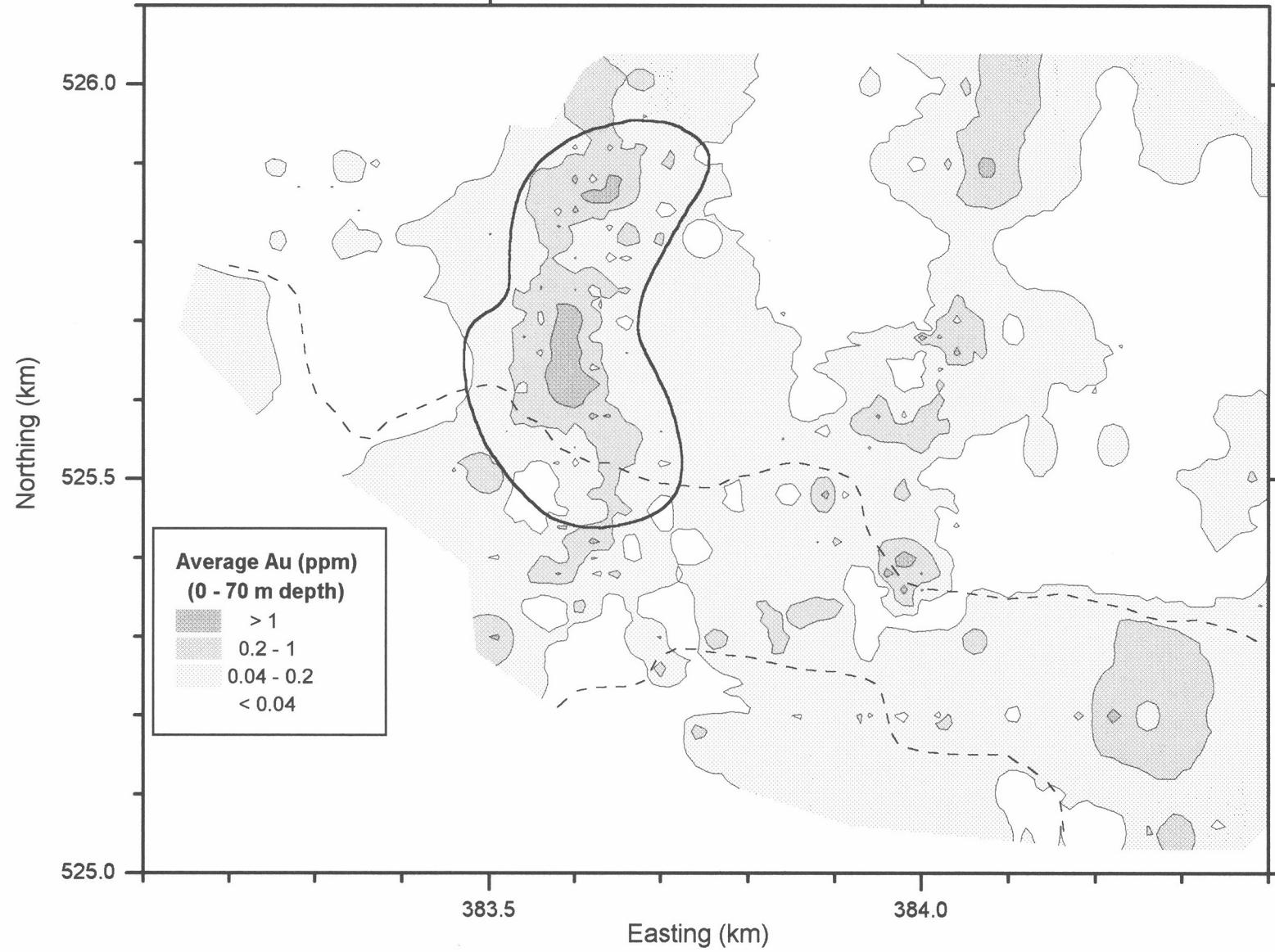


Figure A12.10: Plan showing contoured average Au grade (0 - 70 m), with pit outline and palaeochannel (courtesy Western Mining Corporation Ltd.).



**Appendix 13: Tabulated results for mineral and
biogeochemical samples**

Sample	East.	North.	Depth (m)	Sb	As	Ba	Bi	Br	Ca	Cs	Ce	Co	Cr	Cu	Eu
09-1921	383324	525378	0.50	0.32	7.31	169	<1	9.68	5.75	1.3	24.1	13	205	45	<0.5
09-1919	383364	525378	0.50	0.31	6.51	208	1	22.6	6.35	<1	20.3	11.4	193	43	<0.5
09-1913	383434	525378	0.50	<0.2	8.48	244	<1	15.8	12.10	1.08	17.3	10.7	161	45	<0.5
09-1905	383494	525378	0.50	<0.2	5.3	204	<1	8.99	4.48	<1	18.7	11.7	211	40	<0.5
09-1897	383534	525378	0.50	<0.2	5.05	252	2	12.9	4.30	1.27	20.5	11.1	200	36	<0.5
09-1893	383564	525378	0.50	0.31	4.95	150	<1	9.06	3.73	2.17	20.3	11.8	215	42	0.53
09-1889	383574	525378	0.50	0.25	5.66	213	<1	12.6	6.55	<1	23.2	13.1	197	49	0.6
09-1885	383594	525378	0.50	0.32	5.95	156	1	8.77	3.65	1.5	22.4	12.6	212	40	0.53
09-1923	383614	525378	0.50	<0.2	5.65	198	2	10.8	6.95	1.57	25.8	14.4	201	45	0.53
09-1925	383624	525378	0.50	0.27	8.27	135	2	14.4	7.15	1.48	23.2	13.1	191	48	0.65
09-1927	383644	525378	0.50	0.28	5.93	230	2	12.4	4.20	1.61	23.8	12.8	203	41	<0.5
09-1929	383664	525378	0.50	0.31	5.99	237	<1	9.71	3.35	1.83	28	15.6	228	45	0.53
09-1931	383684	525378	0.50	0.45	7.03	210	2	12.4	5.95	1.84	27.8	16	216	52	0.86
09-1933	383704	525378	0.50	0.36	6.24	218	<1	12.6	4.40	1.58	23.9	13	211	45	0.53
09-1935	383724	525378	0.50	0.34	7.16	198	<1	14.4	4.20	2.02	26.8	15.5	221	43	<0.5
09-1937	383744	525378	0.50	<0.2	5.36	219	<1	7.92	3.10	1.66	22.5	12.7	211	37	0.53
09-1939	383764	525378	0.50	0.27	7.6	243	3	10.9	5.65	<1	21.7	12	195	38	0.54
09-1941	383784	525378	0.50	0.25	8.58	282	<1	11.2	6.50	1.28	22.6	12.3	197	42	0.53
09-1943	383824	525378	0.50	<0.2	6.37	174	<1	9.95	4.48	1.73	22.5	11.8	201	40	<0.5
09-1945	383864	525378	0.50	nd	nd	nd	<1	nd	5.35	nd	nd	nd	nd	38	nd
Sample	total Au	Fe	Hf	La	Pb	Lu	Mg	Mn	Na	Ni	K	Rb	Sm	Sc	Sr
09-1921	10.6	2.49	2.11	11.3	6	<0.2	0.77	290	0.371	74	0.48	24.2	2.06	7.92	96
09-1919	6.8	2.45	1.71	9.87	7	<0.2	0.58	271	0.325	66	0.75	24.8	1.78	7.29	89
09-1913	13.9	1.82	1.48	8.76	3	<0.2	1.05	198	0.437	53	<0.2	20.7	1.61	5.9	142
09-1905	7.5	2.36	1.96	10.5	7	<0.2	0.52	265	0.318	71	0.67	21.9	1.81	7.58	73
09-1897	8.5	2.26	2.11	10.3	5	<0.2	0.60	247	0.413	65	0.55	33.1	1.82	7.25	79
09-1893	8.0	2.52	2.1	11	7	<0.2	0.54	276	0.348	69	<0.2	<20	1.93	7.58	68
09-1889	5.6	2.4	1.65	11.8	3	<0.2	0.75	302	0.449	77	0.35	30.2	2.1	7.97	90
09-1885	5.8	2.65	1.84	11.9	4	<0.2	0.66	303	0.371	74	0.35	22	2.07	8.18	65
09-1923	8.9	2.5	2.01	12.9	5	<0.2	0.88	350	0.373	79	0.52	20.8	2.36	8.11	96
09-1925	16.6	2.29	1.89	11.8	6	<0.2	1.11	256	0.466	76	0.66	22.8	2.18	7.92	102
09-1927	5.8	2.42	2.12	11.7	4	<0.2	0.86	299	0.378	79	0.48	25.8	2.16	8.34	78
09-1929	9.8	2.9	2.35	15.2	9	<0.2	0.44	401	0.472	89	0.62	38	2.73	9.94	62
09-1931	10.6	2.68	2.3	15.3	9	<0.2	0.83	369	0.445	91	0.7	32.7	2.82	10.1	85
09-1933	6.8	2.54	2.21	11.9	5	<0.2	0.87	323	0.438	70	0.65	26.6	2.24	8	83
09-1935	12.4	2.82	2.32	13.6	5	<0.2	0.78	365	0.407	78	0.62	31.5	2.49	9.31	82
09-1937	6.3	2.45	2.22	12.2	5	<0.2	0.62	339	0.358	70	0.61	27.1	2.2	8.08	67
09-1939	10.4	2.43	2.13	11.1	5	<0.2	1.10	303	0.44	65	0.53	28.2	2.04	7.41	109
09-1941	8.9	2.3	2.07	12.1	5	<0.2	1.14	272	0.431	73	0.65	29.8	2.17	7.94	113
09-1943	8.8	2.47	2.02	11.1	6	<0.2	0.92	299	0.389	69	0.4	26.1	2.1	7.49	105
09-1945	6.7	nd	nd	nd	5	nd	0.12	301	nd	64	nd	nd	nd	nd	124

**Table A13.1: Elemental abundances at Argo for 0-1m material.
Majors are in %, traces in ppm and Au in ppb.
For all samples, Ir(20ppb), Mo(5ppm), Se(5ppm) and Ag(5ppm) were below detection (in brackets).
nd not determined.**

Sample	Ta	Th	TiO ₂	U	W	Yb	Zn	Zr	Salinity	water Au	iodide Au	cyanide Au
09-1921	<1	5.2	0.31	<2	<2	0.96	39	76	2.43	1.192	5.64	1.48
09-1919	<1	4.83	0.3	<2	<2	0.84	53	71	2.05	0.792	3.08	2.736
09-1913	<1	4.05	0.24	2.32	<2	0.81	26	54	3.04	0.96	4.92	2.108
09-1905	<1	4.99	0.34	<2	<2	0.93	38	74	2.72	1.1	4.68	2.148
09-1897	<1	5.21	0.31	<2	<2	0.86	37	74	6.83	0.848	4.32	1.532
09-1893	<1	5.3	0.33	<2	<2	0.97	40	77	1.88	0.984	4	1.328
09-1889	1.05	5.31	0.32	<2	<2	0.97	39	75	3.48	1.128	5.2	1.44
09-1885	<1	5.53	0.34	<2	<2	1	39	76	2.44	1.284	5.28	2.12
09-1923	<1	5.45	0.33	<2	<2	1.21	42	74	2.45	1.016	3.56	1.84
09-1925	<1	5.29	0.31	<2	<2	1.05	37	69	3.08	1.516	5.56	2.276
09-1927	1.18	5.65	0.34	<2	<2	1.04	39	76	3.14	1.128	3.956	1.776
09-1929	<1	6.19	0.38	<2	<2	1.27	44	86	3.60	1.472	6.16	0.948
09-1931	<1	6.54	0.37	<2	<2	1.3	45	79	2.75	1.4	5.12	1.668
09-1933	<1	5.56	0.32	<2	<2	1.06	37	72	3.31	1.148	3.7	1.752
09-1935	<1	6.1	0.35	<2	<2	1.18	41	86	2.76	0.76	4.12	1.532
09-1937	<1	5.59	0.36	<2	<2	1.03	39	81	2.54	1.26	3.684	1.604
09-1939	<1	4.94	0.31	<2	<2	1.03	32	73	3.15	1.348	4.4	1.56
09-1941	<1	5.33	0.32	<2	<2	0.95	33	26	2.67	1.44	4.84	2.16
09-1943	<1	5.24	0.31	<2	<2	1.08	32	71	2.67	1.288	3.912	1.704
09-1945	nd	nd	0.3	nd	nd	nd	34	82	3.09	1.192	2.892	1.868

Table A13.1 (continued).

Sample Id	Sample	Hole ID	Easting	Northing	Depth	Type	Al2O3
a	09-1585	TD 3489	383420	525800	9-10	mottles	8.669
b	09-1666/67	TD 3798	383520	525880	22-24	pisoliths	3.543
c	09-1591	TD 3489	383420	525800	26.5	lignitic	nd
d	09-1590	TD 3489	383420	525800	25.5	buff/cream clay and grey lignitic material	nd
e	09-1486	TD 3676	383580	525840	3-4	mottles	nd
f	09-1623/24	TD 3827	383525	525620	5-7	mottles	4.469
g	09-1625/26	TD 3827	383525	525620	7-9	mottles	6.184
h	09-1629/30	TD 3827	383525	525620	11-13	mottles	6.478
i	09-1655	TD 3827	383525	525620	37.5	lignitic	nd
j	09-1658	TD 3827	383525	525620	40.5	lignitic	nd
k	09-1657	TD 3827	383525	525620	39.5	pale grey clay with some lignitic material	nd
l	09-1661/62	TD 3827	383525	525620	50-52	pisoliths	2.64
m	09-2298	TD 3718	383594	525620	5.5	ferruginous silicified clay	nd
n	09-2300	TD 3718	383594	525620	8.5	Fe-segregations	nd
o	09-2303	TD 3718	383594	525620	21.5	shaly clay	nd
1	09-1671	TD 3798	383520	525880	72.5	blue-grey unweathered rock	nd
2	09-1610	TD 3676	383580	525840	32.5	khaki clay	nd
3	09-1490	TD 3676	383580	525840	41-42	Fe saprolite	nd
4	09-1670	TD 3798	383520	525880	52.5	green-grey clay partially weathered	nd
5	09-1613	TD 3676	383580	525840	43.5	green/grey clay	nd
6	09-1611/12	TD 3676	383580	525840	33-34/42-43	Fe saprolite	7.84
14	09-2323	TD 3718	383594	525620	62.8	saprolite with quartz veins	nd
7	09-1603	TD 3582	383620	525580	32.5	red clay	nd
8	09-1665	TD 3827	383525	525620	108.5	unweathered rock (grey) with quartz	nd
10	09-1607	TD 3582	383620	525580	41.5	partially weathered rock- quartz veins	nd
9	09-1602	TD 3582	383620	525580	31.5	cream/yellow clay with quartz	nd
12	09-2314	TD 3718	383594	525620	38.5	pale saprolite with some quartz	nd
13	09-2319	TD 3718	383594	525620	52.5	pale saprolite - chloritic	nd
11	09-2248	TD 4103	383995	525340	67.5	lignite/sands	nd

Table A13-2: Elemental abundances at Argo for regolith and bedrock samples.

Majors are in %, traces in ppm and Au in ppb.

For all samples, Ir(20ppb) and Se(5ppm) were below detection (in brackets).

nd not determined.

Sample Id	CaO	Fe	K	MgO	Mn	Na	P2O5	S	SiO2	TiO2	Ag	As	Au	Ba	Bi	Br	Ce	
a	0.12	26.19	0.39	0.54	333	0.21	0.117	770	42.04	0.436	<5	115	7.3	701	nd	3.31	9.18	
b	0.02	46.48	0.01	0.32	5391	0.17	0.111	1480	12.03	0.226	<5	66.7	<5	6	nd	9.78	106	
c	nd	1.68	<0.2	nd	98	1.17	nd	nd	nd	0.43	<5	6.48	25.3	<100	2	21.4	39.8	
d	nd	1.15	0.39	nd	137	0.91	nd	nd	nd	0.64	<5	4.92	85.3	<100	<1	13	32.5	
e	nd	30.50	<0.2	nd	nd	0.09	nd	nd	nd	nd	<5	154	<5	694	nd	5.13	5.51	
f	0.08	21.04	0.22	0.55	287	0.26	0.026	1130	58.27	0.59	<5	70	5.1	259	nd	11.8	6.67	
g	0.04	22.65	0.31	0.41	248	0.16	0.069	1260	53.41	0.363	<5	71.2	<5	403	nd	5.23	6.26	
h	0.02	24.00	0.31	0.4	256	0.14	0.078	1040	50.01	0.326	<5	70.8	<5	346	nd	3.05	5.33	
i	nd	3.33	<0.2	nd	213	1.40	nd	nd	nd	1.11	<5	139	229	124	<1	36.7	23.3	
j	nd	1.59	<0.2	nd	175	2.10	nd	nd	nd	0.66	<5	75.1	28.1	157	1	44.8	16	
k	nd	0.96	<0.2	nd	80	1.93	nd	nd	nd	0.49	<5	9.75	66.5	<100	2	40.8	18.9	
l	0.85	41.29	0.07	0.63	2587	0.08	0.008	4090	5.09	0.241	<5	35.1	100	5	nd	<2	4.21	
m	nd	14.2	0.27	nd	251	0.42	nd	nd	nd	0.67	<5	48.3	<5	263	2	14.5	12.6	
n	nd	10.8	0.21	nd	128	0.10	nd	nd	nd	0.18	<5	49.9	<5	2470	0	2.44	3.59	
o	nd	0.94	0.3	nd	36	0.30	nd	nd	nd	1.52	<5	3.67	<5	165	1	5.5	10.2	
1	nd	9.17	0.54	nd	1540	1.61	nd	nd	nd	0.79	<5	9.22	9.3	<100	2	4.53	11.3	
2	nd	9.25	0.71	nd	528	1.62	nd	nd	nd	0.51	<5	78.2	102	241	1	26.5	45.1	
3	0.03	28.16	0.15	0.44	73	0.13	0.110	530	37.98	1.01	<5	57.6	216	107	nd	5.18	89.4	
4	nd	8.85	<0.2	nd	778	2.25	nd	nd	nd	0.55	<5	7.41	224	<100	1	14.7	10.7	
5	nd	7.90	0.48	nd	794	1.41	nd	nd	nd	0.36	<5	9.65	227	<100	2	28.2	30.3	
6	0.02	25.54	0.27	0.43	108	0.10	0.108	480	44.70	0.97	<5	71.4	426	64	nd	4.2	50.2	
14	nd	1.15	<0.2	nd	150	0.04	nd	nd	nd	0.06	<5	51.7	1140	<100	1	<2	<2	
7	nd	2.67	1.24	nd	101	0.81	nd	nd	nd	0.38	<5	27.3	1380	348	<1	10.8	6.19	
8	nd	5.40	<0.2	nd	1276	4.65	nd	nd	nd	0.59	<5	29.4	4220	<100	<1	<2	2.26	
9	nd	4.56	0.69	nd	472	3.98	nd	nd	nd	0.4	<5	29.8	7680	<100	1	15.2	120	
10	nd	3.25	<0.2	nd	128	0.69	nd	nd	nd	0.7	<5	25.5	9880	<100	<1	7.28	8.88	
12	nd	12.40	<0.5	nd	1583	1.31	nd	nd	nd	0.72	<5	191	23200	455	0	31.2	46.1	
13	nd	8.41	<0.5	nd	2106	3.67	nd	nd	nd	0.75	<5	49.8	31000	202	1	22.9	6.86	
11	nd	1.09	<0.5	nd	nd	1.01	nd	nd	nd	nd	nd	22.9	26	351000	393	nd	24.2	23.9

Table A13.2 (continued).

Sample Id	Cl	Co	Cr	Cs	Cu	Eu	Ga	Hf	La	Lu	Mo	Ni	Pb	Rb	Sb	Sc	Sm
a	430	19.7	1650	1.1	113	<0.5	14	2.43	4.96	<0.2	<5	315	7	13	2.26	23.2	1.22
b	2510	674	500	<1	413	3.05	14	2.98	20.3	0.47	<5	545	24	3	0.5	82.2	9.1
c	nd	30	206	<1	109	2.2	nd	9.4	24.8	0.53	<1	40	17	<20	<0.2	33.5	7.19
d	nd	31.3	215	1.22	104	0.63	nd	10.3	29.3	0.36	<1	45	16	<20	0.31	20.9	3.51
e	nd	13.8	3860	<1	nd	<0.5	nd	1.91	2.6	<0.2	<5	nd	nd	<20	3.67	18.4	0.73
f	550	10.3	1990	<1	36	<0.5	8	3.09	5.15	<0.2	<5	71	7	11	1.4	8.62	0.66
g	560	12.2	1760	<1	51	<0.5	9	1.86	4.45	<0.2	<5	80	7	11	1.49	15.1	0.66
h	310	11.1	1660	1.05	51	<0.5	10	1.77	3.65	<0.2	<5	78	10	13	1.48	15.4	0.64
i	nd	410	168	<1	70	0.98	nd	5.2	16.2	<0.2	<20	978	49	<20	<0.2	9.56	3.52
j	nd	58.8	190	2.07	25	0.55	nd	5.41	13.6	<0.2	<5	143	21	<20	<0.2	12.4	2.12
k	nd	23.6	180	<1	61	0.66	nd	5.35	17.4	<0.2	<5	72	15	<20	0.23	14.6	2.45
l	650	24.9	34.1	<1	141	<0.5	4	0.71	2.2	<0.2	<5	143	1	1	0.7	28.8	0.68
m	nd	16	1390	1.64	45	<0.5	nd	3.85	14.2	<0.2	<5	82	6	<20	1.51	11.7	1.01
n	nd	5.22	518	<1	45	<0.5	nd	1.38	2.57	<0.2	<5	25	0	<20	1.69	7.64	0.36
o	nd	3.52	395	<1	20	<0.5	nd	9.08	14.4	0.31	<5	50	5	<20	0.34	20.2	1.66
1	nd	63	105	<1	41	0.9	nd	1.7	4.5	0.4	1	201	2	<20	1.7	35	2.7
2	nd	90.7	136	1.4	164	2.1	nd	1.9	15.9	0.7	<1	155	3	41	1.0	39	6.8
3	2030	214	86.5	<1	121	4.1	13	1.4	13.0	1.0	<5	153	21	3	0.5	50	11.4
4	nd	60.4	104	<1	42	0.9	nd	1.7	4.0	0.3	<1	165	3	<20	0.7	31	2.3
5	nd	462	178	5.4	568	4.1	nd	2.3	28.6	1.0	<1	261	5	42	2.3	43	13.5
6	1290	204	98.3	1.1	142	4.5	10	1.3	15.9	1.1	<5	194	12	11	0.4	37	12.7
14	nd	5.89	14.3	<1	11	<0.5	nd	<0.5	<0.5	<0.2	<5	3	5	<20	0.6	2	<0.2
7	nd	9.43	108	1.8	37	<0.5	nd	2.0	4.2	<0.2	<1	113	7	25	1.0	37	0.9
8	nd	27.9	21.7	<1	46	<0.5	nd	0.6	2.1	<0.2	2	20	5	<20	0.5	22	1.3
9	nd	83.7	41.2	2.3	107	2.6	nd	0.8	61.8	0.4	<1	99	7	48	0.4	31	10.0
10	nd	10.2	128	2.5	43	0.6	nd	2.9	5.1	0.3	<1	117	8	23	1.2	46	1.3
12	nd	151	82.8	<1	422	1.3	nd	2.1	27.8	0.4	<5	137	77	23	1.6	51	4.3
13	nd	33.3	57.3	1.1	151	0.7	nd	2.0	3.8	0.4	<5	50	4	23	2.0	32	2.2
11	nd	36.5	81.5	<1	nd	1.0	nd	<1	12.5	<0.2	<20	nd	nd	<20	<0.5	4	2.7

Table A13.2 (continued).

Sample Id	Sr	Ta	Th	U	V	W	Y	Yb	Zn	Zr
a	31	<1	18.7	<2	651	<2	6	0.94	56	99
b	8	<1	5.11	<2	380	<2	34	4.86	374	97
c	18	2.65	6.9	21.6	nd	<2	nd	3.75	45	462
d	20	<1	9.73	14.6	nd	<2	nd	2.62	33	517
e	nd	<1	20	<2	nd	<2	nd	0.54	<100	nd
f	36	<1	12.5	<2	444	<2	4	0.69	41	121
g	23	<1	14.1	<2	451	<2	3	0.53	29	80
h	17	<1	15.2	<2	469	<2	2	<0.5	34	75
i	9	1.53	2.56	16.9	nd	<2	nd	1.1	350	259
j	13	1.16	2.95	<2	nd	<2	nd	1.12	301	244
k	13	1	3.65	5.34	nd	<2	nd	1.16	62	256
l	3	<1	<0.5	<2	179	<2	4	0.63	44	10
m	59	<1	13.2	<2	nd	3.31	nd	0.94	54	138
n	61	<1	7.64	<2	nd	2.83	nd	<0.5	20	44
o	16	<1	8.45	2.01	nd	<2	nd	2.09	24	406
1	102	1.2	<0.5	<2	nd	<2	nd	2.5	170	56
2	15	1.7	0.6	<2	nd	10	nd	5.5	114	76
3	15	<1	<0.5	<2	441	<2	62	7.8	93	58
4	78	1.1	<0.5	<2	nd	<2	nd	1.9	114	52
5	9	2.7	<0.5	<2	nd	<2	nd	7.1	299	78
6	9	1.3	<0.5	<2	326	<2	63	8.5	142	46
14	5	<1	<0.5	<2	nd	<2	nd	<0.5	9	1
7	19	<1	0.9	<2	nd	27	nd	1.7	47	77
8	255	2.5	<0.5	<2	nd	21	nd	1.3	47	39
9	62	<1	<0.5	<2	nd	10	nd	3.1	120	68
10	20	<1	1.3	<2	nd	16	nd	2.4	91	126
12	13	<1	0.9	<2	nd	11	nd	3.1	161	58
13	32	<1	<0.5	<2	nd	18	nd	2.6	147	57
11	nd	<1	<2	<15	nd	<3	nd	1.2	nd	nd

Table A13.2 (continued).

Sample	Profile	Depth	moist. %	Au ppb				Sample	Profile	Depth	moist. %	Au ppb
09-1471	A	0-5cm	1.8	<5				09-1567	F	0-10cm	1.9	<5
09-1472	A	5-10cm	3.1	nd				09-1568	F	10-20cm	6.6	nd
09-1473	A	10-20cm	5.0	9.2				09-1569	F	20-30cm	9.9	16.0
09-1474	A	20-30cm	6.4	nd				09-1570	F	30-40cm	9.4	nd
09-1475	A	30-40cm	7.6	19.2				09-1571	F	40-50cm	10.8	23.1
09-1476	A	40-60cm	7.2	nd				09-1572	F	50-60cm	10.2	nd
09-1477	A	60-80cm	8.0	13.9				09-1573	F	60-70cm	9.0	19.1
09-1478	A	80-100cm	8.4	nd				09-1574	F	70-80cm	9.3	nd
09-1479	A	100-120cm	11.1	11.1				09-1575	F	80-90cm	8.6	13.2
09-1480	A	120-135cm	10.1	nd				09-1576	F	90-100cm	7.9	nd
09-1481	A	135-140cm	10.7	23.6				09-1577	F	100-120cm	10.3	14.7
09-1482	A	140-160cm	14.7	nd				09-1578	F	120-140cm	11.7	nd
								09-1579	F	140-150cm	10.6	15.1
09-1517	C	0-10cm	1.4	<5				09-1580	F	150-160cm	12.3	nd
09-1518	C	10-20cm	3.3	nd				09-1581	F	160-165cm	13.5	8.7
09-1519	C	20-30cm	10.2	20.8				09-1582	F	165-175cm	16.1	nd
09-1520	C	30-40cm	7.7	nd				09-1583	F	175-195cm	13.6	<5
09-1521	C	40-50cm	6.4	17.3								
09-1522	C	50-60cm	8.2	nd				09-1534	D	0-10cm	1.0	<5
09-1523	C	60-70cm	7.2	11.2				09-1535	D	10-20cm	5.0	<5
09-1524	C	70-80cm	8.0	nd				09-1536	D	20-30cm	8.3	nd
09-1525	C	80-90cm	7.6	11.0				09-1537	D	30-40cm	10.7	16.3
09-1526	C	90-100cm	7.7	nd				09-1538	D	40-50cm	12.4	nd
09-1527	C	100-110cm	8.2	10.2				09-1539	D	50-60cm	12.1	14.3
09-1528	C	110-120cm	8.5	nd				09-1540	D	60-70cm	5.3	nd
09-1529	C	120-140cm	7.2	11.0				09-1541	D	70-80cm	7.0	11.3
09-1530	C	140-160cm	8.9	nd				09-1542	D	80-90cm	9.3	nd
09-1531	C	155-160cm	8.1	<5				09-1543	D	90-100cm	11.0	10.6
09-1532	C	160-180cm	12.8	nd				09-1544	D	100-110cm	9.1	nd
09-1533	C	180-200cm	11.1	<5				09-1545	D	110-130cm	8.4	12.0
								09-1546	D	130-140cm	14.4	nd
Sample	Profile	Depth	moist. %	Au ppb	Ca %	Mg %		09-1547	D	140-150cm	12.6	21.2
09-1795	G	0-1m	nd	11.0	4.550	0.820		09-1548	D	150-160cm	10.9	14.0
09-1796	G	1-2m	nd	13.8	8.80	3.10		09-1549	D	160-170cm	14.3	<5
09-1797	G	2-3m	nd	6.8	1.03	0.60		09-1550	D	170-190cm	13.8	nd
09-1798	G	3-4m	nd	<5	0.110	0.180		09-1551	D	190-210cm	13.5	<5
09-1799	G	4-5m	nd	<5	0.0366	0.0950						
09-1800	G	5-6m	nd	6.0	0.3010	0.2430						
09-1843	I	0-1m	nd	10.9	4.925	0.715						
09-1844	I	1-2m	nd	15.0	7.650	0.835						
09-1845	I	2-3m	nd	<5	0.560	0.229						
09-1846	I	3-4m	nd	<5	0.146	0.2025						

Table A13.3.1: Elemental abundances at Argo for Profiles A (383580E 525830N), C (383500E 525620N), D (383610E 525580N), F (383510E 525880N), G (383620E 526030N), I (383330E 526030N). nd not determined.

Sample	Profile	Depth	moist. %	total Au	Ca %	Mg %	water Au	iodide Au	cyanide Au	org. C %
09-1493	B	0-10cm	2.1	<5	0.26	0.15	0.50	1.36	2.06	0.604
09-1494	B	10-20cm	3.2	nd	nd	nd	nd	nd	nd	nd
09-1495	B	20-30cm	5.4	18.0	8.65	1.10	1.46	5.76	10.40	0.372
09-1496	B	30-40cm	7.2	nd	nd	nd	nd	nd	nd	nd
09-1497	B	40-50cm	8.6	23.7	11.35	1.39	1.40	9.52	12.92	0.284
09-1498	B	50-60cm	8.5	nd	nd	nd	nd	nd	nd	nd
09-1499	B	60-70cm	8.7	18.6	10.90	1.33	0.97	9.60	12.16	0.176
09-1500	B	70-80cm	6.6	nd	nd	nd	nd	nd	nd	nd
09-1501	B	80-90cm	6.9	12.0	10.10	0.99	0.58	6.56	8.12	0.169
09-1502	B	90-100cm	7.3	nd	nd	nd	nd	nd	nd	nd
09-1503	B	100-110cm	7.1	12.5	10.25	0.56	0.70	7.68	9.88	0.167
09-1504	B	110-130cm	7.3	nd	nd	nd	nd	nd	nd	nd
09-1505	B	130-150cm	6.1	10.8	11.80	0.44	0.53	6.28	7.48	0.105
09-1506	B	150-170cm	6.7	9.6	9.00	0.35	nd	nd	nd	0.115
09-1507	B	170-190cm	9.8	24.0	0.07	0.17	0.55	14.96	15.68	0.156
09-1508	B	190-210cm	9.3	<5	0.05	0.01	nd	nd	nd	0.138
09-1509	B	210-230cm	8.2	<5	0.03	0.12	<0.2	<0.2	0.34	0.113
09-1510	B	230-250cm	10.4	nd	nd	nd	nd	nd	nd	nd
09-1511	B	250-270cm	13.2	<5	0.02	0.12	<0.2	<0.2	0.74	0.112
09-1512	B	270-290cm	13.7	nd	nd	nd	nd	nd	nd	nd
09-1513	B	290-310cm	16.7	<5	0.04	0.13	<0.2	0.47	0.54	0.135
09-1514	B	310-330cm	17.2	nd	nd	nd	nd	nd	nd	nd
09-1515	B	330-350cm	16.8	<5	0.03	0.14	<0.2	<0.2	0.53	0.129
09-1781	J	0 - 0.5m	nd	19.8	11.35	1.34	1.52	8.56	14.60	0.170
09-1782	J	0.5 - 1m	nd	14.9	15.55	2.38	0.93	11.04	12.28	0.206
09-1783	J	1 - 1.5m	nd	9.6	1.91	0.96	0.45	5.16	9.84	0.151
09-1784	J	1.5 - 2m	nd	<5	0.04	0.13	0.25	0.72	2.18	0.167
09-1785	J	2 - 2.5m	nd	<5	0.22	0.20	<0.2	<0.2	1.10	0.130
09-1786	J	2.5 - 3m	nd	<5	0.08	0.18	<0.2	0.36	0.52	0.141
09-1787	J	3 - 3.5m	nd	<5	0.08	0.16	<0.2	0.53	0.50	0.124
09-1788	J	3.5 - 4m	nd	<5	0.04	0.14	<0.2	0.36	0.44	0.122
09-1789	J	4 - 4.5m	nd	<5	0.04	0.14	<0.2	0.23	0.47	0.108
09-1790	J	4.5 - 5m	nd	<5	0.03	0.13	<0.2	0.25	1.13	0.115
09-1791	J	5 - 5.5m	nd	<5	0.02	0.09	<0.2	<0.2	1.03	0.089
09-1792	J	5.5 - 6m	nd	<5	0.02	0.09	<0.2	<0.2	0.57	0.104
09-1793	J	6 - 6.5m	nd	<5	0.01	0.12	<0.2	<0.2	0.65	0.091
09-1794	J	6.5 - 7m	nd	<5	0.04	0.13	<0.2	<0.2	1.26	0.127

Table A13.3.2: Elemental abundances at Argo for Profiles B (383432E 525782N) and J (383575E 525670N).

Gold analyses are in ppb.

nd not determined.

Sample	Depth	Sb	As	Ba	Br	Ce	Cs	Cr	Co	Eu	total Au	Hf	Fe	La	Lu
09-1552	0-10cm	0.39	4.65	127	11.4	25	1.6	226	14.2	0.52	<5	2.11	2.59	11.10	<0.2
09-1553	10-20cm	0.34	4.93	195	16.3	25	1.9	213	16.3	0.71	8.1	2.09	2.46	11.90	<0.2
09-1554	20-30cm	0.30	6.21	187	19.7	25	1.5	191	15.6	0.52	15.3	1.93	2.28	11.70	<0.2
09-1555	30-40cm	0.32	7.18	134	21.1	21	1.4	167	12.8	0.51	23.3	1.69	1.92	9.54	<0.2
09-1556	40-50cm	0.24	8.78	156	16.1	21	1.1	162	13.4	<0.5	22.6	1.65	1.98	9.80	<0.2
09-1557	50-60cm	0.37	11.40	236	12.0	23	<1	163	15.3	0.52	14.4	1.58	1.90	10.60	<0.2
09-1558	60-70cm	0.21	11.20	307	10.7	24	1.6	176	16.8	0.56	10.3	1.79	2.01	12.60	<0.2
09-1559	70-80cm	0.21	10.40	256	10.7	24	1.1	160	15.7	0.60	14.6	1.62	1.67	11.40	<0.2
09-1560	80-90cm	0.23	10.30	228	10.4	23	<1	157	14.8	<0.5	17.0	17.00	1.71	10.20	<0.2
09-1561	90-100cm	0.28	10.60	208	11.0	23	1.7	158	16.1	<0.5	14.5	1.59	1.67	10.90	<0.2
09-1562	100-120cm	0.25	13.10	181	10.2	29	1.1	174	19.4	0.86	17.8	1.42	1.87	12.90	<0.2
09-1563	120-140cm	0.34	14.70	259	11.9	109	1.5	213	80.2	1.68	21.7	1.95	2.17	36.40	0.32
09-1564	140-160cm	1.11	19.30	216	33.9	162	1.3	248	91.6	1.31	11.9	2.41	2.52	17.30	0.24
09-1565	160-180cm	0.33	16.00	354	43.8	12	2.3	263	10.5	<0.5	<5	2.31	2.72	7.23	<0.2
09-1566	180-200cm	0.39	14.40	837	34.9	10	2.7	299	9.7	<0.5	<5	2.67	3.10	7.35	<0.2
Sample	Mo	K	Rb	Sm	Sc	Na	Ta	Th	W	U	Yb	Zn	Ca	Mn	pH
09-1552	<5	0.54	28.7	2.14	8.12	0.45	<1	5.17	3.4	<0.5	1.07	<100	0.58	257	7.98
09-1553	<5	0.63	<5	2.21	8.13	0.51	<1	4.89	<0.5	<0.5	1.03	118	2.29	251	8.29
09-1554	<5	0.77	26.1	2.21	7.56	0.44	<1	4.99	<0.5	<0.5	0.92	<100	6.75	224	8.22
09-1555	<5	0.50	22.5	1.79	6.82	0.36	<1	4.29	<0.5	<0.5	0.83	<100	9.40	167	8.19
09-1556	<5	0.45	<5	1.81	6.70	0.33	<1	4.55	3.1	<0.5	0.92	<100	10.50	170	8.39
09-1557	<5	0.44	20.3	2.02	7.08	0.36	<1	4.51	<0.5	<0.5	0.99	<100	10.45	183	8.42
09-1558	<5	<0.2	27.6	2.34	7.24	0.35	<1	4.23	<0.5	<0.5	1.07	<100	11.35	219	8.45
09-1559	<5	<0.2	<5	2.16	6.50	0.32	<1	3.90	<0.5	<0.5	0.97	<100	14.05	180	8.40
09-1560	<5	0.65	20.5	1.87	6.39	0.35	<1	3.91	<0.5	2.3	0.86	<100	13.50	141	8.44
09-1561	<5	0.2	<5	1.96	6.65	0.39	<1	3.97	<0.5	3.3	0.86	<100	12.85	141	8.44
09-1562	<5	0.22	22.8	2.42	7.49	0.44	<1	4.19	<0.5	2.9	1.09	<100	8.85	158	8.51
09-1563	<5	0.28	31.4	6.01	9.56	0.48	1.4	5.15	<0.5	7.1	2.52	<100	5.75	242	8.36
09-1564	16	0.3	24.4	4.36	13.40	0.55	<1	6.43	<0.5	19.2	2.36	<100	0.23	217	7.74
09-1565	5.5	0.25	28.6	0.89	12.90	0.59	1.0	6.30	<0.5	6.1	0.64	108	0.13	44	7.28
09-1566	<5	1.17	33.4	0.89	13.20	0.54	<1	7.37	<0.5	3.4	0.78	<100	0.28	34	7.71
Sample	water Au	iodide Au	cyanide Au	org. C %	moist. %										
09-1552	0.236	1.388	2.62	1.160	3.0										
09-1553	0.272	2.888	5.64	0.880	5.0										
09-1554	0.496	6.76	10.72	0.463	5.8										
09-1555	0.648	9.72	15.64	0.396	7.5										
09-1556	0.728	10.56	15.56	0.345	8.1										
09-1557	0.992	10.16	12.20	0.292	6.9										
09-1558	0.852	10.36	9.88	0.142	5.9										
09-1559	0.508	7.76	10.72	0.157	4.5										
09-1560	0.56	9.52	11.44	0.130	5.3										
09-1561	0.488	9.64	12.04	0.110	6.6										
09-1562	0.528	13.16	14.76	0.112	6.9										
09-1563	0.548	17.08	17.68	0.140	7.9										
09-1564	0.36	10.36	10.64	0.186	8.5										
09-1565	0.116	0.764	1.30	0.155	12.1										
09-1566	0.152	0.34	1.58	0.130	12.0										

Table A13.3.3: Elemental abundances at Argo for Profile E (383600E 525841N).

Majors are in %, traces in ppm and Au in ppb.

For all samples, Ir(20ppb), Se(5ppm) and Ag(5ppm) were below detection (in brackets).

Sample	Type	Easting	Northing	Nearest sampling	Sb	As	Ba	Br	Ce	Cr	Co	Eu	Au	Hf
09-1672	Eucalypt	383520	525922	Prof F	0.04	<0.1	<20	15.20	<0.2	1.1	<0.2	<0.05	<0.5	<0.1
09-1673	Eremophila	383520	525922	Prof F	<0.02	<0.1	<20	29.40	0.44	1.2	0.21	<0.05	<0.5	<0.1
09-1674	mull	383520	525922	Prof F	0.03	0.44	<20	7.15	2.40	13.8	1.43	0.07	2.2	0.18
09-1675	Eucalypt	383432	525777	Prof B	<0.02	<0.1	<20	16.40	<0.2	0.7	<0.2	<0.05	<0.5	<0.1
09-1676	Eremophila	383432	525777	Prof B	<0.02	<0.1	<20	36.90	<0.2	0.6	<0.2	<0.05	<0.5	<0.1
09-1677	mull	383432	525777	Prof B	0.15	0.55	<20	6.10	1.90	11.9	0.99	<0.05	1.6	0.12
09-1678	Eucalypt	383471	525640	Prof C	<0.02	<0.1	<20	13.50	<0.2	2.0	<0.2	<0.05	<0.5	<0.1
09-1679	Eremophila	383471	525640	Prof C	<0.02	<0.1	<20	39.40	0.24	2.3	<0.2	<0.05	0.5	<0.1
09-1680	mull	383471	525640	Prof C	0.04	0.60	<20	10.70	3.41	16.9	1.78	0.06	3.4	0.21
09-1681	Eucalypt	383610	525570	Prof D	<0.02	<0.1	<20	21.10	<0.2	0.9	<0.2	<0.05	<0.5	<0.1
09-1682	Eremophila	383610	525600	Prof D	<0.02	<0.1	<20	37.40	<0.2	0.8	<0.2	<0.05	<0.5	<0.1
09-1683	mull	383610	525600	Prof D	0.02	0.39	<20	6.34	2.97	14.1	1.71	0.05	1.9	0.20
09-1684	Eucalypt	383610	525600	Prof D	<0.02	<0.1	<20	16.70	<0.2	1.1	<0.2	<0.05	<0.5	<0.1
09-1685	Eucalypt	383600	525857	Prof E	<0.02	<0.1	<20	27.00	0.26	1.4	<0.2	<0.05	<0.5	<0.1
09-1686	Eremophila	383600	525857	Prof E	<0.02	<0.1	<20	26.10	0.28	1.1	0.20	<0.05	0.5	<0.1
09-1687	mull	383600	525857	Prof E	0.03	0.54	21.8	8.70	4.34	17.5	2.38	0.08	2.3	0.22
09-1688	<i>E. lesouefii</i>	383588	525840	Prof E	<0.02	0.12	<20	24.40	0.27	2.8	<0.2	<0.05	<0.5	<0.1
09-1689	mull	383588	525840	Prof E	0.03	0.58	29.2	8.35	3.55	18.5	1.82	0.06	4.9	0.25
Sample	Fe	La	Lu	K	Sm	Sc	Na	Th	W	Yb				
09-1672	<0.01	0.06	<0.01	0.36	0.02	0.03	0.42	<0.1	0.26	<0.01				
09-1673	0.02	0.12	<0.01	1.28	0.02	0.08	0.03	0.10	<0.1	0.01				
09-1674	0.16	1.13	0.01	0.08	0.21	0.67	0.09	0.45	0.50	0.10				
09-1675	<0.01	0.05	<0.01	0.42	0.01	0.02	0.39	<0.1	<0.1	0.01				
09-1676	<0.01	0.03	<0.01	1.08	0.01	0.02	0.03	<0.1	<0.1	<0.01				
09-1677	0.15	0.80	<0.01	0.09	0.15	0.49	0.10	0.33	0.27	0.06				
09-1678	<0.01	0.05	<0.01	0.33	0.02	0.04	0.28	<0.1	0.39	<0.01				
09-1679	0.02	0.11	<0.01	1.17	0.02	0.07	0.03	0.11	0.36	0.01				
09-1680	0.20	1.55	0.02	0.11	0.29	0.84	0.07	0.59	0.26	0.13				
09-1681	<0.01	0.03	<0.01	0.53	<0.01	0.01	0.58	<0.1	0.36	<0.01				
09-1682	0.01	0.07	<0.01	1.35	0.02	0.05	0.03	<0.1	<0.1	<0.01				
09-1683	0.16	1.27	0.01	0.10	0.22	0.69	0.08	0.46	0.31	0.10				
09-1684	<0.01	0.03	<0.01	0.46	0.01	0.02	0.51	<0.1	0.26	<0.01				
09-1685	<0.01	0.09	<0.01	0.41	0.02	0.05	0.92	<0.1	0.46	<0.01				
09-1686	0.02	0.11	<0.01	1.18	0.02	0.06	0.02	<0.1	<0.1	<0.01				
09-1687	0.22	1.64	0.02	0.10	0.30	0.97	0.09	0.61	0.26	0.15				
09-1688	0.01	0.09	<0.01	0.47	0.02	0.06	0.44	<0.1	0.56	0.01				
09-1689	0.21	1.53	0.02	0.08	0.29	0.85	0.06	0.62	0.31	0.13				

Table A13.4: Elemental abundances at Argo for vegetation samples.
Majors are in %, traces in ppm and Au in ppb.

Sample	Easting	Northing	Depth	Au ppb	Ca %	Mg %
09-1795	383620	526030	0-1m	11.0	4.55	0.82
09-1796	383620	526030	1-2m	13.8	8.80	3.10
09-1797	383620	526030	2-3m	6.8	1.03	0.60
09-1798	383620	526030	3-4m	<5	0.11	0.18
09-1799	383620	526030	4-5m	<5	0.04	0.10
09-1800	383620	526030	5-6m	6.0	0.30	0.24
09-1805	383590	526030	0-1m	9.9	3.48	0.58
09-1813	383550	526030	0-1m	11.9	4.18	0.57
09-1814	383550	526030	1-2m	8.2	5.05	1.38
09-1817	383530	526030	0-1m	10.8	0.06	0.01
09-1825	383490	526030	0-1m	9.7	6.50	0.93
09-1826	383490	526030	1-2m	13.1	9.85	1.50
09-1831	383450	526030	0-1m	11.2	4.63	0.94
09-1835	383410	526030	0-1m	9.8	6.70	1.15
09-1839	383370	526030	0-1m	11.7	3.05	0.44
09-1843	383330	526030	0-1m	10.9	4.93	0.72
09-1844	383330	526030	1-2m	15.0	7.65	0.84
09-1845	383330	526030	2-3m	<5	0.56	0.23
09-1846	383330	526030	3-4m	<5	0.15	0.20
09-1847	383630	526030	0-1m	14.1	4.18	0.93
09-1851	383650	526030	0-1m	14.5	2.58	0.55
09-1852	383650	526030	1-2m	11.3	7.90	2.44
09-1855	383670	526030	0-1m	12.5	5.25	1.03
09-1859	383690	526030	0-1m	12.7	2.11	0.56
09-1860	383690	526030	1-2m	12.0	8.30	2.85
09-1863	383710	526030	0-1m	12.1	4.43	0.09
09-1867	383740	526030	0-1m	10.0	3.40	0.73
09-1868	383740	526030	1-2m	13.9	8.45	3.23
09-1871	383760	526030	0-1m	11.0	2.30	0.40
09-1873	383771	526046	0-1m	9.6	1.71	0.26
09-1874	383771	526046	1-2m	10.7	4.70	1.04
09-1876	383782	526063	1-2m	13.8	5.80	1.56
09-1879	383805	526096	0-1m	9.2	2.32	0.43
09-1883	383827	526129	0-1m	10.0	2.98	0.27
09-1884	383827	526129	1-2m	20.4	8.20	1.91
09-1885	383594	525378	0-1m	5.8	3.65	0.66
09-1889	383574	525378	0-1m	5.6	6.55	0.75
09-1890	383574	525378	1-2m	11.3	9.45	0.72
09-1893	383554	525378	0-1m	8.0	3.73	0.54
09-1897	383534	525378	0-1m	8.5	4.30	0.60
09-1898	383534	525378	1-2m	9.6	8.10	0.56
09-1905	383494	525378	0-1m	7.5	4.48	0.52
09-1906	383494	525378	1-2m	10.6	9.35	0.47
09-1913	383434	525378	0-1m	13.9	12.10	1.05
09-1914	383434	525378	1-2m	11.3	8.30	0.47
09-1917	383404	525378	0-1m	11.6	10.90	0.73
09-1919	383364	525378	0-1m	6.8	6.35	0.58
09-1920	383364	525378	1-2m	13.7	11.50	0.53
09-1921	383324	525378	0-1m	10.6	5.75	0.77
09-1922	383324	525378	1-2m	8.7	10.30	0.51
09-1923	383614	525378	0-1m	8.9	6.95	0.88
09-1925	383624	525378	0-1m	16.6	7.15	1.11
09-1926	383624	525378	1-2m	8.6	9.70	1.29
09-1927	383644	525378	0-1m	5.8	4.20	0.86
09-1929	383664	525378	0-1m	9.8	3.35	0.44
09-1931	383684	525378	0-1m	10.6	5.95	0.83
09-1933	383704	525378	0-1m	6.8	4.40	0.87
09-1934	383704	525378	1-2m	13.9	8.20	2.65
09-1935	383724	525378	0-1m	12.4	4.20	0.78
09-1937	383744	525378	0-1m	6.3	3.10	0.62
09-1939	383764	525378	0-1m	10.4	5.65	1.10
09-1941	383784	525378	0-1m	8.9	6.50	1.14
09-1943	383824	525378	0-1m	8.8	4.48	0.92
09-1944	383824	525378	1-2m	6.3	8.95	3.10
09-1945	383864	525378	0-1m	6.7	5.35	0.12
09-1946	383864	525378	1-2m	9.4	4.60	2.27

Table A13.5: Gold, Ca, Mg abundance at Argo for samples collected by auger.