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# Impacts by acidic metals-rich groundwater on the hyporheic zone of an intermontane stream

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# Impacts by acidic, metals-rich groundwater on the hyporheic zone of an intermontane stream

by

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Impacts by acidic, metals-rich groundwater on the hyporheic zone of an intermontane stream.

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The hyporheic zone has been gaining ecological recognition as an important site of nutrient cycling and habitat, but very little is known about metal behavior within the zone. This understanding is important for assessing the environmental imacts of mining and for designing remediation strategies for riparian systems. Metal behavior in the hyporheic zone was studied at Silver Bow Creek, MT, where anoxic and acidic (pH=3-5) groundwater with high dissolved metal concentrations travels through a floodplain heavily contaminated with mining wastes and comes into contact with neutral (pH=7-8), oxic, and relatively low metal concentration surface water. A shallow hyporheic zone underlies the streambed where physical mixing and chemical transformation of these waters was found to occur.

Sampling the dissolved (<0.45 $\mu$m) metal and As concentrations in surface water, hyporheic zone water (<30 cm below and lateral to the streambed), and adjacent groundwater was conducted along a 1 Km stretch of the creek at three sites with variable surface water to groundwater flow direction relationships. Results of water analyses indicated that water in the shallow subsurface had a mean pH of 6, and mean concentrations of most metals were generally inbetween mean surface and groundwater concentrations. The highest levels of dissolved As at the site were found in the shallow hyporheic zone, indicating that the hyporheic zone is a distinct geochemical environment. Conservative elements (Ca and Mg) allowed for the calculation of physical mixing ratios, which indicated that 50% of the hyporheic zone samples contained >20% groundwater. All other metals were found to be acting non-conservatively in the hyporheic zone.

The solid phase was examined by setting into the streambed a series of slotted plastic columns filled with 2mm aluminosilicate beads which collected metal precipitates over the course of 52 days. Upon removal, dense bands of iron oxide precipitates were found on many of the bead columns at the surface water- substrate boundary. These precipitation zones, commonly only 1-5 cm thick, are interpreted to be products of metals in the groundwater coming out of solution upon mixing with higher pH and more oxic surface water. The thickness of the mixing zone appeared to be controlled by the the relationship of general groundwater and surface water flow directions, as well as by small scale variability in the permeability of streambed and floodplain sediments. The implication of these processes is that metals transported in solution by the groundwater precipitate onto the hyporheic zone and streambed sediments, thereby contaminating the hyporheic zone and contributing to the surface water metal load.

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# Introduction

The hyporheic zone has been defined broadly in the literature as the saturated subsurface area connected to a stream channel which shares with it some biological, chemical, or physical characteristics [*Williams and Hynes*, 1974; *Triska et al.*, 1989; *Valett et al., 1990; Hendricks and White, 1991*; *Valett et al.*, 1993] (Figure 1). A more detailed and universal definition does not exist, because researchers have not used interdisciplinary criteria when proposing definitions of the hyporheic zone [see *White*, 1993]. Nonetheless, this loosely-defined zone has rapidly been gaining recognition as both a key ecological zone crucial to the health of stream biota, as well as a major site of exchange, metabolism, and storage of particulates and solutes [*Grimm and Fisher*, 1984; *Bencala*, 1984; *Stanford and Ward*, 1988; *Triska et al.*, 1989; *Valett*, 1993]. Much progress has been made in the last couple of decades on characterizing many of the biological processes in this zone, yet relatively little has been made in the understanding of the physical and chemical dynamics of hyporheic zones where surface waters and adjacent groundwaters mix [*Bencala*, 1993.] In particular, there is a marked lack of understanding about contaminant storage and exchange through hyporheic zones.

Most studies on the physical and chemical dynamics of the hyporheic zone have concentrated on its connectivity with surface water, and they have generally concluded that the two interact extensively and that hyporheic zones play a major role in storage of stream solutes [*Bencala et al.*, 1984; *Munn and Meyer*, 1988; *Triska et al.*, 1989; *Valett et al.*, 1990; *Castro and Hornberger*, 1991]. The exchange of nitrogen, oxygen, and organic material between surface water and hyporheic zones has been documented, and many authors contend that hyporheic zones are important sites for nutrient cycling [*Grimm and Fisher*, 1984; *Jacobs et al.*, 1988; *Hendricks and White*, 1991; *Findlay et al.*, 1993;

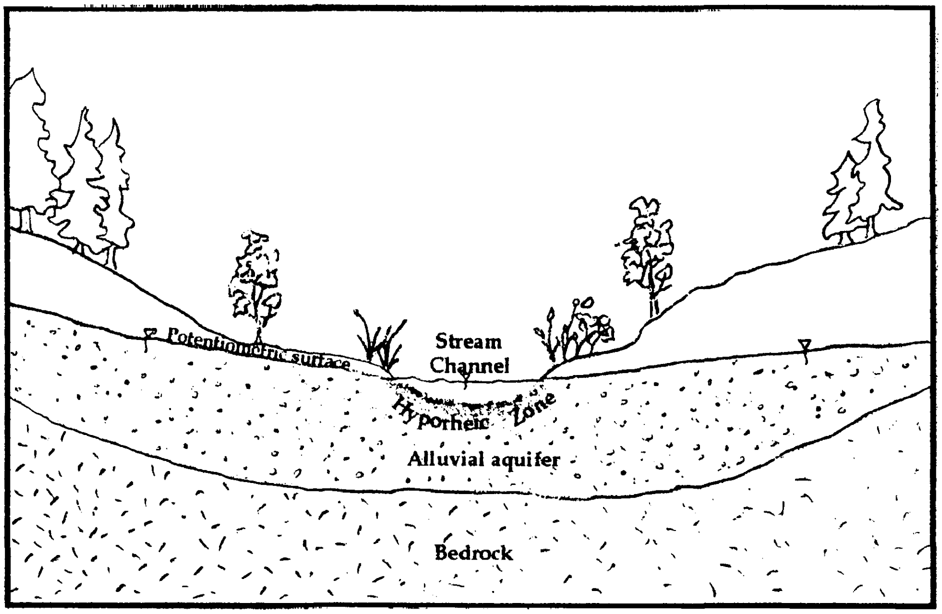



Figure 1: Schematic illustration of the location of the hyporheic zone

*Holmes et al.*, 1994; *Findlay and Sobczak*, 1996; *Pusch*, 1996]. In addition, studies of biologic communities in the hyporheic zones have shown they are important habitats for many macroinvertebrates [*Williams and Hynes*, 1974; *Coleman and Hynes*, 1980; *Stanford and Ward*, 1988; *Williams*, 1989] and are sought by fish for spawning [*Wickett*, 1954; *Hansen*, 1975; *Johnson*, 1980]. A widely-accepted notion that has emerged from this research is that hyporheic animals, organic matter, and solutes are capable of extensive lateral and vertical movement and transport constrained by specific physical and chemical characteristics of each hyporheic environment.

Less is known about the interaction between groundwater and hyporheic zones. Some studies have documented the release of nitrogen and organic matter from groundwater into hyporheic and surface waters [*Coats et al.*, 1976; *Wallis et al.*, 1981; *Rutherford and Hynes, 1987; Valett et al.*, 1990;*Triska et al.*, 1993;*Wondzell and Swanson*, 1996]. Other studies have illustrated the volumetric importance of groundwater contributions to streamflow generation during storms [*Freeze*, 1972; *Sklash and Farvolden*, 1979; *Gillham*, 1984; *Blowes and Gillham*, 1988; *Novakowski and Gillham*, 1988; *Squillace*, 1996]. They found that groundwater contributes a much larger component of storm runoff than commonly acknowledged, suggesting that groundwater, surface water, and hyporheic zone interactions are dynamic and transient.

Many rivers and adjacent aquifers are contaminated with heavy metals from mining wastes, and the transport of these contaminants through hyporheic zones needs to be explored and understood. This understanding is crucial for accurately defining routes of contaminant transport targeted in riparian remediation designs. To date, there has been no published research on the geochemistry of metals and arsenic in groundwater entering the hyporheic zone and surface water from groundwater. Instead, most studies on metal contamination have concentrated on transport of metals either through groundwater, surface water, or stream sediments, and not on interrelating these components in the hyporheic zone. Benner et al. [1995] discussed the behavior of metals in the hyporheic zone at one transect across Silver Bow Creek, MT, the site of this study (Figure 2). Yet their study focussed only on surface water infiltration into the hyporheic zone and was spatially and temporally limited.

The goal of this research was to determine how metals-contaminated groundwater affects the geochemistry of the hyporheic zone and surface water in an intermontane stream. In this paper, the hyporheic zone is defined as the shallow area surrounding the streambed (typically <30 cm below the streambed surface) where the surface water and groundwater physically interact to form a chemically defined transition zone. The examination of both the physical controls on mixing together with the resultant chemical reactions was conducted using geochemical analyses of dissolved and solid phases along a representative reach of the stream during variably sized flow events. This research proposes that a dynamic and spatially complex hyporheic zone exists where dissolved metals from adjacent groundwater are transferred into the solid phase, continually contributing to the streambed's metal load and contaminating the hyporheic zone upon which many aquatic organisms depend in healthy streams.

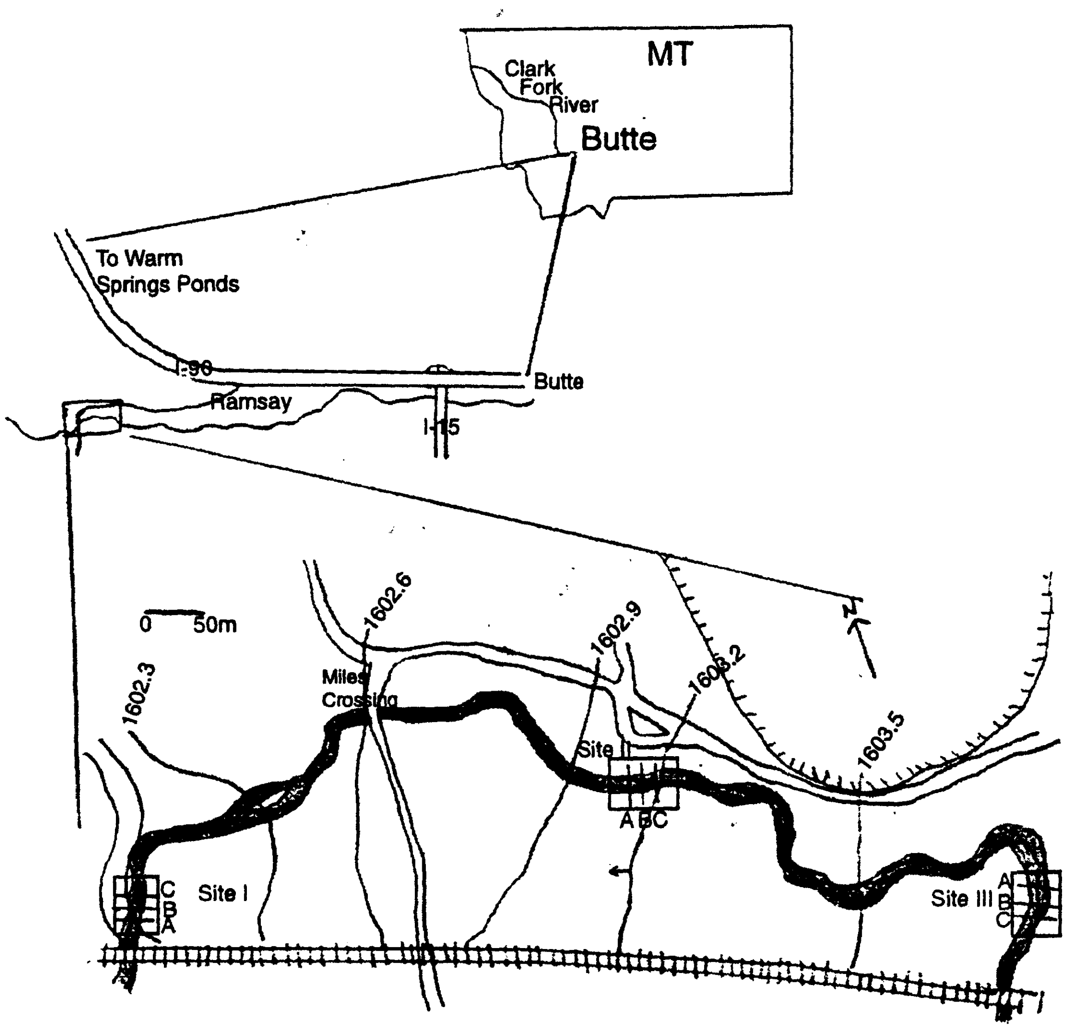



Figure 2: Location map of study area. Map of study area shows the three research sites, with the locations of transects A,B, and C at each site. Potentiometric lines on study area map are from Shay [1997].

## Site description:

Silver Bow Creek, at the headwaters of the Clark Fork River in western Montana, was chosen to study metal transport through the hyporheic zone due to the large chemical differences between the acidic, anoxic, and metal-rich groundwater and the relatively dilute, oxic, and neutral-pH surface water [*Benner et al.*, 1995]. The abrupt boundaries between these waters in many portions of this system provide optimal conditions for detecting the small-scale processes occuring on either side of the surface water-groundwater interface. Also, the stream exhibits strong morphological variations, producing a variety of physical relationships between surface water and groundwater flow directions, which are thought to influence the extent of mixing. In addition, the large extent of metal contamination in Silver Bow Creek and its floodplain makes it a useful site for comparison to other systems heavily impacted by mining wastes.

The source of contamination at Silver Bow Creek is over a century of large scale mining in Butte, MT, located 18 km upstream from the study site. The mining resulted in the release of over 100 million metric tons of mining wastes into the creek [*Andrews*, 1987], much of which was carried downstream by major floods at the turn of the century and became deposited in wide stretches of the floodplain [*CH2M Hill Inc.*, 1989; *Nimick and Moore*, 1991]. Along the study site portion of the creek, an up to 2 m thick and several hundred meter wide sequence of metal-rich mine tailings intermixed with sediments make up the top portion of the river's floodplain [*Benner et al.*, 1995; *Lucy*, 1996; *Shay*, 1997]. These tailings have highly elevated levels of arsenic, cadmium, copper, iron, lead, manganese, and zinc, which have been mobilized through time and have contaminated the underlying pre-mining floodplain sediments as well [*Shay*, 1997].

The groundwater is acidic and contaminated with dissolved metals due to oxidation of metal-sulfide minerals in the floodplain aquifer and vadose zone [*Nordstom*, 1982; *Moore and Luoma*, 1990; *Lucy*, 1996]. Benner et al. [1995] found the groundwater to have on average a pH of 4.2-4.9, an alkalinity of 0 meq/l, dissolved oxygen levels less than 1 mg/l, sulfate levels of 1500 mg/l, and metal concentrations of about 30 mg/l Al, 140 mg/l Ca, 20 mg/l, 0.55 mg/l Cd, Cu, 370 mg/l Fe, 35 mg/l Mg, and 54 mg/l Zn. Shay [1997] described in more detail the geochemistry of the aquifer and the relationship of groundwater contamination to the stratigraphy of the floodplain sediments. He found the groundwater chemistry to be extremely spatially heterogeneous, both laterally and with depth, and that zones of highly contaminated groundwater generally correlated with areas within the floodplain where contaminated sediments are continually or seasonally saturated by the groundwater or capillary fringe.

The water table has been found to lie between 0 to 1.5 m below land surface, depending on location and temporal variability, and is hydrologically connected with the creek [*Shay*, 1997]. Water level measurements taken across the site indicate that general groundwater movement is from east to west [*Smart*, 1995; *Shay*, 1997]. Although the surface water is significantly less contaminated than the groundwater, it is devoid of aquatic life with the exception of certain microorganisms [*Wielinga et al.*, 1994], algae, and an extremely depauperate aquatic insect population. During major precipitation events, it becomes particularly contaminated due to input from the floodplain [*Lucy*, 1996].

# Methods

Three sites along the 1 km study area were selected following preliminary measurements of temperature, pH, and specific conductance used to approximate locations of groundwater inflow versus surface water infiltration [*Sillman et al.*, 1995; *White et al.*, 1987; *Jones et al.*, 1994] (Figure 2). Two of the sites were located where groundwater flowed approximately perpendicular to the surface water, thereby presumably forming a flow-through system like that caracterized by Benner et al. [1995]. The third site was located in an area where the surface water and groundwater flow directions were approximately parallel. Each site was divided into three transects, each about 5 m apart. Detailed streambed topographic maps were constructed at each site. These maps were used to correlate the chemistry of the subsurface water with streambed topography and grain size.

Two shallow piezometers were installed several meters away from the creek banks. Water levels were measured in wells during every sampling session using an electric tape. Concurrent collection of floodplain piezometric data by Shay [1997] futher aided in the making of potentiometric maps of the area. These surveyed instruments enabled the measurement and comparison of water levels on both sides of the stream relative to each other and to surface water stage.

*Water sampling:*

Each transect was instrumented with 5 subsurface water access tubes (1 cm OD polyethelene tubing), which were used for sampling the pore water below the streambed surface and in the adjacent banks and floodplain (Figure 3). Small diameter, flexible tubing was used instead of open PVC wells so that sample exposure to air was minimized. The lower 10 cm of the tubes were perforated and covered with a fine nylon screen. Two of the tubes were placed into the floodplain approximately 1 m away from the stream bank,

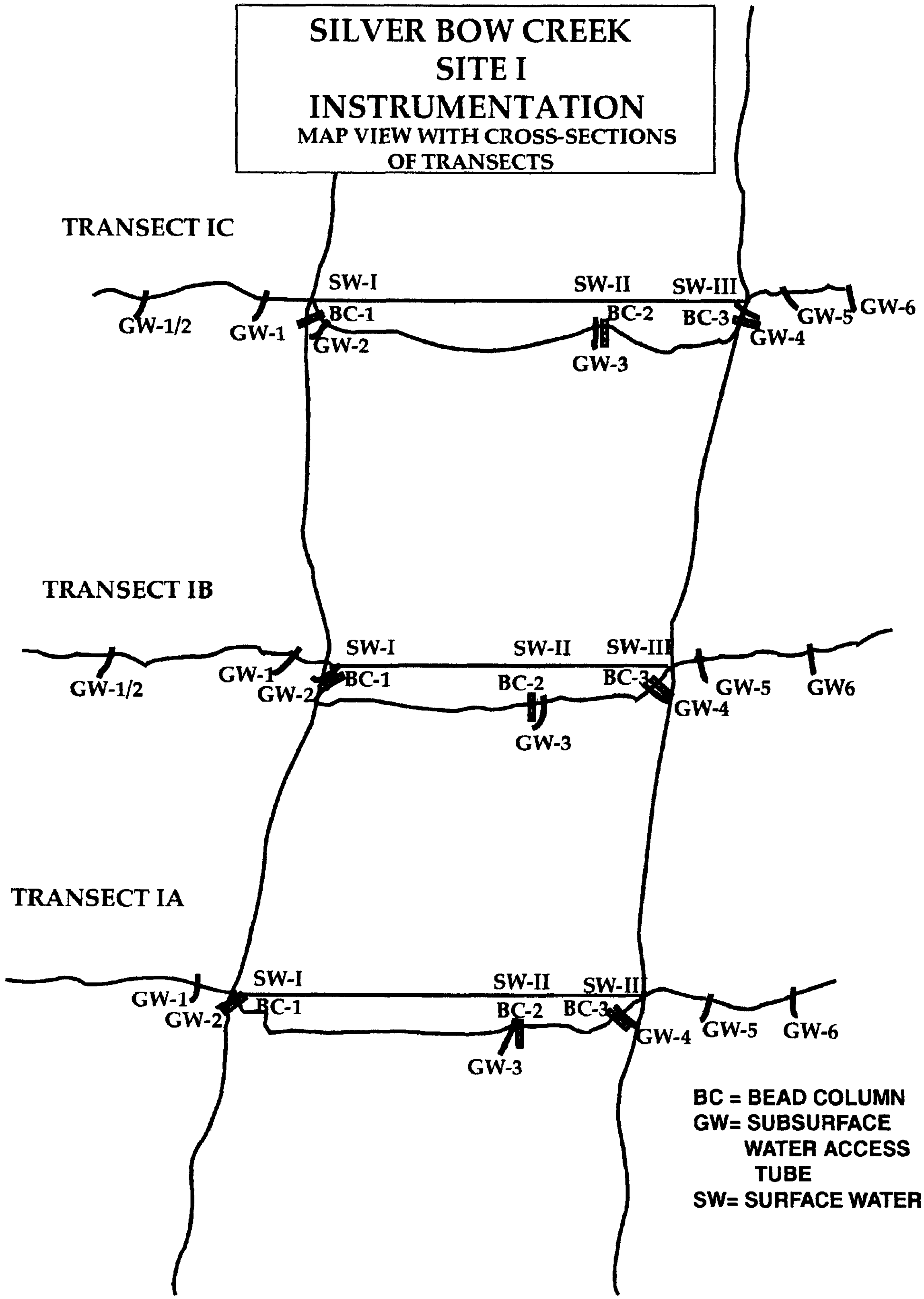



*Figure3: Instrumentation map*

0 m 2 m

another two were submerged and set into the banks of the stream, and one tube was placed into the streambed at the center of the transects. Transects at Site I had two additional tubes, which were installed for purposes of sampling water away from the creek bed during high flow, when all five tubes became submerged. The tubes were installed by driving a steel rod into the sediment and upon its removal immediately inserting the plastic tubing. Wooden stakes attached to the tubes were inserted to stabilize the shallow tubes. The tubes penetrated between 15-25 cm into the streambed.

Each subsurface water sample was taken using an acid washed 60 cc syringe after purging at least one tube and one syringe volume. Small sample volumes were used in order to avoid integrating water from areas far from the tubes. The subsurface water access tubes were filled with water and tightly sealed after each sampling event. Three depth-integrated surface water samples were taken across each transect, one near each bank and one in the center.

Syringe collected samples were immediately pushed through a 0.45 $\mu$m filter set in an acid washed filter housing and into an acid washed 30 ml bottle. Approximately 10 ml of sample was used to purge the filter and bottle before taking the sample. Each cation sample was acidified with three drops of concentrated trace-metal grade $HNO_3$ immediately following collection. Anion samples were unacidified. All samples were immediately placed on ice in the field and kept chilled until analysis. Field blanks and duplicates were collected during every sampling session. In the laboratory, the acidified samples were analyzed using a Thermo Jarrel-Ash Inductively Coupled Argon Plasma Emission Spectrometer (ICAPES) for As, Ca, Cd, Co, Cu, Fe, Mg, Mn, Mo, Na, Ni, Pb, Si, Sr, Ti, and Zn. Unacidified samples were run on a Dionex Ion Chromatograph (IC) for chloride, nitrate, and sulfate analysis within 48 hours of sampling.

Dissolved oxygen, pH, and specific conductance were measured in the field on small sub-samples. Alkalinity was measured in the field by titrating HCl in the sub-sample until the pH dropped to 4.5. Temperature was measured for all the sample sites at one point in time in order to minimize temperature fluctuations which occur during the course of the day of sampling. A thermometer probe was inserted about 10 cm into the sediment as close as possible to the subsurface water access tubes, and direct readings were taken.

*Solid phase sampling:*

Using artificial substrates to sample the solid phase by-passed the problems encountered when trying to core coarse-grained stream sediments and delineating coating history on the variably sized sediments [*Benner et al.*, 1995]. Twenty-seven bead columns were constructed using 40 cm long polycarbonate tubing (1 cm OD., 0.6 cm ID) which were slotted (1 mm width) with a band saw on two sides in 3 mm intervals. Aluminosilicate beads (2 mm average diameter) were inserted into the columns, with plastic dividers separating every 10 cm of tube. The dividers were used to minimize vertical integration of the water flowing through the columns. The assembled columns were soaked in 20% reagent-grade HCl for 2 hours and rinsed repeatedly with deionized water until the ambient pH of deionized water was reached. In the field, each tube was carefully inserted into the substrate so that 30 cm of the column was below the channel bed surface and 10 cm was exposed in the surface water. Three bead columns were placed in each of the 9 transects, with each column placed as close as possible to the three subsurface water sampling tubes in each transect (Figure 3). The bead columns were identified by the transect in which they were placed (e.g. "IA" = Site I, Transect A) followed by 1, 2, or 3, depending on whether they were in the left bank, center, or right bank of the creek (looking upstream), respectively.

After 52 days, the bead columns were removed. With the removal of each column, the location of the water-substrate boundary was marked with a rubber band, and each column was quickly rinsed in the stream to wash off excess sediment and algal growths.

Each column was labeled, photographed, wrapped in plastic wrap, and stored. In the laboratory, the columns were oven-dried at 70°C and then carefully sectioned into 4-7 segments, depending on the amount of visible coating variation on the columns. The beads within the surface water portions of the columns were carefully chosen by using only those with no visible algal coatings. (Only two bead sections (Bead IIC-3, section 0-8.5 cm, and Bead IIIA-3, section 0-7.5 cm) were analyzed using beads with some algal coatings that could not be avoided). This was done because analysis of beads with algal coatings demonstrated that the algae themselves contained highly elevated metal concentrations (200-300% the concentration of beads from the same section without algal coatings), thereby obscuring concentrations of precipitates on the beads. Approximately one gram of bead from each section was measured out. The weighed beads were placed into an acid-washed centrifuge tube, to which 10 mL of 40% trace metal grade HCl was added. The columns were then shaken for 1 hour and centrifuged for 10 minutes. The solutions were analyzed for major metals using the ICAPES.

*Sediment sampling*

Three sediment samples were taken from along each bank of each of the three study sites. The samples were taken from the top 1-2 cm of stream sediment and wet sieved through a 63 $\mu$m mesh, using ambient stream water. The samples were stored on ice for transport to the laboratory, where they were immediately centrifuged and dried in a 70°C oven. The dried sediment then underwent a microwave aqua-regia digest, and metal concentrations were determined with use of the ICAPES.

*Quality Assurance/ Quality Control*

Accuracy and precision were measured separately for the water samples and for the bead digest samples. Field duplicates, lab duplicates, lab standards (internal and external), and blanks were used to find the % error (or variability) associated with each element in each water and bead sample.

Accuracy was measured by comparison to USGS standards T107 and T117, which were measured during every use of the ICAPES for cation analysis (Table 1). Almost all of the mean measured values were less than 10% different from the reported mean values. For those measured during water analysis, exceptions for USGS T107 were Cd (19.6%), Cu (12%), Mn (12.9%), and Si (12.7%) and for USGS T117 were Ca (12.7%), Mn (10.9%), Si (13.7%), and Zn (13.3%). For the standards measured during bead analysis, the accuracy was not as good, likely due to carry-over from the high concentrations of metals in the bead digests into the relatively dilute standards. All elements were no more than 15% different from the reported values. Exceptions for USGS T107 were Ca (17.1%), Cd (28.4%), Fe (22.4%), Mn (20.4%), Si (20.8%), and Zn (26%), and the exceptions for USGS T117 were Si (15.7%) and Zn (18.8%). Accuracy was less important on the bead digests than was precision, due to the use of the beads for establishing relative concentrations only.

| | Reported values mean (std.dev) | Meas. values (run with water samples) (n=29) | % Diff. from Reported | Meas. values (run with bead samples) (n=20) | % Diff. from Reported |
|---|---|---|---|---|---|
| **USGS T107** | | | | | |
| **Al** | 0.22 (0.045) | 0.24 (0.022) | 9.94 | 0.24 (0.020) | 7.57 |
| **Ca** | 11.7 (0.7) | 12.8 (0.4) | 8.98 | 13.9 (0.7) | 17.1 |
| **Cd** | 0.0143 (0.002) | 0.0174 (0.001) | 19.6 | 0.0190 (0.001) | 28.4 |
| **Cu** | 0.030 (0.0023) | 0.027 (0.012) | 12.0 | 0.03 (0.002) | 7.34 |
| **Fe** | 0.052 (0.007) | 0.056 (0.015) | 7.23 | 0.065 (0.0007) | 22.4 |
| **Mg** | 2.1 (0.13) | 2.2 (0.091) | 4.65 | 2.36 (0.10) | 11.5 |
| **Mn** | 0.045 (0.006) | 0.051 (0.002) | 12.9 | 0.055 (0.002) | 20.4 |
| **Mo** | 0.015 (0.002) | 0.016 (0.002) | 7.69 | 0.017 (0.0024) | 14 |
| **Na** | 20.7 (1.1) | 22.8 (0.44) | 9.66 | 23.6 (1.1) | 12.9 |
| **Si** | 3.6 (2.3) | 4.1 (0.14) | 12.70 | 4.4 (0.22) | 20.8 |
| **Sr** | 0.061 (0.004) | 0.063 (0.002) | 3.23 | 0.067 (0.003) | 22.9 |
| **Zn** | 0.076 (0.01) | 0.08 (0.03) | 5.39 | 0.098 (0.006) | 26 |
| **USGS T117** | | | | | |
| | **Reported values** mean (std.dev) | **Meas. values** (run with water samples) (n=12) | **% Diff. from Reported** | **Meas. values** (run with bead samples) (n=11) | **% Diff. from Reported** |
| **Al** | 0.079 (0.019) | 0.084 (0.022) | 5.84 | 0.090 (0.017) | 13.3 |
| **Ca** | 20.9 (1.2) | 23.7 (0.4) | 12.7 | 24.2 (0.9) | 14.6 |
| **Fe** | 0.47 (0.018) | 0.51 (0.015) | 7.87 | 0.52 (0.019) | 9.78 |
| **Mg** | 10.05 (0.44) | 10.99 (0.091) | 8.92 | 11.03 (0.32) | 9.27 |
| **Mn** | 0.22 (0.003) | 0.25 (0.002) | 10.9 | 0.25 (0.009) | 12.8 |
| **Mo** | 0.012 (0.002) | 0.013 (0.002) | 11.1 | 0.013 (0.002) | 8.70 |
| **Na** | 20.0 (1.26) | 22.0 (0.436) | 9.67 | 22.3 (0.89) | 10.9 |
| **Si** | 5.54 (0.3) | 6.35 (0.1) | 13.7 | 6.48 (0.22) | 15.7 |
| **Sr** | 0.265 (0.011) | 0.277 (0.002) | 4.42 | 0.277 (0.007) | 4.48 |
| **Zn** | 0.176 (0.009) | 0.201 (0.025) | 13.3 | 0.212 (0.010) | 18.8 |

*Table 1: Results of analyses of Standards USGS T107 and T117 water standards run with water and bead digest samples.*

Eighteen field blanks were collected during the water sampling, and all concentrations were below detection, with the exception of Zn, whose average concentration was 0.018 mg/l. Twenty three lab blanks were also run during the course of the water analysis, and again all concentrations were below detection. Lab blanks run during bead digest analyses showed all elements to fall below the detection limit. However, bead blanks, which were digests run on the aluminosilicate beads not installed in the creek bed, showed significant levels of Al and Si, likely resulting from the composition of the beads themselves. For these reasons, Al and Si values had to be discarded for the bead concentration results. Bead blanks also resulted in mean concentrations of Ca with 5.6 $\mu$g/ g bead; Mg with 1.3 $\mu$g/ g bead; Na with 0.96 $\mu$g/ g bead; and Ti with 0.09 $\mu$g/g bead. The highest levels found in the bead blanks during each analysis were used toestablish the boundary of minimally significant bead concentration values in the samples.

Precision was measured through analysis of both lab and field duplicates. Field precision of the water samples was measured by analysis of eleven duplicate samples collected in the field (about one from each sampling event). Precision of the bead samples was measured by taking 17 duplicate samples of beads from randomly selected sections of the tubes. Lab precision was measured by running the same samples (whether water or bead digest) at least once and calculating the variability in the readings by the ICAPES and IC, whichever pertained. Twenty-two lab duplicates were run during the water sample analysis, and twenty were run during the bead digest analysis.

Each sample was compared with its field and/or lab duplicate and the percent difference between the duplicates was calculated for each element. For purposes of calculations, a value of one-half the detection limit was applied to each metal whose concentration fell below the detection limit. The 95% confidence interval of the mean of all the compiled percent difference values was calculated (Table 2). The variability in the lab duplicates was significantly smaller than that of the field duplicates (for the water samples) and bead coating variability (for the beads); therefore, the latter were used for construction of error/variability bars. Thus, the concentration of each element in each sample had an error bar applied to it which represents the 95% confidence interval of the mean field variability for the specific element. The appendix contains all of the field and lab duplicate samples with the individual percent changes as well as the compilation of percent changes from which the 95% confidence intervals were calculated.

| Parameter | Water samples | Bead samples |
|---|---|---|
| pH | 1.3 % | NA |
| Diss. oxygen | 23 % | NA |
| Spec. Cond. | 3.4 % | NA |
| Alkalinity | 19 % | NA |
| Cl | 4.2 % | NA |
| $NO_3$-N | 22 % | NA |
| $SO_4^{2-}$ | 9.7 % | NA |
| Al | 28 % | 37 % |
| As | 22 % | 18 % |
| Ca | 1.3 % | 15 % |
| Cd | 21 % | NA |
| Cu | 21 % | 14 % |
| Fe | 8.4 %(a)<br>31% (b) | 11 % |
| Mg | 2.5 % | 24 % |
| Mn | 2.3 % | 10 % |
| Mo | 8.3 % | 13 % |
| Na | 1.6 % | 18 % |
| Pb | 39 % | 9.2 % |
| Si | 1.2 % | 18 % |
| Sr | 1.7 % | 13 % |
| Ti | NA | 20 % |
| Zn | 16 % | 12 % |

*(a): For concentrations > 20 mg/l*
*(b): For concentrations <1 mg/l*

*Table 2: Summary of 95 % confidence intervals applied to water and bead samples for construction of error/variability bars. the 95% confidence intervals for water reflect field variability, and those for the beads reflect the coating concentration variability.*

# Results and Discussion

***Physical setting***

According to the potentiometric map of the study area, surface water and groundwater had variable flow direction relationships (Figure 2). At Site I, surface water flows approximately perpendicular to the groundwater. There, head measured on the east bank was an average of 9.5 +/- 1.6 cm higher than the head measured in the west bank during all sampling periods. Water levels in the stream fell inbetween the measurements taken on either bank. Furthermore, temperature, assumed to be conservative, indicates that water in the west bank (11.7°C on 6/20/95) was of intermediate composition between east bank water (10.5°C) and surface water (14.8°C). This suggests that at Site I, the stream functioned as a flow-through system, with groundwater moving into it from the east bank and surface water recharging the west bank.

At Site II, the potentiometric maps indicate that groundwater and surface water flow approximately parallel to each other. Water level differences in the north and south banks and in the surface water were small enough to fall within the measurement and surveying error of 3.0 cm. Temperature measurements of the shallow subsurface produced a highly variable pattern of temperature zones which appeared to be controlled by grain size. Generally, there was no spatial regularity to the patterns.

Although the flow relationships at Site III appear to be analogous to those at Site I according to the potentiometric maps, the only discernable head difference was that the east bank generally showed slightly higher (3.9 +/- 0.30 cm) water levels than in the surface water. The difference between the surface water level and head in the west bank was within the measurement and surveying error. Thus, the creek was found to gain water from the east bank, while its potentiometric differences with the west bank are small enough that flow directions could not be determined. Temperature measurements from across the site show that the subsurface water, both in the banks and below the creek bed were commonly 2-4°C colder than the surface water.

*Streambed sediments:*

All sites were generally characterized as having sand and gravel stream bottoms with more fine grained sediments (fine sands and silts) forming the banks. At Site I, the streambed ranged in size from coarse sands to medium gravels. The sediments along its banks were mostly fine to medium silts and sands. At Site II, an unstable gravel bar covered most of the stream bottom during the course of the sampling period. Along the banks, the sediments were mostly silty, with only some fine to coarse grained sands. At Site III, the streambed sediments ranged in size from sands to large cobbles, although the sediments along the banks were silts so fine grained that it was usually difficult and sometimes impossible to extract water samples from them.

*Flow rate in the creek:*

Water sampling took place over the course of four months, during which the flow rate in the creek varied from about 800 to 6100 liters per second (l/s) (USGS, 1996) (Figure 4). Water was sampled from all the transects in two general episodes of flow rate in the creek. One sample set was collected in late June to mid July, when the flow in the creek ranged from 2800 L/s to 6100 l/s. The second set was taken in late August to early September, when the flow rate was considerably lower, ranging from 800 to 1200 l/s. During the lower flow period the bead columns were installed in the creek bed.

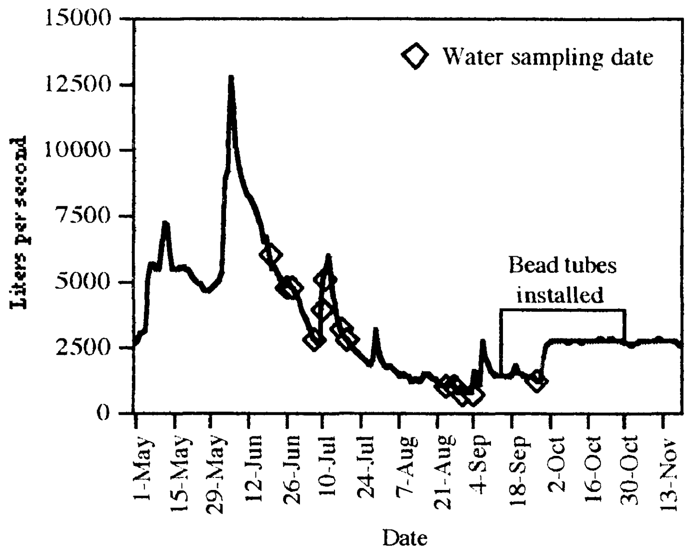



*Figure 4: Flow volume rate (l/s) in Silver Bow Creek at the time of water sampling and of bead tube installation in the creek bed. Data from USGS [1996].*

The head in the groundwater fluctuated about 0.8 m in the aquifer over the course of the sampling period (Shay, 1997).

## ***Hyporheic Zone Chemistry: Dissolved (<0.45 μm) fraction:***

Water highly elevated in metal concentrations compared to the surface water was collected in the shallow hyporheic zone at depths less than 30 cm beneath the creek bed during both low and high flow episodes at all the sites. The chemistry of the hyporheic zone was highly variable both spatially and temporally. Every water sample had a unique chemical composition. Table 3 shows an example of hyporheic zone water chemistry found in two samples from each site. (The appendix shows the entire dataset.)

The pH of water collected from the hyporheic zone commonly measured about 6, which is an intermediate value between typical groundwater (≈ 3 - 5) and surface water (≈7- 8) at the site. Dissolved As in the hyporheic zone samples were found above the detection limit of 0.07 mg/l in 65% of the samples, with an average of 0.28 mg/l. None

| Sample | Site I IB-GW1 6/26/95 | IA-GW2 8/24/95 | Site II IIA-GW5 7/6/95 | IIA-GW2 8/31/95 | Site III IIIB-GW4 7/11/95 | IIIA-GW2 8/28/95 |
|---|---|---|---|---|---|---|
| pH | 6.8 | 6.7 | 6.8 | 7.0 | 6.3 | 6.3 |
| d.$O_2$ | 0.5 | 1.5 | 1.3 | 0.6 | 1.7 | 1.7 |
| Cond. | 1.20 | 0.851 | 2.27 | 0.755 | 1.15 | 1.58 |
| Alkal. | 7.6E+02 | 3.7E+02 | 1.7E+03 | 3.8E+02 | 8.4E+01 | 9.6E+01 |
| Cl | 30 | 15 | 26 | 18 | 27 | 38 |
| $NO_3$ -N | BDL | 0.13 | BDL | BDL | BDL | BDL |
| $SO_4^{2-}$ | 15.3 | 36.4 | 188 | 17.8 | 7.5E+02 | 6.9E+02 |
| Al | 0.39 | BDL | 0.64 | BDL | 0.14 | 0.09 |
| As | 1.6 | 0.11 | 2.6 | 0.21 | 0.11 | BDL |
| Ca | 110 | 88 | 330 | 77 | 150 | 166 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL |
| Cu | 0.175 | BDL | 0.954 | 0.015 | BDL | BDL |
| Fe | 71 | 51 | 2.1E+02 | 22 | 73 | 60 |
| Mg | 21 | 16 | 54 | 11 | 36 | 38 |
| Mn | 20.0 | 8.61 | 45.5 | 7.79 | 12.9 | 10.0 |
| Na | 31 | 32 | 65 | 27 | 78 | 103 |
| Ni | BDL | BDL | 0.023 | BDL | BDL | BDL |
| Pb | BDL | BDL | 0.14 | BDL | BDL | BDL |
| Si | 21 | 17 | 17 | 20 | 23 | 20 |
| Sr | 0.618 | 0.673 | 1.12 | 0.450 | 1.34 | 1.63 |
| Ti | 0.016 | BDL | 0.023 | BDL | BDL | BDL |
| Zn | 0.384 | 0.042 | 2.04 | 0.166 | 6.4 | 12.7 |

*Table 3: The chemical characteristics of six selected hyporheic zone samples, two from each site. Concentrations are in mg/l. Error/ variability bars are listed in Table 2.*

of the 24 groundwater samples collected by Shay [1997] at the same study site had any measurable As, and it was below detection in the surface water. Aluminum, Cd, Co, Cu, Ni, Pb, and Ti were below detection in some samples and above in others. The rest of the measured metals were always at detectable levels, although the concentration ranges for most of them were variable within one to three orders of magnitude. Iron and Zn concentrations had the highest variability, with sample concentrations ranging over three orders of magnitude; dissolved Fe concentrations in the hyporheic zone varied from 0.15 to 350 mg/l, and dissolved Zn concentrations ranged from 0.042 mg/l to 26 mg/l. Dissolved Ca, Cl, Mg, Mn, Na, and Si concentrations had much smaller ranges of variability in the hyporheic zone, generally within one order of magnitude.

Despite the large chemical variation, distinct patterns were found in the distribution of dissolved chemical constituents in the hyporheic zone samples of each of the three sites.

*Site I:*

At Site I, the water samples taken from the upgradient east bank, interpreted from the piezometric data and from research by Benner et al. [1995] to be the local groundwater, typically contained higher concentrations of metals and $SO_4^{2-}$ and had lower pH levels than did the samples taken from the downgradient west bank, interpreted to be the hyporheic zone. The pH levels averaged 4.3 (standard deviaton = 1.2) in the east bank, in contrast with samples from the west bank, where pH levels averaged 6.5 (standard deviation = 0.4). In addition, mean concentrations of $SO_4^{2-}$, Ca, Mg, Cu, Fe, Mn, and Zn were lower in the west bank than in the east bank, although the standard deviation for these concentrations overlapped due to the temporal and small scale spatial variability.

The general trends observed at the Site is exemplified in the Figure 5, which depicts the results of sampling transect B at Site I on one particular day (6/20/95). The concentration patterns of Fe and Mg show highest concentrations in the east bank, lowest were below the creek bed, and intermediate concentrations were in the west bank. The concentration patterns of Ca, Na, and specific conductance were the same as those of Fe and Mg. Sulfate, Al, Cd, and Zn had the same spatial trends as did Cu (shown in the figure), with high concentrations in the east bank samples, and concentrations close to or below detection in all other subsurface water samples. Two of the three sampling sites in the center of the creek bed usually contained water which chemically resembled the surface water. The third of these, sample site GW-3 at Transect A, was found to contain metal concentrations similar to those found in the east bank all four times it was sampled. (The appendix contains the results of the chemical profiles of the water samples taken along each transect during all the sampling events at Site I.)

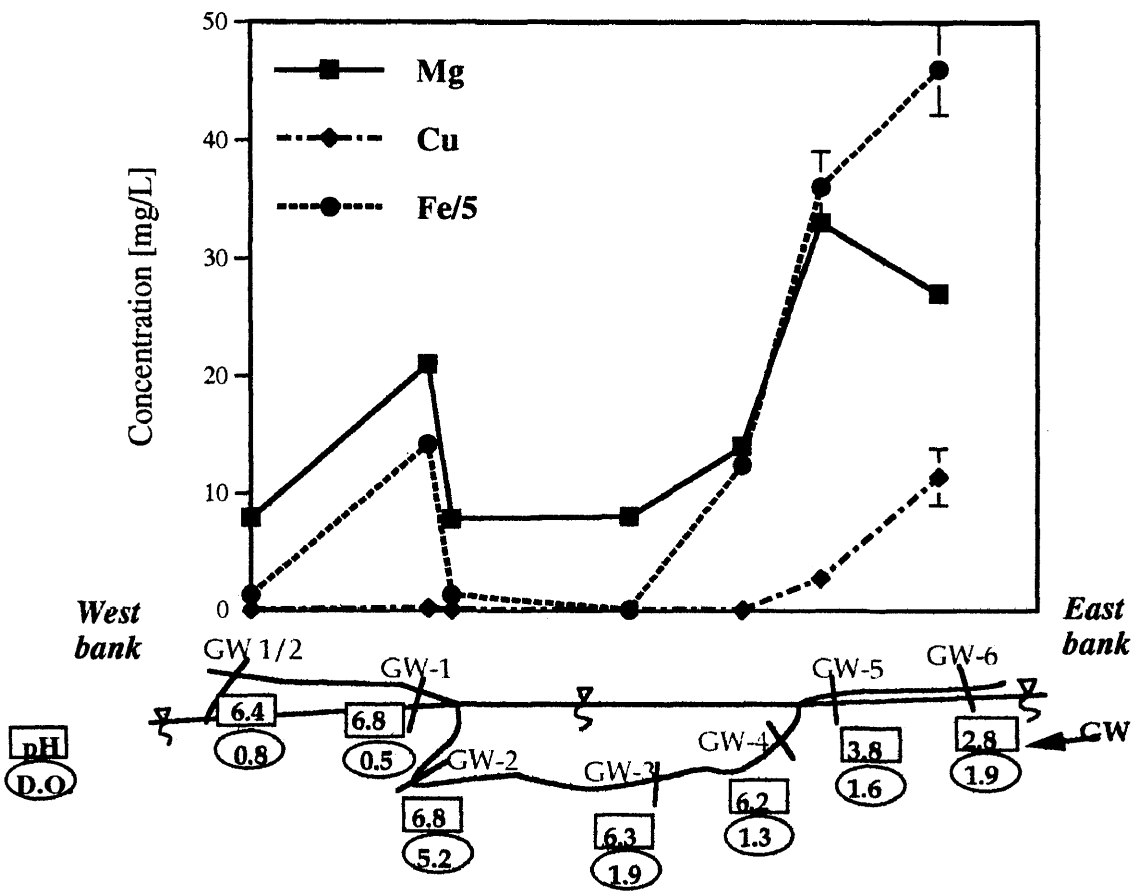



Figure 5: Example of spatial trends of metal concentrations and pH and dissolved oxygen (D.O.) levels found across one transect at Site I. Points on the graph correlate with locations along the transect, shown below the graph.

*Site II:*

The chemical differences across the transects at Site II were not nearly as clear as those at Site I. Figure 6 exemplifies the general spatial trends found across the site. The trends did not show a relationship of metal concentration and acidity favoring either bank. Although average concentrations of Ca, Fe, Mg, Mn, and Na, and specific conductance were commonly slightly higher on the south bank, average Cu and Zn tended to be slightly higher on the north bank. Chloride, $SO_4^{2-}$, and Si concentrations varied as well, but their concentrations did not were not different in either stream bank. Samples taken from beneath the gravelly center of the streambed (wells IIA-GW3, IIB-GW3, and IIC-GW3) very closely resembled the chemistry of the surface water. In addition, the mean metal concentrations at the Site were low compared to those found in water samples from Sites I and III. It thus appeared that most of the samples were more heavily dominated by the surface water than at Site I. (The appendix illustrates the results of the chemical profiles of the water collected along transects at Site II.)

*Site III:*

At Site III, yet another spatial profile was identifiable across the transects. The east and west banks of the creek exhibited almost identical subsurface water chemical compositions (Table 4). The samples were characterized by almost neutral pH and relatively high concentrations of dissolved metals.

The chemistry of the water collected from the subsurface of the central portion of the creek had higher dissolved $O_2$ and $NO_3^-$-N, and lower specific conductance, alkalinity, and concentrations of all the constituents measured than did the water collected from within the banks. Still, most of these concentrations were significantly higher than in the surface water.

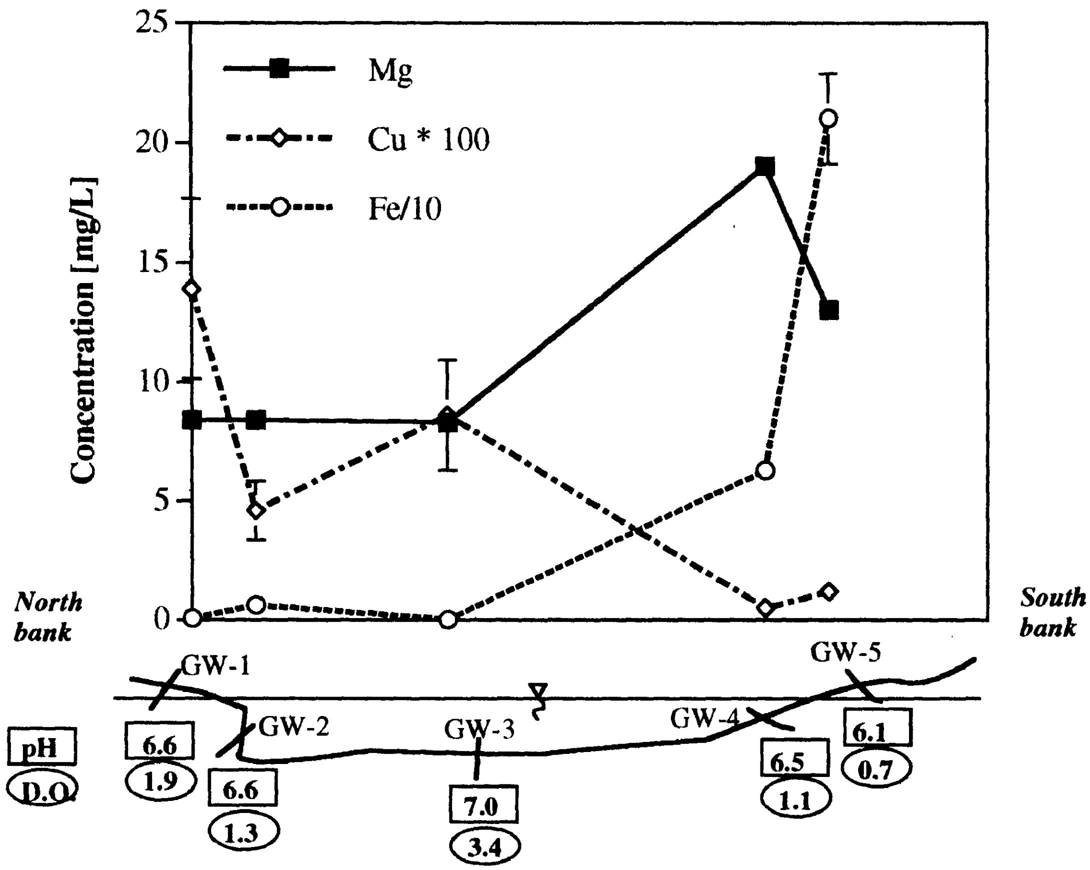



Figure 6: Example of spatial trends of metal concentrations and pH and dissolved oxygen (D.O.) levels found across one transect at Site II. Points on the graph correlate with locations along the transect shown below the graph.

| Site III | West Bank Mean (Std. dev.) (n=9) | Below creek center Mean (Std.dev.) (n=5) | East Bank Mean (Std. dev.) (n=10) |
|---|---|---|---|
| pH | 6.6 *(0.24)* | 6.6 *(0.11)* | 6.6 *(0.37)* |
| D.O. | 1.4 *(0.9)* | 3.5 *(0.9)* | 1.8 *(0.7)* |
| Cond. | 1.27 *(0.47)* | 0.650 *(0.23)* | 1.80 *(0.30)* |
| Alkal. | 458 *(371)* | 122 *(45)* | 306 *(210)* |
| Cl | 25.3 *(6.3)* | 15.8 *(4.9)* | 58.1 *(13)* |
| $NO_3^-$-N | (<0.15) | 0.75 *(0.38)* | (<0.15) |
| $SO_4^{2-}$ | 364 *(291)* | 236 *(127)* | 553 *(340)* |
| Al | 0.12 *(0.10)* | 0.07 *(0.04)* | 0.11 *(0.05)* |
| As | 0.25 *(0.12)* | (<0.07) | 0.22 *(0.13)* |
| Ca | 133 *(39)* | 63 *(24)* | 172 *(46)* |
| Cu | 0.03 *(0.04)* | 0.08 *(0.07)* | 0.03 *(0.02)* |
| Fe | 155 *(139)* | 10.3 *(6.9)* | 57.8 *(40)* |
| Mg | 33.2 *(12)* | 14.4 *(5.8)* | 41.7 *(12)* |
| Mn | 19.0 *(8.9)* | 3.38 *(2.2)* | 9.30 *(4.8)* |
| Mo | 0.23 *(0.20)* | 0.019 *(0.01)* | 0.10 *(0.05)* |
| Na | 72.7 *(23.5)* | 33.2 *(13.6)* | 141 *(41.2)* |
| Si | 21.9 *(2.8)* | 14.4 *(0.55)* | 20.2 *(4.1)* |
| Sr | 0.929 *(0.42)* | 0.473 *(0.22)* | 1.51 *(0.45)* |
| Zn | 1.85 *(2.6)* | 4.73 *(5.1)* | 3.16 *(5.7)* |

*Table 4: Mean and standard deviations of concentrations of metals and other measured constituents at Site III. Mean Cd, Ni, Pb, and Ti are not included because their means were below detection.*

Figure 7, which depicts the concentrations of some metals found at Transect IIIB on 7/17/95, exemplifies these trends found at Site III. The profiles of Mg, Fe, and Cu show the pattern of increasing concentrations of metals with distance away from the creek center, both in the east and west banks.

*Low sulfate samples:*

Some samples from the hyporheic zone were found to contain $SO_4^{2-}$ concentrations that were significantly lower than in the groundwater and in the surface water (Table 5). These samples were usually depleted or almost depleted in $NO_3^-$-N and dissolved $O_2$, and they contained relatively high alkalinity concentrations (Figure 8). In addition, they came from locations where the surface water is thought to be infiltrating the hyporheic zone based on potentiometric data, such as at Site II and in many of the west bank (downgradient) samples at Site I. Only one sample (IIIC-GW4 (8/31/95)) from

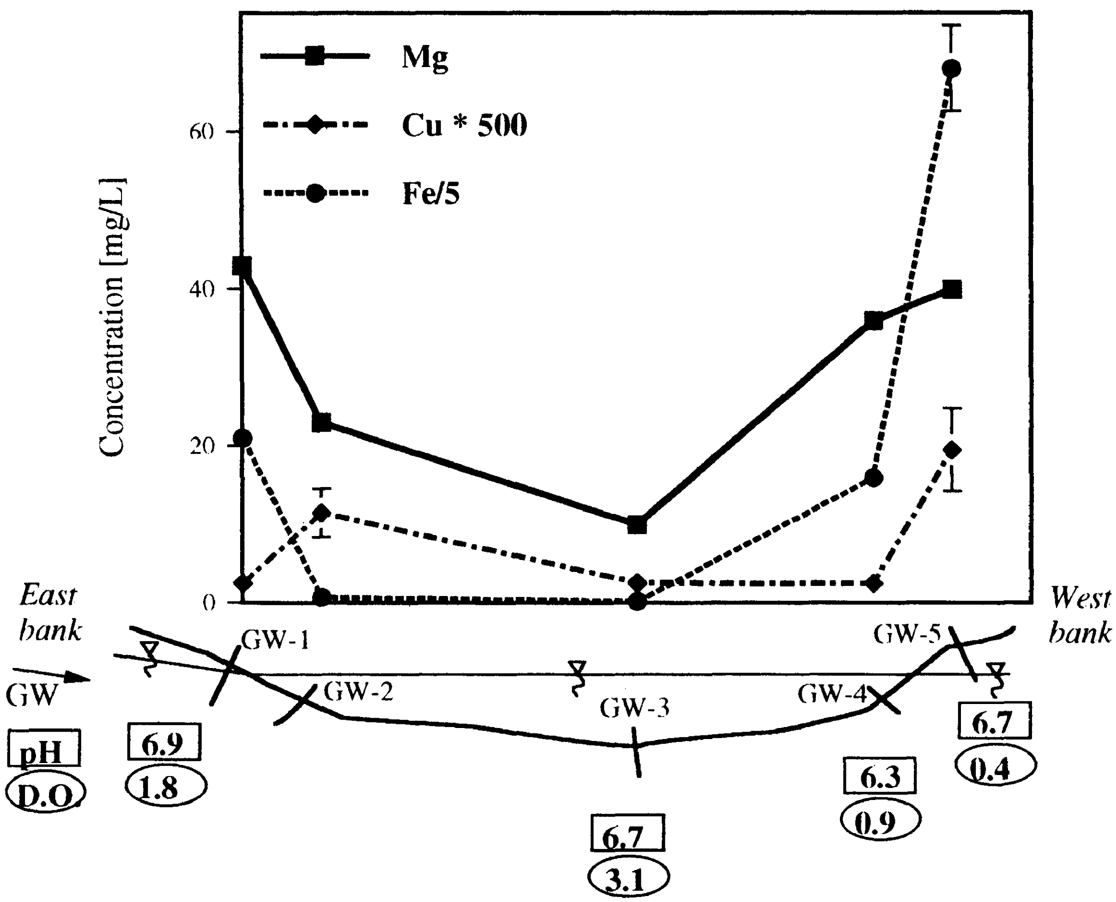



Figure 7: Example of spatial trends of metal concentrations and pH and dissolved oxygen (D.O.) levels found across one transect at Site III. Points on the graph correlate with locations along the transect, shown below the graph.

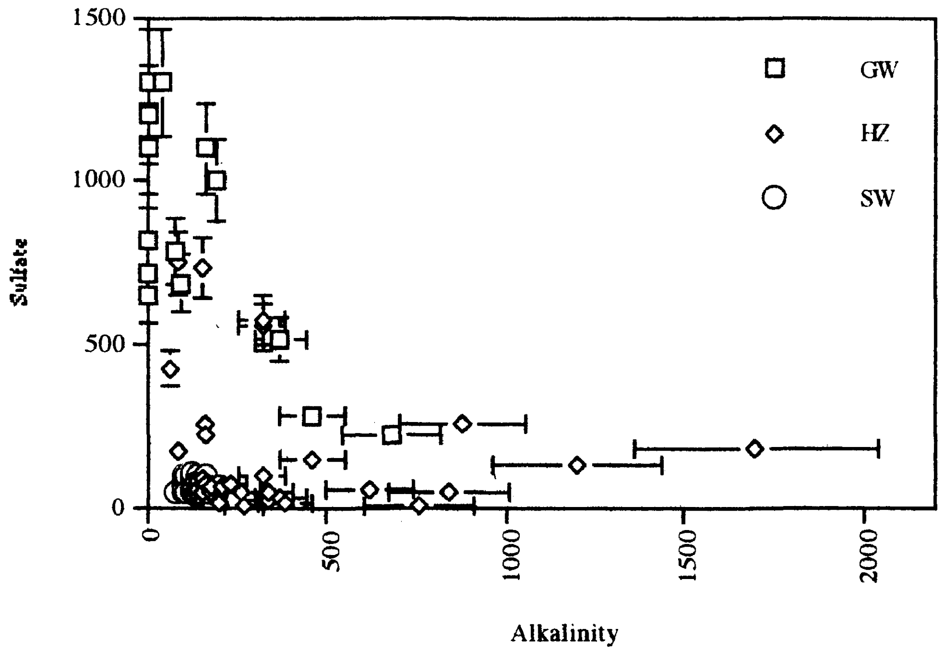



*Figure 8: Sulfate vs. Alkalinity concentrations in the three water groups.*

Site III (where piezometric data indicate the stream to be gaining from at least one side) had a sulfate concentration lower than that in the surface water.

| Hyporheic zone (H.Z.) Sample | H.Z. Diss. $O_2$ | H.Z. $NO_3$ -N | H.Z. $SO_4^{2-}$ | H.Z. Alk. | *Surface water Diss. $O_2$* | *Surface water $NO_3^-$ -N* | *Surface water $SO_4^{2-}$* | *Surface water Alk.* |
|---|---|---|---|---|---|---|---|---|
| *Site I* | | | | | | | | |
| IB-GW1 (6/26/95) | **0.5** | **BDL** | **15.3** | **7.6E+02** | *6* | *0.9- 1.0* | *54-55* | *1.0E+02* |
| IA-GW2 (7/19/95) | **1.2** | **BDL** | **28.9** | **5.7E+02** | *6* | *1.1* | *73* | *1.7E+02* |
| IA-GW2 (8/24/95) | **1.5** | **BDL** | **36.4** | **3.7E+02** | *7-8* | *1.6-1.7* | *90-96* | *1.3E+02* |
| IA-GW2 (9/27/95) | **1.6** | **0.14** | **51.4** | **3.4E+02** | *7* | *1.9* | *108* | *1.3E+02* |
| *Site II* | | | | | | | | |
| IIA-GW4 (7/6/95) | **1.3** | **BDL** | **25.8** | **3.4E+02** | *6* | *0.7-0.9* | *60-63* | *1.3E+02* |
| IIB-GW4 (7/6/95) | **1.1** | **BDL** | **9.25** | **2.7E+02** | *6-7* | *1.2* | *62-67* | *1.4E+02* |
| IIA-GW2 (8/31/95) | **0.6** | **BDL** | **17.8** | **3.8E+02** | *8* | *1.6-1.7* | *102-104* | *1.2E+02* |
| IIA-GW4 (8/31/95) | **0.9** | **BDL** | **55.9** | **2.6E+02** | *8* | *1.6-1.7* | *102-104* | *1.2E+02* |
| *Site III* | | | | | | | | |
| IIIC-GW4(8/31/95) | **2.1** | **0.73** | **79.1** | **2.3E+02** | *8-9* | *1.5-1.6* | *97-102* | *1.2E+02* |

*Table 5: Dissolved oxygen, nitrate-N, sulfate, and alkalinity concentrations in some hyporheic zone samples with most concentrations lower (and alkalinity higher )than surface water and groundwater samples. The surface water chemistry for each given sampling date is listed alongside the hyporheic zone samples for purposes of comparison.*

***Surface water: physical and chemical results***

The surface water chemistry was far less spatially and temporally variable than that of the hyporheic zone water or the groundwater. Generally, it was near neutral in pH, had moderate to high dissolved oxygen levels, and was relatively low in dissolved metal concentrations (Table 6).

| | Mean (Std.dev.) | High (6100 L/s) | Low (800 L/s) |
|---|---|---|---|
| pH | 7.7 (0.35) | 8.2 | 6.6 |
| D.O. | 7.2 (1.3) | 11 | 3.9 |
| Cond. | 0.424 (0.09) | 0.545 | 0.304 |
| Alk. | 1.3E+02 (25) | 2.0E+02 | 80 |
| Cl | 14 (4.2) | 28 | 7.4 |
| $NO_3^-$-N | 1.30 (0.53) | 1.94 | 0.304 |
| $SO_4^{2-}$ | 78.4 (23.7) | 109 | 46.8 |
| Al | *(<0.07)* | 0.34 | *(<0.07)* |
| As | *(<0.07)* | *(<0.07)* | *(<0.07)* |
| Ca | 47 (8.8) | 58 | 35 |
| Cd | *(<0.01)* | *(<0.01)* | *(<0.01)* |
| Cu | 0.136 (0.04) | 0.262 | 0.06 |
| Fe | 0.22 (0.11) | 0.46 | 0.05 |
| Mg | 10.4 (2.17) | 13.2 | 7.54 |
| Mn | 0.90 (0.29) | 1.33 | 0.44 |
| Mo | *(<0.01)* | *(<0.01)* | *(<0.01)* |
| Na | 23 (4.7) | 29 | 16 |
| Ni | *(<0.02)* | *(<0.02)* | *(<0.02)* |
| Pb | *(<0.1)* | *(<0.1)* | *(<0.1)* |
| Si | 13 (0.77) | 16 | 12 |
| Sr | 0.265 (0.05) | 0.330 | 0.198 |
| Ti | 0.003 (0.002) | 0.010 | 0.003 |
| Zn | 0.645 (0.255) | 1.31 | 0.323 |

*Table 6: Summary of surface water chemistry (concentrations in mg/l). The mean data are from all surface water samples collected, thus including those collectied over a range of flow rates in the creek, spanning from 800 to 6100 L/s.*

Surface water chemistry varied at all sites with flow volume. Generally, concentrations of cations and anions decreased with increasing flow rate. Such relationships were particularly clear for Ca, Mg, Mn, Na, Cl, $NO_3^-$-N, $SO_4^{2-}$and specific conductance (Figure 9). Relationships of Cu, Zn, Fe, Si, and pH with flow rate were not as clear (Figure 10).

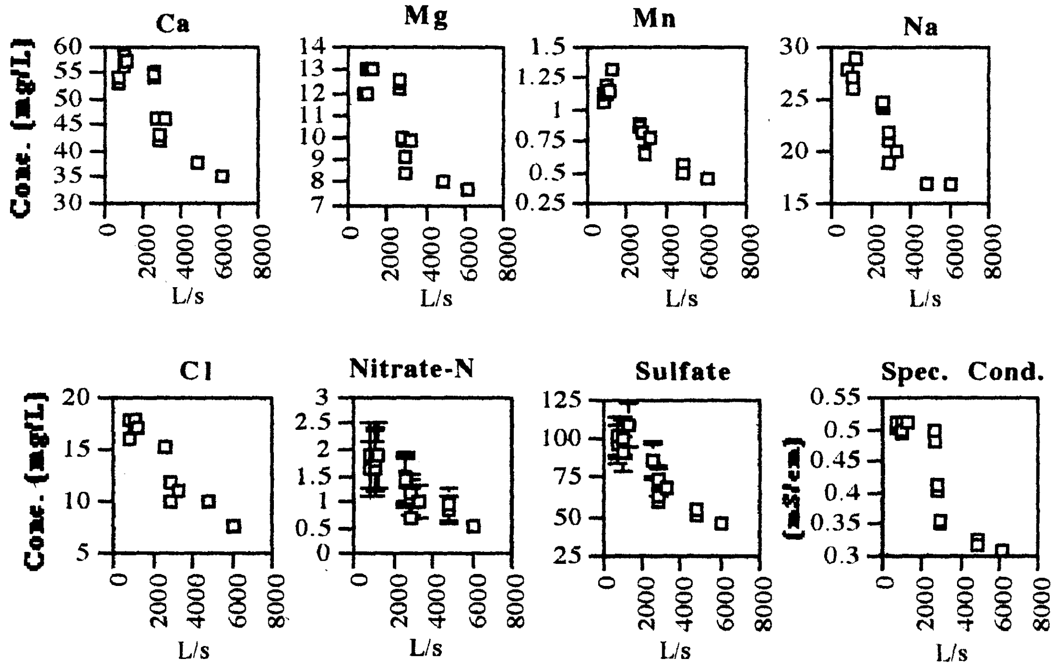



*Figure 9: Concentrations of Ca, Mg, Mn, Na, Cl, $NO_3^-$, $SO_4^{2-}$, and specific conducatnce vs. flow rate (L/s) in Silver Bów Creek.*

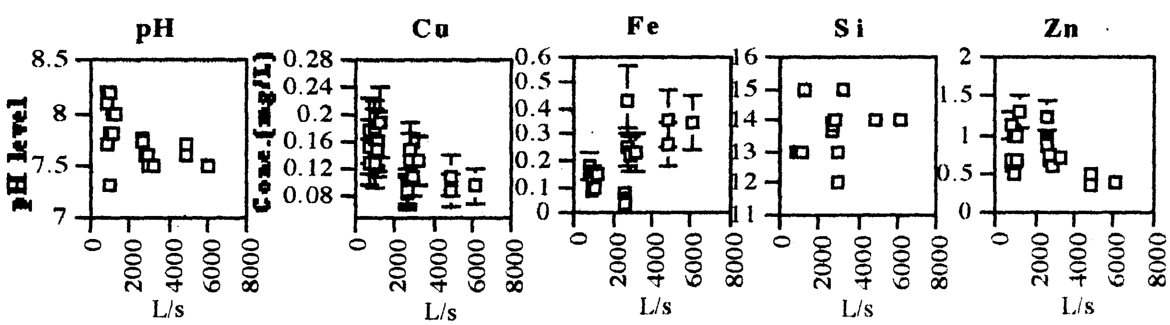



*Figure 10: Concentrations of pH, Cu, Fe, Si, and Zn vs. flow rate (L/s) in Silver Bow Creek.*

Although the flow rate varied over a 7.5-fold difference over the course of the study period (from 800 to 6100 L/s), the concentrations of the elements did not vary accordingly (Table 7).

| Parameter | Conc. at 800 L/s | Conc. at 6100 L/s | Conc. at 800 L/s/ Conc. at 6100 L/s |
|---|---|---|---|
| Mn | 1.1 mg/l | 0.45 mg/l | 2.4 |
| Cl | 17 mg/l | 7.5 mg/l | 2.3 |
| $SO_4^{2-}$ | 100 mg/l | 45 mg/l | 2.2 |
| Ca | 53 mg/l | 35 mg/l | 1.5 |
| Mg | 13 mg/l | 7.6 mg/l | 1.6 |
| Na | 28 mg/l | 17 mg/l | 1.6 |
| spec. cond. | 0.50 | 0.31 | 1.6 |
| Zn | 0.5-1.1 mg/l | 0.38 mg/l | 1.3 - 2.9 |
| Cu | 0.12- 0.18 mg/l | 0.10 mg/l | 1.2 - 1.8 |

*Table 7: Comparison of concentrations of selected parameters during low and high flows in the surface water*

***Solid phases***

The bead columns provided a finer resolution scale of the chemical characteristics of the hyporheic zone. When the three bead columns in each of the nine transects were removed from the streambed, each exhibited two to three distinct color zones. The top section (about 10 cm in the length) that projected out into the surface water was green due to algal coatings on all of the bead columns. Most subsurface portions (the remaining approximately 30 cm in length) of the columns remained white in color. Yet 22 of the 27 bead columns exhibited some amount of precipitation by reddish iron oxides along their lengths, usually right at the surface water - substrate boundary. On some bead columns, this coloration was a thick, dark red, and other columns had much thinner and lighter red coatings. Bead Column IIIA-2 is an example of a bead column that exhibits the three main color zonations (Figure 11).

The red precipitation zones generally spanned no more than about 5 cm of the bead column lengths, although considerable variability existed. Some bead columns exhibited much thicker zones of precipitation (up to 30 cm, in the case of IA-2 (Figure 12) and others showed two separate zones of precipitation (IC-1, IIC-3 (Figure 11), IIB-1, and IIIC-2) .

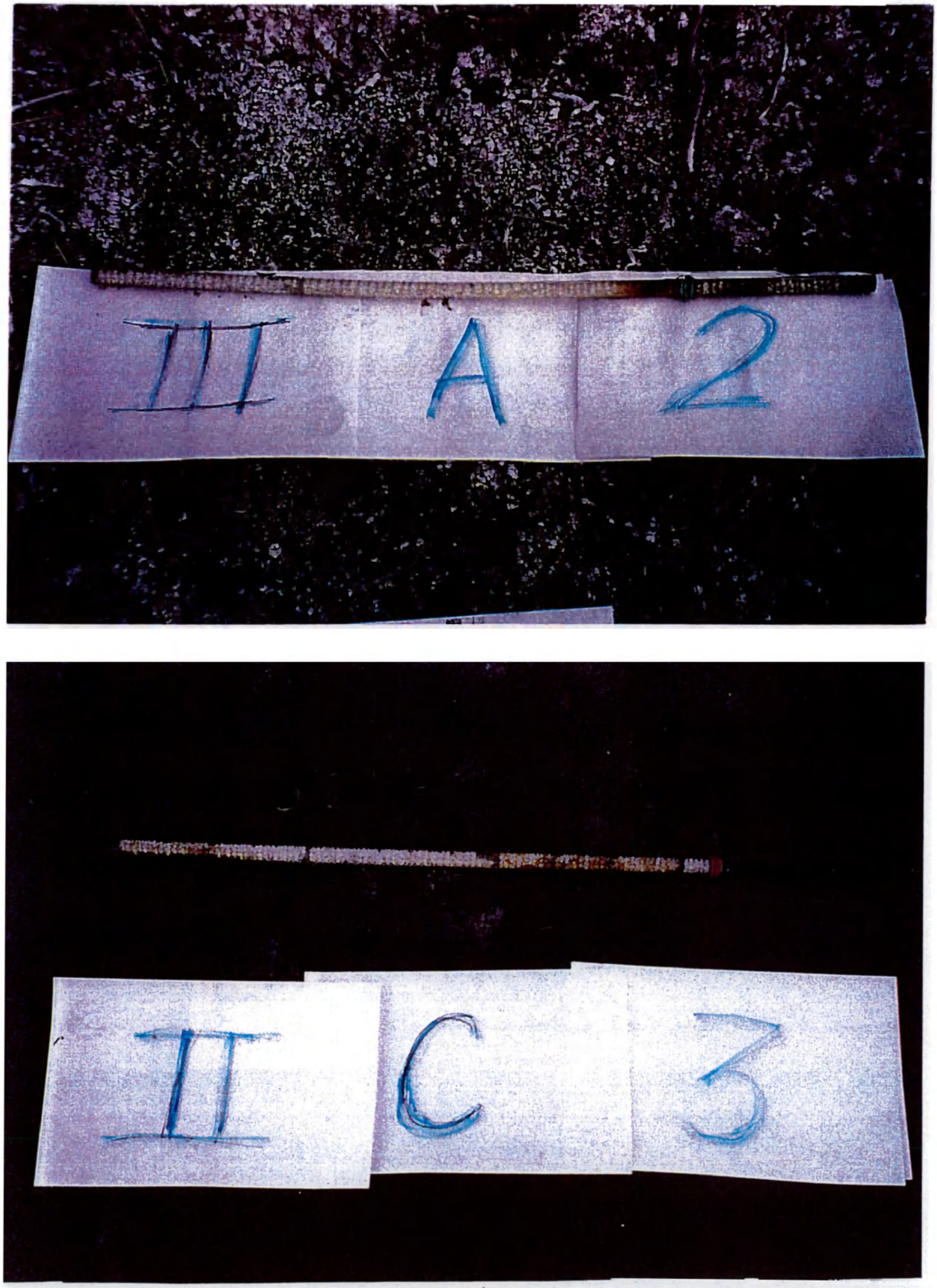



Figure 11: Photographs of bead columns IIIA-2 and IIC-3. Rubber bands mark the surface water - streambed boundary.

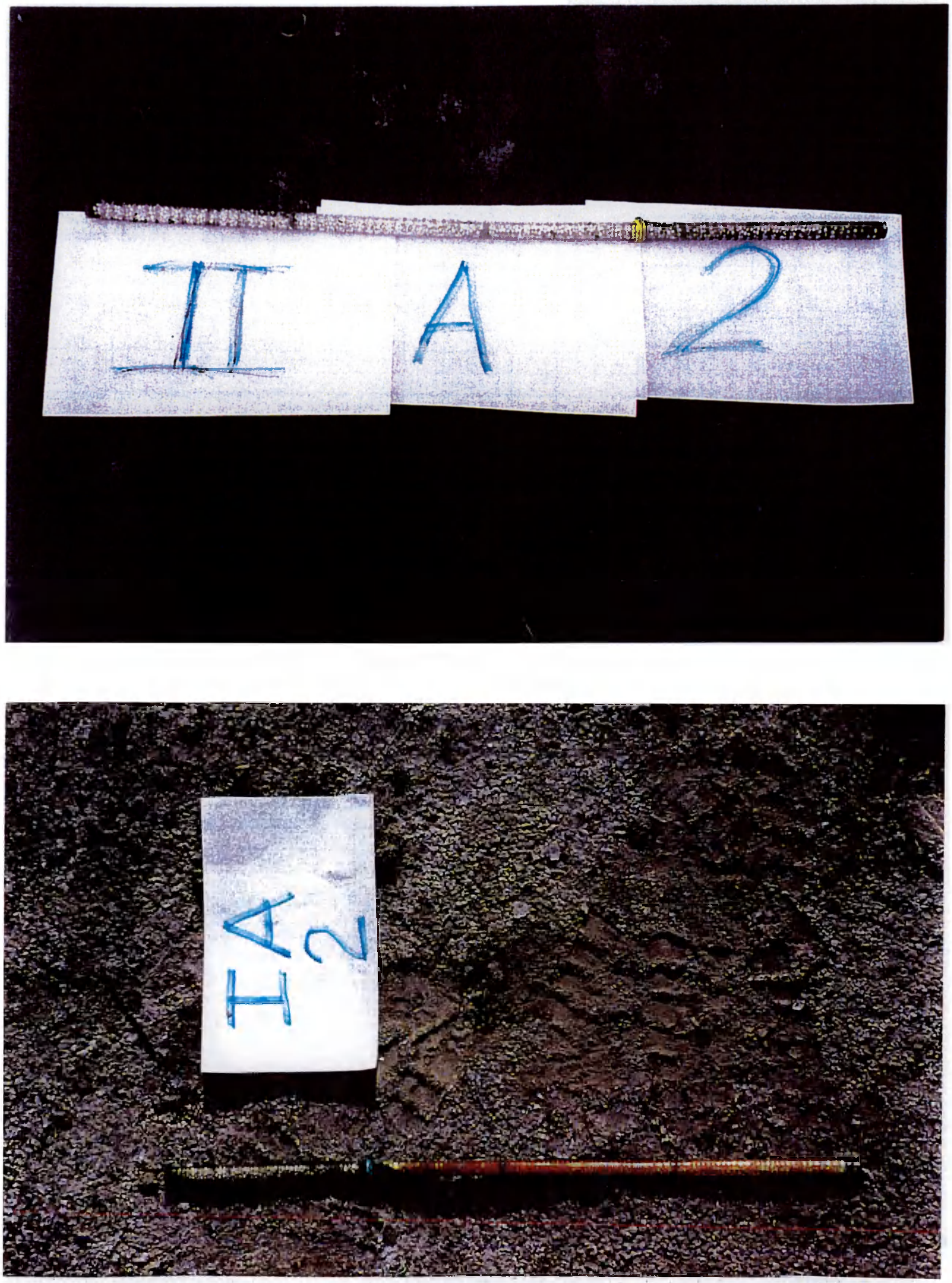



Figure 12: Photographs of bead columns IIA-2 and IA-2. Rubber bands mark the surface water - streambed boundary.

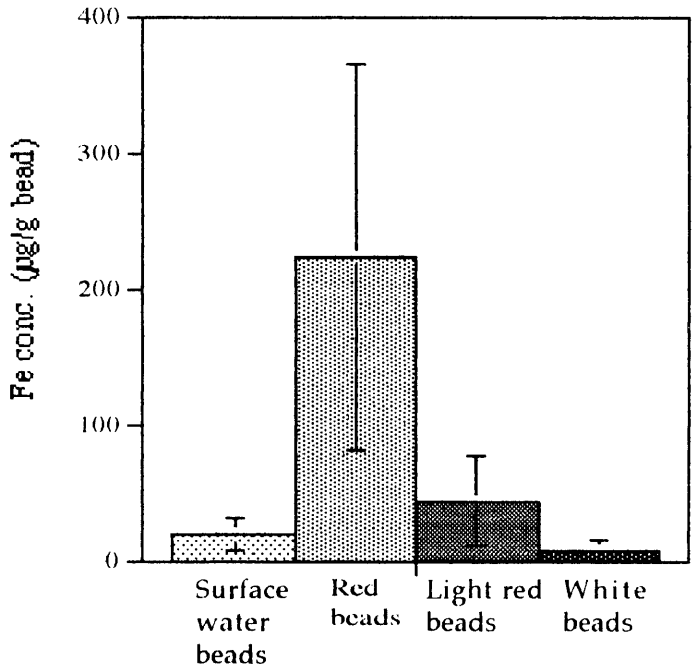
The five columns with no precipitation zones are IIA-2 (Figure 12), IIB-2, IIC-2 , all of which were located in the center of the creek at Site II, IB-2, in the center of the creek at Site I, and IIA-1, located along the north bank of Site II. The concentrations of metals and As along the lengths of the columns mentioned above are listed in the Table 8.

| CONCENTRATIONS ON BEADS (µg/ g BEAD) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SW/ | | | | | | | | | | | | | | | | |
| (0cm=top) | Subs. | Colors on | | | | | | | | | | | | | | | |
| Sample Name | bound. | bead tube | As | Ca | Cd | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Sr | Ti | Zn |
| IA-2 0-12cm | 13 cm | 0-13 green | 0.44 | 13 | 0.05 | 17.8 | 39 | 6.4 | 7.05 | 0.05 | 7.6 | BDL | 9.0 | 0.97 | 0.128 | 0.304 | 13.3 |
| IA-2 12-15cm | | 13-15 light red | 1.2 | 11 | 0.08 | 31.2 | 140 | 3.0 | 3.36 | 0.20 | 4.1 | BDL | 10 | 1.2 | 0.108 | 0.142 | 15.8 |
| IA-2 15-23cm | | 15-42 red | 0.42 | 9.6 | 0.05 | 18.2 | 210 | 3.6 | 3.77 | 0.31 | 4.8 | BDL | 6.4 | 3.0 | 0.085 | 0.161 | 12.9 |
| IA-2 23-33.5cm | | | 0.21 | 22 | BDL | 10.9 | 140 | 3.6 | 3.25 | 0.21 | 5.4 | BDL | 3.6 | 1.6 | 0.117 | 0.164 | 6.38 |
| IA-2 33.5-42cm | | | 0.22 | 9.0 | BDL | 10.7 | 190 | 3.8 | 3.41 | 0.30 | 5.6 | BDL | 3.1 | 1.6 | 0.071 | 0.164 | 6.13 |
| | | | | | | | | | | | | | | | | | |
| IC-1 0-8cm | 8 cm | 0-8 green w/ | 0.48 | 9.1 | BDL | 5.55 | 18 | 2.6 | 1.98 | BDL | 2.0 | 0.25 | 3.6 | 0.71 | 0.075 | 0.238 | 6.79 |
| IC-1 8-11 cm | | red streak | 0.58 | 11 | BDL | 2.65 | 30 | 4.2 | 4.81 | BDL | 3.7 | 0.73 | 5.0 | 1.1 | 0.094 | 0.174 | 8.04 |
| IC-1 11-30 cm | | 8-11 v.l. red | BDL | 8.0 | BDL | 4.49 | 7.6 | 4.1 | 3.52 | BDL | 4.9 | 0.34 | 2.3 | 0.48 | 0.060 | 0.137 | 9.84 |
| IC-1 30-42cm | | 11-30 white | 2.3 | 13 | 0.12 | 18.0 | 300 | 3.8 | 6.46 | 0.43 | 4.4 | 1.6 | 40 | 1.2 | 0.268 | 0.179 | 21.9 |
| | | 30-42 med. red | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| IIA-1 0-10.5cm | 15.5 cm | 0-10 drk green | BDL | BDL | BDL | 4.22 | 10 | BDL | 1.30 | BDL | BDL | BDL | 3.0 | BDL | BDL | BDL | 3.61 |
| IIA-1 10.5-15.5cm | | 10-15.5 green | BDL | BDL | BDL | 2.91 | 9.2 | BDL | 0.880 | BDL | BDL | BDL | 2.9 | BDL | BDL | BDL | 2.12 |
| IIA-1 15.5-22cm | | 15.5-20.5 | BDL | BDL | BDL | 3.11 | 6.3 | BDL | 0.612 | BDL | BDL | BDL | 2.4 | BDL | BDL | BDL | 1.79 |
| IIA-1 22.5-33cm | | l.green | BDL | BDL | BDL | 2.98 | 5.5 | BDL | 0.616 | BDL | BDL | BDL | 2.5 | BDL | BDL | BDL | 4.46 |
| IIA-1 33-42cm | | 20.5-42 white | BDL | BDL | BDL | 1.12 | 3.4 | BDL | 0.410 | BDL | BDL | BDL | 2.3 | BDL | BDL | BDL | 2.17 |
| | | | | | | | | | | | | | | | | | |
| IIA-2 0-10.5cm | 13.5 cm | 0-13.5 green | BDL | BDL | BDL | 4.75 | 17 | BDL | 1.82 | BDL | BDL | BDL | 5.0 | BDL | BDL | BDL | 4.12 |
| IIA-2 11-13.5cm | | 13.5-42 white | BDL | BDL | BDL | 2.35 | 9.9 | BDL | 0.780 | BDL | BDL | BDL | 3.4 | BDL | BDL | BDL | 2.54 |
| IIA-2 13.5-21.5 cm | | | BDL | BDL | BDL | 1.82 | 7.6 | BDL | 0.648 | BDL | BDL | BDL | 2.8 | BDL | BDL | BDL | 1.98 |
| IIA-2 22-32 cm | | | BDL | BDL | BDL | 0.85 | 3.7 | BDL | 0.365 | BDL | BDL | BDL | 2.1 | BDL | BDL | BDL | 1.08 |
| IIA-2 32-42cm | | | BDL | BDL | BDL | 0.77 | 4.4 | BDL | 0.340 | BDL | BDL | BDL | 2.0 | BDL | BDL | BDL | 0.96 |
| | | | | | | | | | | | | | | | | | |
| IIB-1 0-8cm | 8cm | 0-8 green | BDL | 10 | BDL | 4.85 | 16 | 1.9 | 1.62 | BDL | 1.6 | 0.19 | 4.1 | 0.66 | 0.083 | 0.192 | 5.13 |
| IIB-1 8-14cm | | 8-14 v.light red | 0.75 | 9.4 | BDL | 4.01 | 28 | 1.68 | 1.27 | BDL | 1.37 | BDL | 4.9 | 1.62 | 0.098 | 0.253 | 7.49 |
| IIB-1 14-26cm | | 14-26 white | 0.6 | 7.8 | BDL | 2.65 | 11 | 1.71 | 0.58 | BDL | 1.51 | BDL | 1.9 | 0.85 | 0.067 | 0.203 | 5.79 |
| IIB-1 26-35cm | | 26-41 light red | 1.41 | 10 | BDL | 4.10 | 36 | 2.14 | 1.19 | BDL | 1.56 | BDL | 5.2 | 1.87 | 0.105 | 0.296 | 4.65 |
| IIB-1 35-41cm | | | 1.77 | 12 | BDL | 2.98 | 31 | 2.30 | 1.17 | BDL | 2.0 | BDL | 4.6 | 1.24 | 0.117 | 0.296 | 5.03 |
| | | | | | | | | | | | | | | | | | |
| IIB-2 0-7cm | 7 cm | 0-6 green | BDL | BDL | BDL | 5.23 | 16 | BDL | 1.75 | BDL | BDL | BDL | 4.4 | BDL | BDL | BDL | 4.79 |
| IIB-2 7-12cm | | 6-8 light green | BDL | BDL | BDL | 5.50 | 21 | BDL | 1.83 | BDL | BDL | 0.68 | 4.6 | BDL | BDL | BDL | 4.51 |
| IIB-2 12-19.5cm | | 8-40.5 white | BDL | BDL | BDL | 3.85 | 21 | BDL | 1.34 | BDL | BDL | 1.36 | 3.7 | BDL | BDL | BDL | 3.53 |
| IIB-2 20-30cm | | | BDL | BDL | BDL | 2.13 | 16 | BDL | 0.923 | BDL | BDL | 1.35 | 2.7 | BDL | BDL | BDL | 2.29 |
| IIB-2 30-40.5cm | | | BDL | BDL | BDL | 0.92 | 3.1 | BDL | 0.334 | BDL | BDL | BDL | 1.6 | BDL | BDL | BDL | 1.26 |
| | | | | | | | | | | | | | | | | | |
| IIC-2 0-4.5cm | | | 0.32 | 12 | BDL | 5.80 | 18 | 2.2 | 2.10 | BDL | 1.8 | BDL | 3.9 | 0.52 | 0.093 | 0.162 | 5.49 |
| IIC-2 4.5-8.5cm | | | 0.24 | 12 | BDL | 4.74 | 15 | 2.2 | 1.81 | BDL | 2.4 | BDL | 2.8 | 0.46 | 0.088 | 0.172 | 4.06 |
| IIC-2 8.5-11cm | 8.5 cm | 0-8.5 green | BDL | 11 | BDL | 3.55 | 11 | 1.7 | 1.50 | BDL | 2.6 | BDL | 2.0 | BDL | 0.070 | 0.126 | 3.38 |
| IIC-2 11-21cm | | 8.5-40 white | BDL | 9.9 | BDL | 2.46 | 7.7 | 1.5 | 0.843 | BDL | 2.4 | BDL | 1.5 | BDL | 0.062 | 0.122 | 2.41 |
| IIC-2 21-30cm | | | BDL | 6.9 | BDL | 1.29 | 4.0 | 0.9 | 0.390 | BDL | BDL | BDL | BDI | BDL | BDL | BDL | 1.49 |
| IIC-2 30-40cm | | | BDL | 6.5 | BDL | 1.01 | 3.1 | 1.1 | 0.37 | BDL | 1.4 | BDL | BDI | BDL | 0.14 | 0.090 | 1.3 |

*Table 8: Concentrations of metals and As (µg/g bead) along the lengths of 7of the 27 bead columns.*

(A full listing of the concentrations on all the bead columns are in the appendix.)

Analysis of the bead column sections revealed that the white sections generally contained the lowest metal concentrations, the red sections contained the highest concentrations, and the green zones contained concentrations inbetween the two, although closer to the low concentrations on the white beads. The element for which this was most clearly apparent was Fe (Figure 13).




*Error bars are the standard deviation of the mean concentrations of the samples.*

*Figure 13: Mean Fe concentrations (µg/g bead) on bead color zones (all samples, compiled.)*

The standard deviations of the means for Fe concentrations shown in the figure are so large because the figure uses data from all the columns, which come from different portions of the creek, which overly a very chemically heterogeneous groundwater system. Examination of columns on an individual or site specific scale reveal significantly smaller variability bars among the different color zones. The concentrations of metals on the surface water beads were far less variable than those found on white or red beads, likely due to the relatively homogeneous chemical nature of the surface water across the site. The comparison of ratios of dissolved metals in the surface water to ratios of metals on bead columns (surface water sections) shows the following sequence of preferential precipiation in the surface water: Fe > Cu > Zn > Mn >Na > Mg > Ca. (i.e., of these metals, Fe is most unstable in the dissolved phase of the surface water, and Ca is most stable).

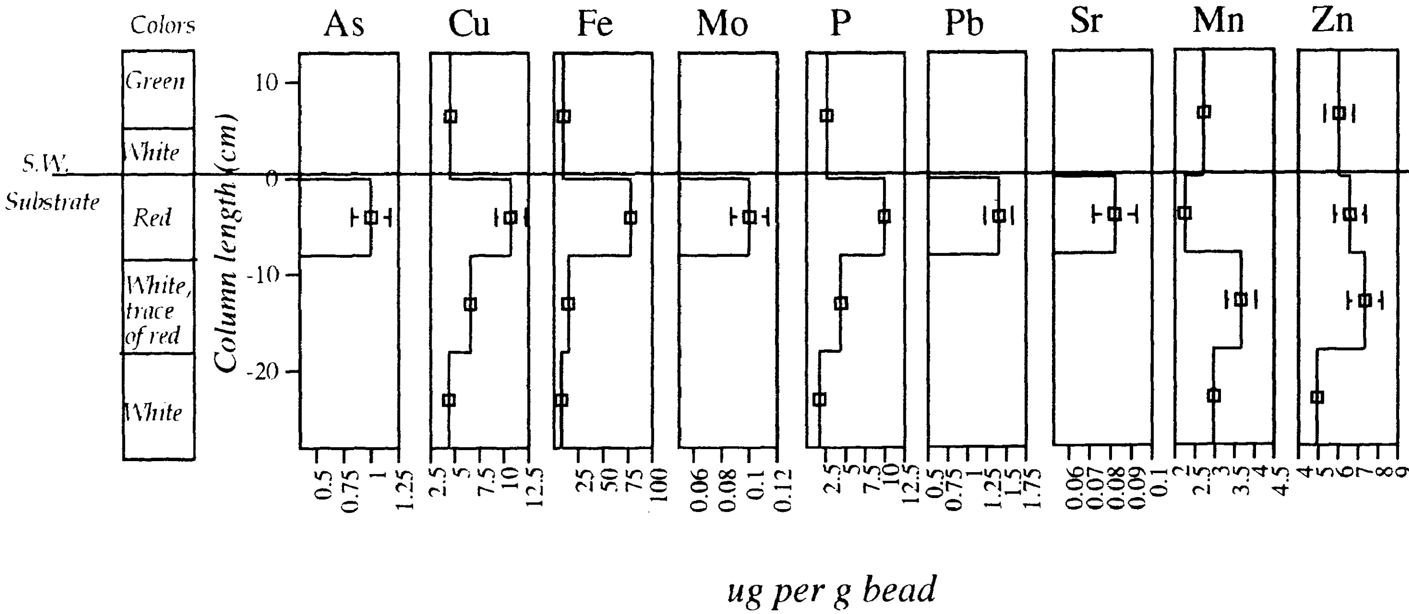
Figures 14-16 illustrate the concentrations of various metals and As along the lengths of a few of the bead columns, one from each site. Note the correlation of concentration with coloration on the columns, and that many metals peak in concentration at the same places along the columns. Metals which typically do not exhibit clear trends along the lengths of column are Ca, Mg, Na, and Ti. The appendix contains the concentrations of the metals and As for each section along all the bead columns.

*Site-specific trends: Bead columns*

Eight of the nine bead columns from Site I had red precipitation zones on them. The six bead columns within the banks (one in each bank for each transect) had the precipitation zones located right along the interface between the surface water and the streambank sediments, with concentrations of Fe≈100-300 $\mu$g/g bead; Mn≈3-5 $\mu$g/g bead; Zn≈6-20 $\mu$g/g bead. Two of the three bead columns set into the center of the creek bed revealed precipitation zones. That of Transect A had the longest accumulation of precipitates found on any of the columns; the precipitation spanned the entire 30 cm length of its subsurface portion. The bead column in the center of Transect B was the only column at the site without any detectable precipitation on it.

At Site II, none of the three bead columns in the center of each transect had any detectable precipitation zones, yet those along the banks (except for IIA-1) did. However, the precipitation zones on four of the six were very light red in color and had metal concentrations significantly lower (Fe≈30-40 $\mu$g/g bead; Mn≈1.0-1.5 $\mu$g/g bead; Zn≈3-7 $\mu$g/g bead) than on those in the darker red precipitation zones common to bead columns at the other sites.

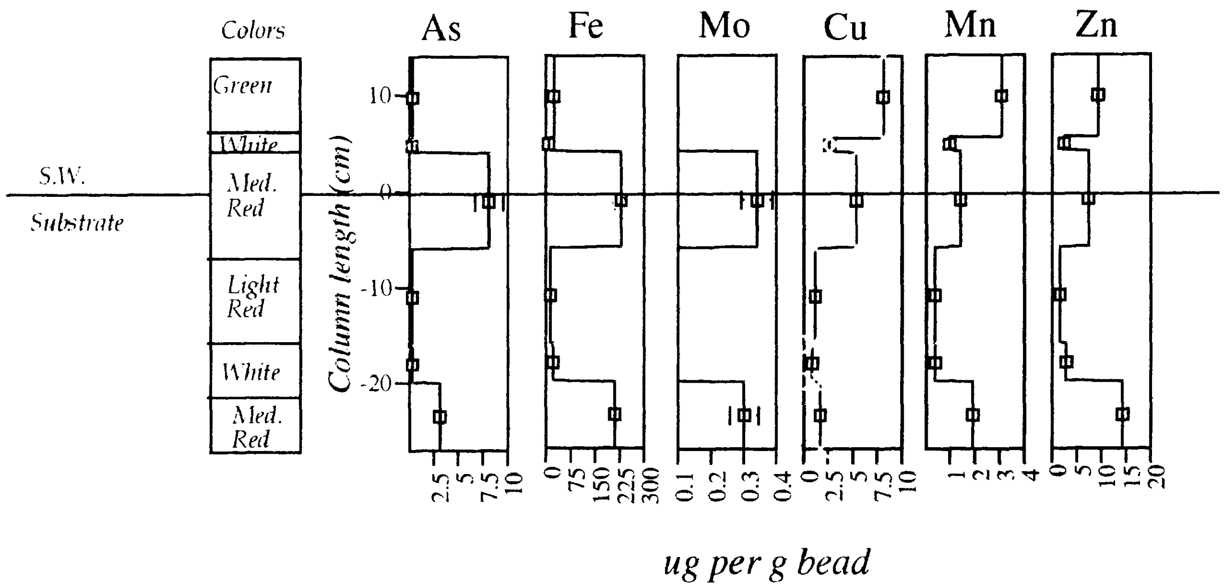
# Bead Column IA-1




*BDL/ No significant trends:*
*Al, Ca, Cd, Mg, Na, Si, Ti*

Figure 14: Bead column IA-1 concentration profile

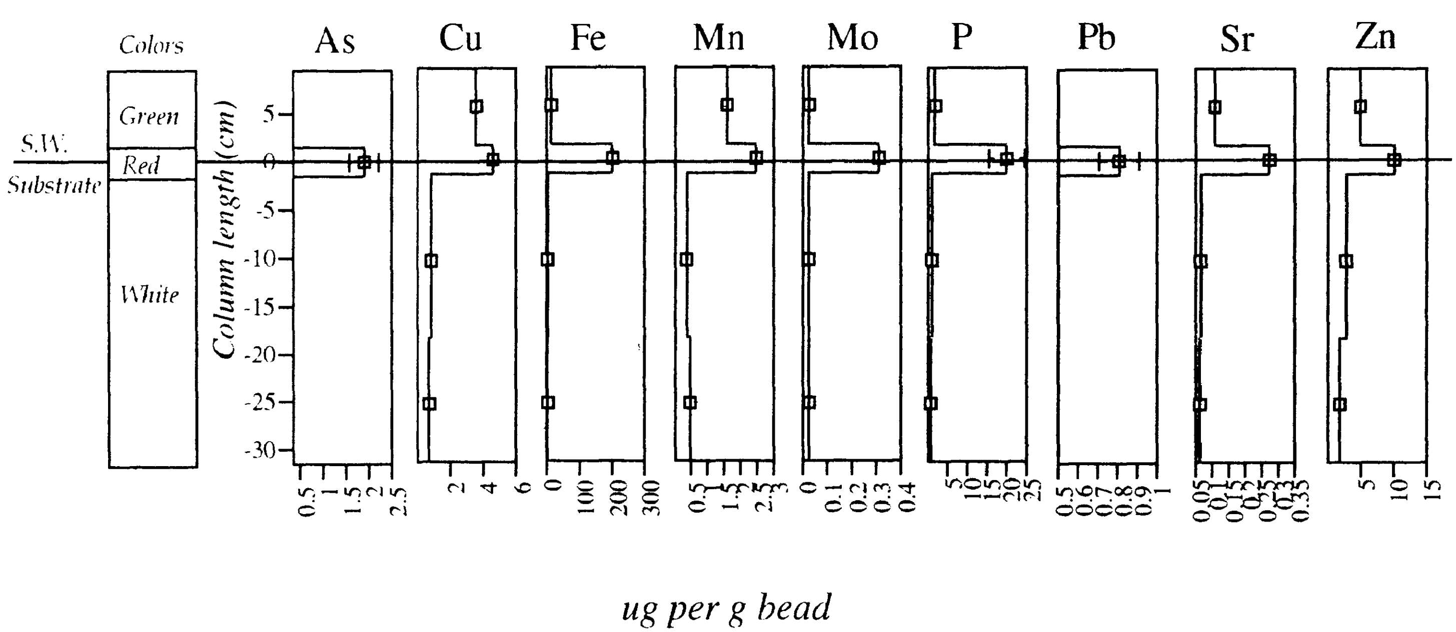
# Bead Column IIC-3




*BDL/ No siginificant trend:*
*Al, Ca, Cd, Na, P, Pb, Si, Sr, Ti*

Figure 15: Bead column IIC-3 concentration profile

# Bead Column IIIC-1




*BDL/ No significant trends:*
*Al, Ca, Cd, Mg, Na, Si, Ti*

Figure 16: Bead column IIIC-1 concentration profile

At Site III, every bead column, including the three in the center of the creek bed, had a zone of precipitation on it. The precipitation zones were all relatively dense, with high metal concentrations (Fe≈100-700 $\mu$g/g bead; Mn≈0.5-3 $\mu$g/g bead; Zn≈5-18 $\mu$g/g bead), and occurred right at the surface water - substrate boundary. A few (e.g. IB-1, IIIA-1 and IIIB-3) had metal concentrations on their surface water portions which were significantly elevated (about 2-5 times more concentrated) than the more typical concentrations found on other surface water beads.

***Physical mixing in the hyporheic zone:***

The results of the examination of the physical relationships of groundwater and surface water flow directions, as well as the temperature patterns found beneath the creek bed at the three sites indicated that the waters were physically mixing. The solute chemical composition of the hyporheic zone samples being distinct from that of both the surface water and local groundwater is more evidence that physical mixing of the waters was likely taking place. The component of physical mixing in the hyporheic zone can be identified through the use of conservative ions, or natural tracers that do not make a transition between the solid and aqueous phases across the groundwater- surface water interface. In addition to not reacting, conservative metals concentrations should form a linear relationship when plotted against each other, indicating that they may be a product of mixing of chemically different waters [*Faure*, 1991]. The mixing ratios calculated from concentrations of conservative elements in the hyporheic zone indicate the proportion of groundwater to surface water present in each subsurface water sample.

Benner et al. [1995] used Cl and Mn as conservative elements in their study at Silver Bow Creek. Chloride is typically thought to be one of the least reactive solutes in aquatic systems and has been used in many tracer studies [*Feth*, 1981; *Legrand-Marcq and Laudelot*, 1985; *Triska et al.*, 1989; *Stollenwerk*, 1994], and Mn has been used in other studies as a conservative tracer as well [*Bencala et al.*, 1987]. However, other than in the surface water, Cl and Mn do not form a linear relationship according to the data collected for this study. Na has been found to act conservatively in aquatic systems together with Cl [*Theobald et al.*, 1963; *Chapman*, 1982]. However, these two do not form a neatly linear relationship either, likely indicating an unidentifiable measurement problem with Cl. A small range of Cl concentrations (16-22 mg/l) are connected with a wider range of Na concentrations (approximately 20-120 mg/l). Most importantly, the very small differences between the surface water Cl concentrations and the groundwater Cl concentrations (all but the ones collected near Site III) made it a poor choice for calculations of mixing ratios.

Ca and Mg appear to be acting conservatively at the site, and their concentrations in the surface water and the groundwater are relatively large. Ca and Mg follow linear conservative mixing relationships [*Faure*, 1991] (Figure 17).

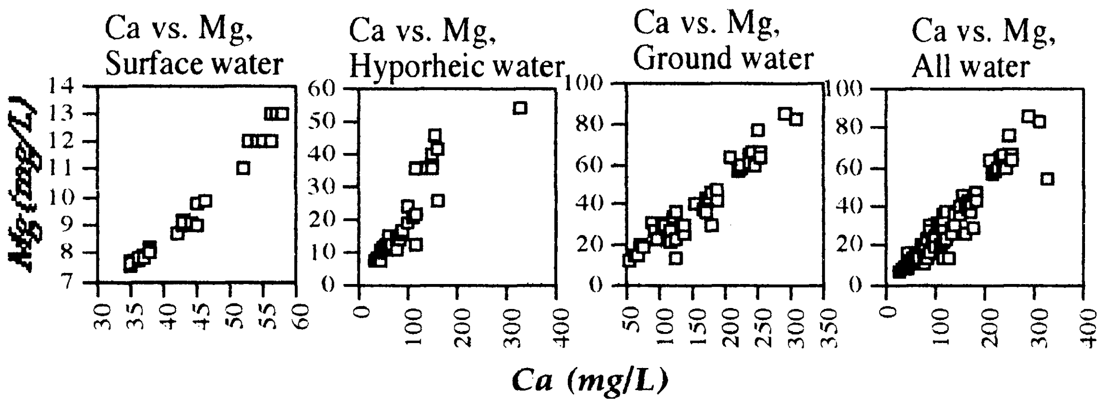



*Figure 17: Dissolved Ca vs. Mg concentrations [mg/l] in water samples.*

In addition, the solid phase sampling results support the conservative behavior of Ca and Mg. On 20 of the 27 bead columns, Ca and Mg did not exhibit any statistically significant trends along the length of the bead columns, suggesting that they generally undergo very small to insignificant chemical changes across the surface water - groundwater interface as reflected in the solid phase. The comparison of dissolved vs. solid phase ratios in the surface water further confirm the observed conservative nature of Mg and Ca, since they were shown to be most stable in the surface water's dissolved phase compared to the other metals. Other researchers have found one or both of these elements to behave conservatively in aqueous systems as well [*Stauffer*, 1985; *McKnight and Bencala*, 1990; *Wetherbee and Kimball*, 1991]. Thus, Ca and Mg were used to calculate mixing ratios in the hyporheic zone.

By using the mixing equation:

$$y = 100 * ([HZ]-[SW])/([GW]-[SW])$$ [*Benner et al.*, 1995; modified from *Triska et al.*, 1989]

where
y= the percent groundwater in the hyporheic zone water
[HZ]= the concentration of the element in the hyporheic zone
[SW]= the concentration of the element in the surface water
[GW]= the concentration of the element in the groundwater

the percent of groundwater in the hyporheic zone water samples could be calculated using Ca and Mg concentrations (Figures 18-20). Because each sample was unique, a separate mixing ratio was calculated for each.

Calcium and Mg (and Na at Site II) yielded nearly identical values of mixing ratios for most of the subsurface water samples, usually within +/- 10%. Variabilities exist due to possible sampling errors, analysis errors, and inaccurate concentrations used to represent the local groundwater chemistry.

Finding the endmember groundwater concentration ([GW]) proved difficult. Due to the variability of the metals concentrations in the groundwater generally existing on scales smaller than the size of any of the three sites used in this study [*Shay*, 1997], it was not feasible to make a generalization of the groundwater chemistry across the study area for calculating mixing equations. Instead, values for the groundwater concentrations were assigned according to the chemistry of the closest high-metal, upgradient sample at each transect. Although some of these samples may have been influenced by the surface water due to their close proximity (within 3 meters) to the creek, they likely represent the local groundwater interacting with the creek better than would samples taken from piezometers further away on the floodplain which commonly contain water of greatly different chemical composition. If these samples have some surface water component within them, the mixing ratios may be an overestimation of the amount of groundwater calculated per sample. However, there is no way to draw the line between "pure" groundwater and

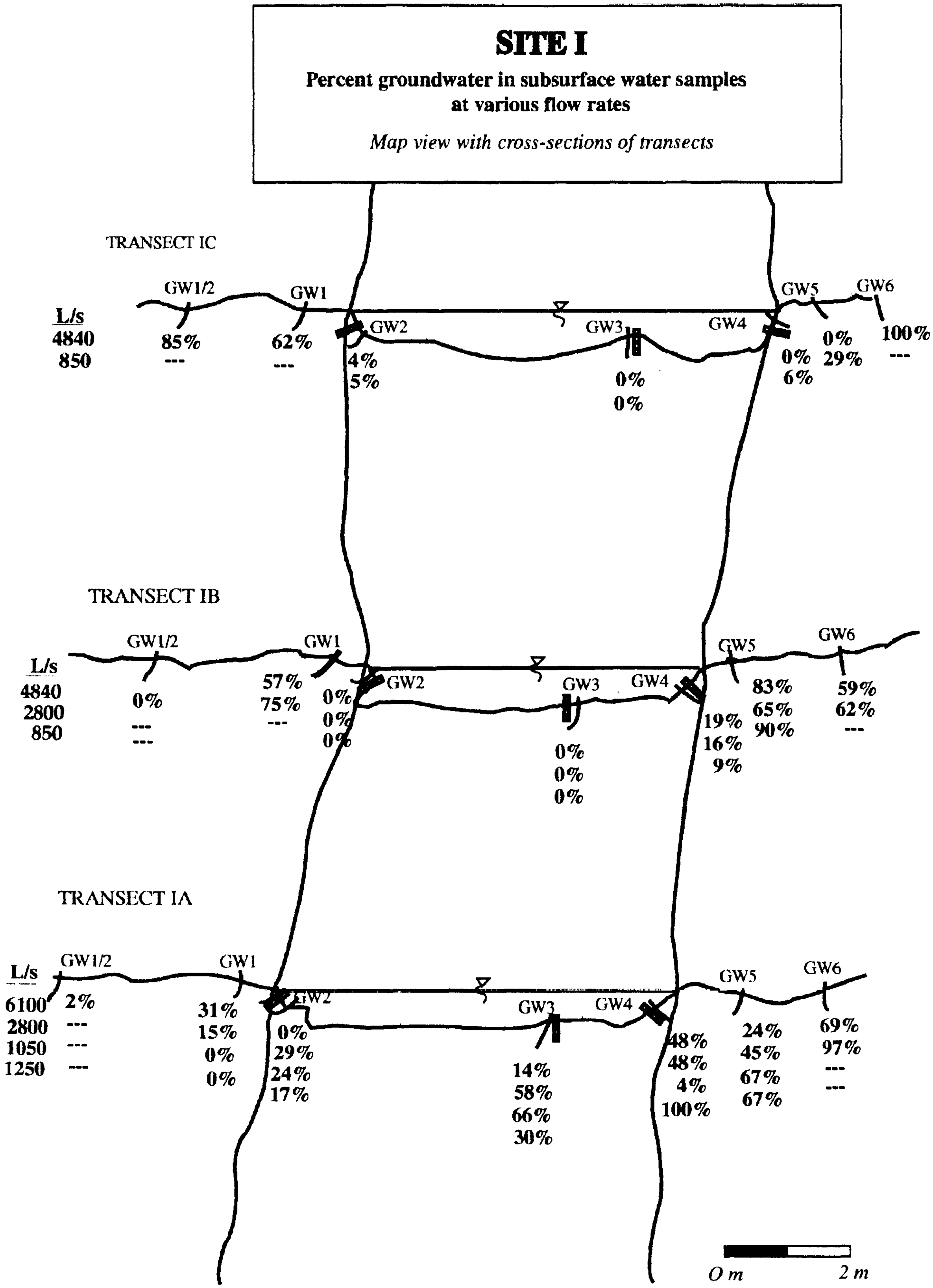

SITE I
Percent groundwater in subsurface water samples
at various flow rates
Map view with cross-sections of transects
TRANSECT IC
L/s
4840
850
GW1/2
85%
---
GW1
62%
---
GW2
4%
5%
GW3
0%
0%
GW4
0%
6%
GW5
0%
29%
GW6
100%
---
TRANSECT IB
L/s
4840
2800
850
GW1/2
0%
---
---
GW1
57%
75%
---
GW2
0%
0%
0%
GW3
0%
0%
0%
GW4
19%
16%
9%
GW5
83%
65%
90%
GW6
59%
62%
---
TRANSECT IA
L/s
6100
2800
1050
1250
GW1/2
2%
---
---
---
GW1
31%
15%
0%
0%
GW2
0%
29%
24%
17%
GW3
14%
58%
66%
30%
GW4
48%
48%
4%
100%
GW5
24%
45%
67%
67%
GW6
69%
97%
---
---
0 m
2 m

*Figure 18*

**SITE II**

**Percent groundwater in subsurface water samples at various flow rates**

*Map view with cross-sections of transects*

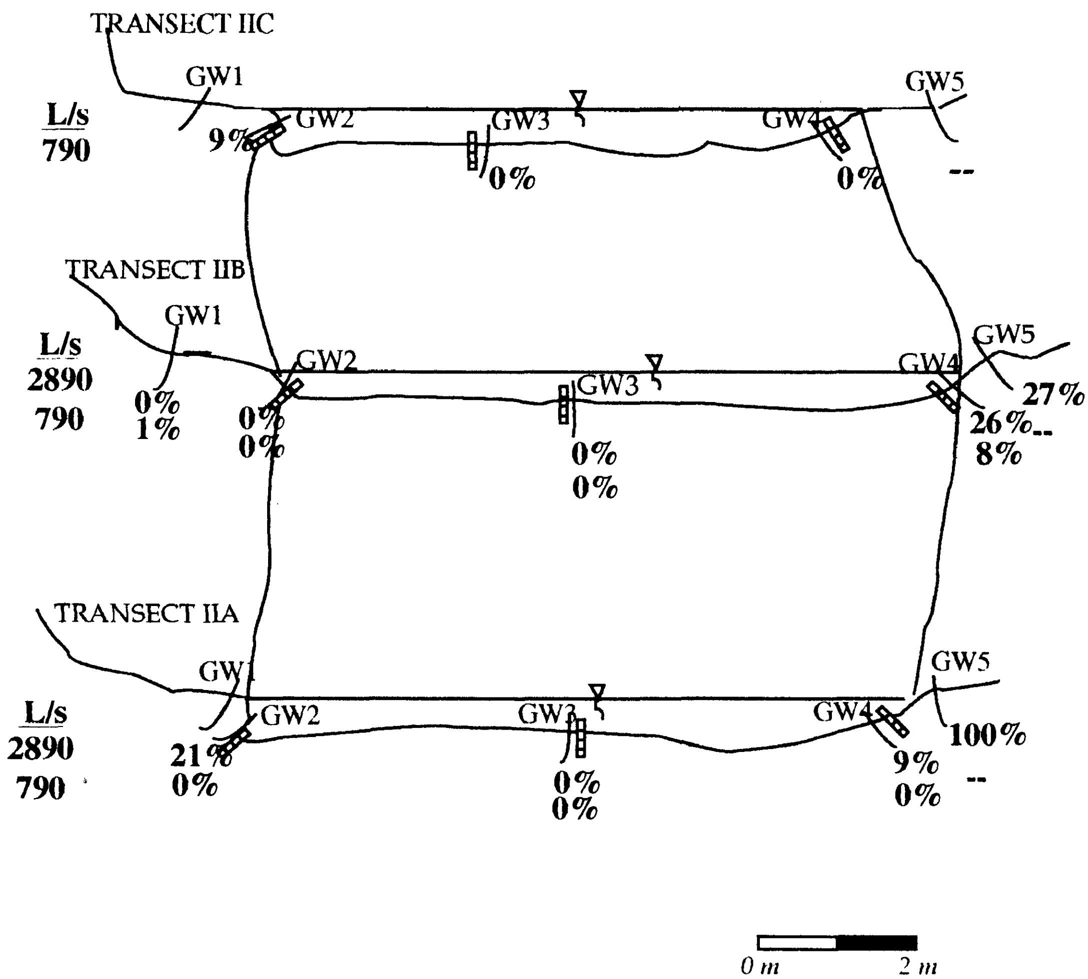



*Figure 19*

# SITE III

**Percent groundwater in subsurface water samples at various flow volumes**

*Map view with cross-sections of transects*

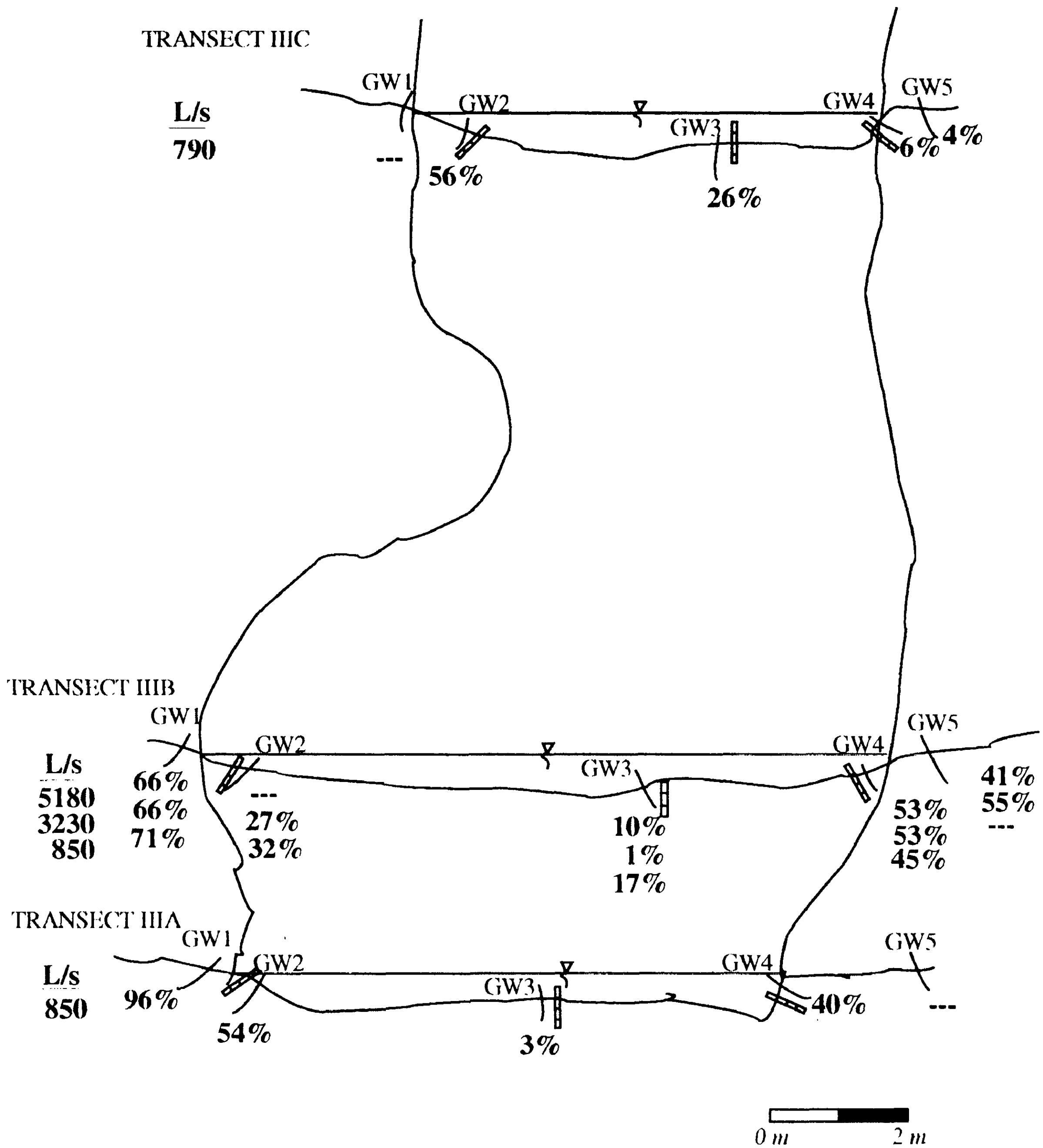



*Figure 20*

groundwater partially diluted by inflowing surface water, given the heterogeneity of the groundwater system itself.

At Site I, the groundwater Ca and Mg concentrations used were taken from east bank (upgradient) samples with the highest concentrations of these elements. For transect IA, water sample IA-GW4 (9/27/95) was used as the groundwater end member; for Transect IB, sample IB-GW5 (8/27/95) was used; and for Transect C, sample IC-GW6 (6/28/95) was used. At Site II, the values used were derived from IIA-GW5 (7/6/95), a sample collected from the stream bank about 0.5 m south of the creek at the site. It contained significantly higher concentrations of Ca, Mg , and Na than did the two closest ( 10 and 20 m away) floodplain piezometers. The mixing ratios for Site II indicate that Na is acting conservatively together with Ca and Mg, and thus was included in calculating the average mixing ratios at this site. At Site III, the values were taken from the subsurface water access tube GW-1 in transect IIIA. The sampling tube was chosen because it was upgradient of the creek, and its concentrations of conservative elements were highest.

The surface water concentrations [SW] varied significantly with flow volume, and thus the end member surface water values varied with each sampling date. This variability was accounted for in the calculations; surface water values used were adjusted for the specific concentration found on the same day as the hyporheic zone water sample was collected.

*Site-specific trends with mixing ratio results*

As seen in Figures 18-20, the mixing ratio results indicate that significant portions of the shallow subsurface water samples are groundwater in a the samples (> 20% groundwater in 48% of the samples). The mixing ratios also illustrate the large degree of heterogeneity seen in the samples, both in terms of spatial distribution and changes with flow rate in the creek. Nonetheless, on a site by site analysis, general trends were discernable.

At Site I's east bank, where the highest metal concentrations were observed in the water samples, the mixing ratios further indicate that groundwater comprises a relatively large portion of the samples (mean 48%). The west bank had lower mean percentages of groundwater composition (17%), and the samples from the below the center of the creek at Transects B and C were calculated as having 0% groundwater. The samples from below the center of the creek at Transect A, which contained relatively high metal concentrations, show groundwater comprising proportions of the samples similar to those in the east bank. Thus, the west bank samples are again interpreted as representing the local hyporheic zone, where infiltrating surface water mixes with the groundwater in the west bank. The upgradient east bank samples more closely resemble the local groundwater as characterized by Shay [1997], and are interpreted to represent the groundwater moving into the creek. This general relationship was also described by Benner et al. [1995] at the same site (specifically, at this study's transect IC).

At Site II, the mixing ratios indicate that both banks contained some proportion of groundwater, although not more than about 27% at any location (other than IIA-GW5, which was used as the groundwater end member). All samples taken from beneath the center of the streambed were calculated to contain 0% groundwater. The mixing ratios suggest that this site is heavily controlled by the surface water, as compared with other sites, and groundwater is not a major component of the shallow hyporheic zone (Figure 19).

The mixing ratios at Transects A and B at Site III also complement the general trends seen in the metal concentrations across the transects. Generally, both east and west banks contained similarly high proportions of groundwater according to the mixing ratios. Each transect exhibited increasing groundwater concentrations further from the center of the creek. Yet, even those samples below the center of the creek bed contained from 1 to 27% groundwater, depending on sample time and location. Thus, the east banks samples are interpreted to represent the local inflowing groundwater, due to the high metal concentrations found in the samples and because of the higher head in the east bank piezometer. Because of the undetectable head differences between the west bank and the surface water, there does not appear to be a strong gradient moving surface water into the groundwater or vice versa. This, in conjunction with the high concentrations of metals and the calculated proportion of groundwater in the west bank samples and in the center of the creek, suggest that the creek may be gaining water from all sides at this site.

***Chemical transition in the hyporheic zone***

No metals other than Ca and Mg (and in places Na and Cl) form linear plots of their concentration relationships, and their mixing ratios do not match those produced using the conservative elements. This indicates that chemical reactions are taking place in the hyporheic zone in conjuction with the physical mixing of the waters.

Examination of the bead columns with precipitation bands further indicates that physical mixing is not the only factor controlling the chemistry of the hyporheic zone. The highest concentrations of metal precipitates typically occurred right at the surface water - substrate boundary. These precipitation zones are interpreted to represent the portion of the hyporheic zone where acidic, reduced, and high-dissolved metal concentration water comes into contact with large enough amounts of the neutral, oxic, and more dilute surface water to induce the precipitation of metal oxides [*Benner et al.*, 1995]. Very minimal precipitation of metals is found on the white portions of the bead tubes below the red precipitation zones. These white portions are thus interpreted to have resided in more acidic and less oxic environments which are favorable to retaining metals in solution [*Stumm and Morgan*, 1970]. Such environments are found where larger proportions of groundwater are present. The concentrations of precipitates observed in the surface water portions of the bead columns are also relatively low. Therefore, conservative physical mixing between the two low solid-phase concentration zones cannot explain the thick bands of high metal concentration precipitates that separate the two. Instead, these zones of precipitation are products of chemical reactions which occur where the chemically distinct surface and groundwaters mix to the extent that metals in the groundwater become unstable in the dissolved phase due to the dilution by oxic and neutral surface water.

The precipitation of metals within the mixing zone agrees with chemical theories and field and laboratory observations of pH and Eh controlling the partitioning of metals into their dissolved and solid phases [*Stumm and Morgan,* 1970; *Chapman et al.,* 1983; *Nordstrom and Ball,* 1986; *Stollenwerk,* 1994]. In numerous studies on streams affected by acid mine drainage, researchers have illustrated the close correlation of dissolution/ precipitation and sorption/ desorption reactions with changing pH and redox conditions [*Theobald et al.,* 1963; *McKnight and Bencala,* 1990; *Davis et al.,* 1991; *Smith et al.,* 1992]. Generally, metals become increasingly less soluble in less acidic and more oxidizing conditions, and microbial action greatly accelerates the rate of redox reactions [*Nordstrom,* 1982]. The oxidation rate of Fe (II) to Fe (III) is pH dependent [*Nordstrom,* 1982], typically occuring between a pH of about 4.5 and 5.0, and commonly results in the formation of Fe oxides or oxyhydroxides [*McKnight and Bencala,* 1990]. At higher pH levels, metals such as Al, Cd, Cu, Mn, Pb, and Zn come out of solution and can sorb with the Fe oxides [*Johnson,* 1986; *Filipek et al,* 1987; *Rampe and Runnells,* 1989; *Callenderet al.,* 1991].

Most of the hyporheic zone water samples had near neutral pH levels, yet they commonly contained high levels of metal concentrations. This suggests that many of the metals remain in the dissolved phase (or in colloids <0.45 $\mu$m that can pass through the filter) at least until a near- neutral pH is reached. The relationship between pH levels and metal concentrations is seen in Figure 21. The relatively steady concentrations of metals such as Fe, Co, Mn, Mo, and Zn between pH levels of 2-6 contrast with the range of concentrations present between pH units 6 and 8, where the levels of dissolved metals concentrations drop drastically, presumably due to their precipitation or adsorption onto Fe oxides and mixing with the more dilute and oxic surface water. Constituents without clear pH- dependent dissolved phase concentrations are Ca, Mg, Na, Sr, Ti, Cl, and $NO_3^-$-N, at least for the pH ranges encountered in this study.

Interestingly, the behavior of dissolved As differs from that of the metals. At near neutral pH levels, As is observed to occur in solution (Figure 21), as reflected in the appearance of As in about half of the hyporheic zone water samples and in a few of the near-stream groundwater samples. As previously mentioned, dissolved As was not found above the detection limit of 0.07 mg/l in any of the floodplain piezometers sampled by Shay [1997] nor in the surface water. Of the hyporheic zone samples with detectable As concentrations, 88% had a pH between 6 and 7. What may be occurring is that the dissolved As captured in the samples had been in a chemical environment in which As is neither stable as associated with sulfides (as it is in reduced environments) nor with iron oxides (as it is in oxidized environments). The source for the As is likely the streambed sediments in the hyporheic zone, which were found to have average concentrations of 433 ppm (stdev= 75) in the <63 $\mu$m size fraction. Still, the bead columns show a very close correlation of solid As and Fe in precipitation zones, which is what was expected based on reports by other researchers [*DeCarlo and Thomas*, 1985; *Rampe and Runnells*, 1989; *Smith et al.*, 1992; *Moore*, 1994]. On all of the bead columns with measurable levels of As, the concentration profiles along the columns exactly matched those of Fe. This indicates that the As sorbs with iron oxyhydroxides in the hyporheic zone, where conditions are oxic and neutral enough to foster the precipitation of iron oxyhydroxides and

As. Thus, the water and bead samples captured two different phases of As existing in the hyporheic zone.

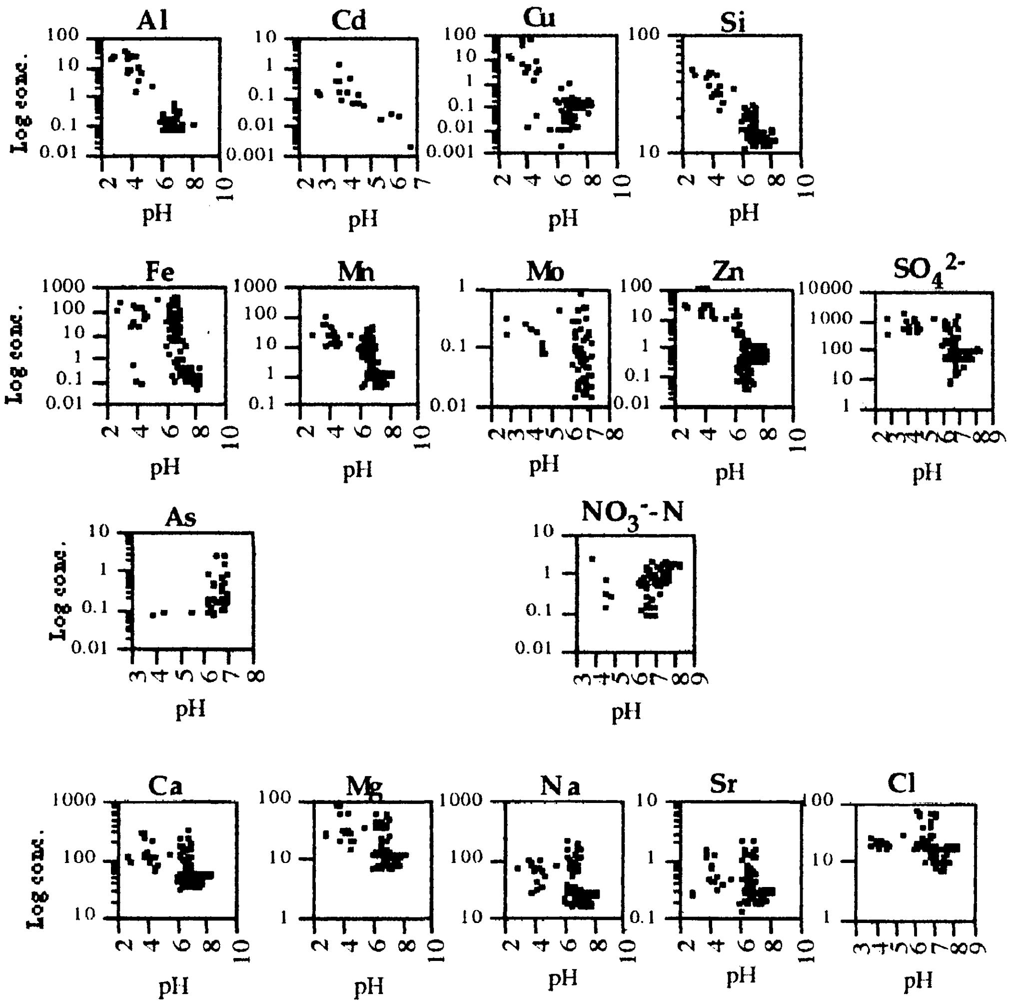



*Figure 21: Concentrations [mg/l] of elements versus pH levels. Note log scale. The graphs include data from all the surface, ground, and hyporheic zone water samples, in addition to 12 groundwater samples collected by Shay (1997).*

*Surface water infiltration versus groundwater upwelling:*

The low dissolved $SO_4^{2-}$, $NO_3^-$-N, and $O_2$ concentrations and the high alkalinity levels in many of the hyporheic zone samples (Table 5) can be explained by microbial reduction. Sulfate reduction occurs in less oxic environments than does $NO_3^-$ reduction [*Brock et al.*, 1994], meaning that $SO_4^{2-}$ reduction will not occur before $NO_3^-$ reduction in an increasingly reducing environment. This may suggest that $SO_4^{2-}$ reducing bacteria and

$NO_3^-$ reducing bacteria inhabit the zones where surface water infiltrates the hyporheic zone and supplies $SO_4^{2-}$, $NO_3^-$, and $O_2$ . The bacteria reduce the $NO_3^-$ and subsequently the $SO_4^{2-}$ as well, where the conditions become increasingly more reducing with depth. In their study of the hyporheic zone of Little Lost Man Creek in California, Triska et al. [1989] also attributed the non-conservative behavior on $NO_3^-$-N either to microbial uptake or dissimilatory reduction. The relatively high alkalinity levels associated with most of these samples can be attributed to the products of microbial respiration [*Brock et al.,* 1994]. These patterns are helpful in distinguishing between zones of surface water infiltration versus groundwater upwelling. These samples with the low $SO_4^{2-}$, $NO_3^-$-N, and $O_2$ concentrations are interpreted as having been taken from zones of surface water infiltration.

Precipitation patterns on some of the bead columns also aided in making the distinction between areas where surface water was infiltrating into the hyporheic zone versus where groundwater was upwelling. For example, bead columns with no precipitation zones (Columns IIA-1, IIA-2, IIB-2, and IIC-2 (Figure 22) exhibited a steady

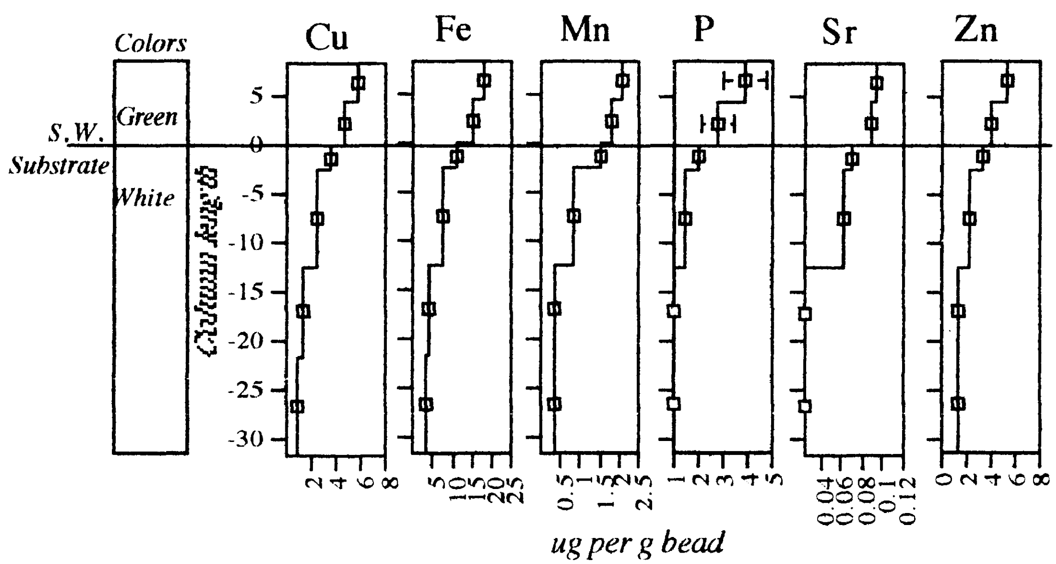



*Figure 22: Concentration of metals coatings on bead column IIC-2, an example of surface water infiltration along the length of the column. Metals whose concentrations are not shown were either below detection or did not exhibit any significant differences in concentrations along the length of the column.*

decresing trend of metals concentrations with depth and were interpreted as having been in zones of surface water infiltration. The concentrations of metals along the subsurface portions of these bead columns decrease with depth presumably due to redox gradients and dropping pH levels in the substrate, which will increasingly drive metals to go into solution. The relatively small but detectable amounts of accumulation on the surface water portions of the bead columns are thought to be products of redox reactions precipitating metals in the oxic, neutral pH surface water. They also may be due to elevated metal algal coatings on the beads.

Metal concentration trends along bead columns IA-2, IB-1 (Figure 23), IC-3, IIIA-1, IIIA-2, IIIA-3, and IIIC-3 are interpreted as being indicators of groundwater infiltration into the stream. On these columns, Fe concentrations come to a maximum lower down (i.e. deeper in the substrate) on the bead column than do metals such as Cu, Mn, and Zn. These other metals were found to precipitate out higher on the bead column, closer to the surface water. As discussed earlier, this sequence follows redox patterns found by other researchers in which Fe precipitates out more readily in conditions less oxic and alkalinity than those required for the precipitation of metals such as Mn, Cu, and Zn. Such conditions can be met with a greater proportion of neutral pH and more oxic surface water, and it is thought that the proportion of surface water in the hyporheic zone grades upward towards the surface water boundary. Thus, this sequence of metal concentrations can be interpreted as having been formed as a result of groundwater recharging the surface water. (It is possible that more bead columns exhibited this sequence of metals precipitation, but the separation of beads columns into no less than 2 cm sections for purposes of analysis was not on a small enough scale to detect the possible trends.)

On some of the bead columns (IA-2, IB-1, IB-3, IC-3, IIIA-1, IIIB-3, and IIIC-3), Cu, Mn, and Zn have their maximum concentrations on the surface water portions of the bead columns. These concentrations are significantly higher than the typical concentrations

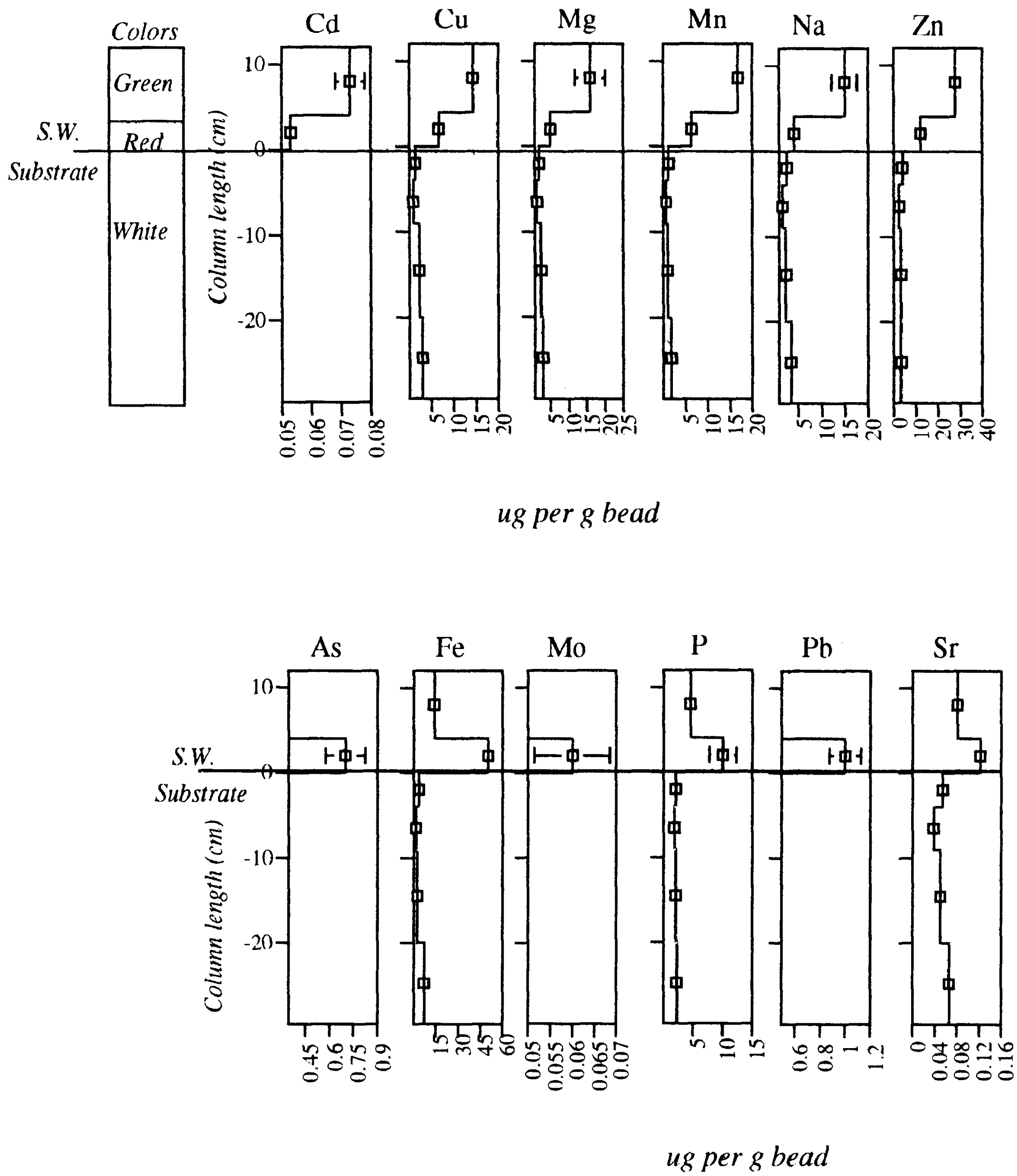



*Figure 23: Concentrations of metals along the length of bead column IB-1, an example of groundwater upwelling along the length of the column. Metals Al, Ca, not shown (Al, Ca, Ti) had no significant trends.*

of these metals found on most of the other surface water beads. This implies that the source for these metals must be in the upwelling groundwater and not in the surface water. It shows that these metals may stay in solution throughout their migration through the hyporheic zone and precipitate only once in the surface water.

The implication of these processes is that groundwater is upwelling into the creek in many areas, supplying dissolved As and metals to the stream sediments and water. Many of the metals appear to precipitate right at the surface water - substrate boundary, suggesting that the bed sediments are a sink for metals loading from the groundwater. Blowes et al. [1991] reported the presence of 1-5 cm thick "hardpans" at the depth of active oxidation of sulfide-rich tailings, and attributed their formation to the precipitation of iron hydroxide and oxyhydroxide minerals upon contact with porewater of increased pH. The thickness of these precipitation zones and processes of their formation are analogous to those found at the mixing zone at Silver Bow Creek. It is likely that hardpans do not form at Silver Bow Creek because the precipitation occurs on unstable creek sediments, which are continuously being transported downstream.

***Spatial and temporal controls on mixing:***

As illustrated by the mixing ratios, there appear to exist highly variable distributions of the degree of mixing on both spatial and temporal scales. The small scale heterogeneity in the groundwater chemistry across the site is likely an important chemical control on the variability of the hyporheic zone chemistry. A major physical control in the extent of mixing is thought to be the general groundwater to surface water flow direction relationships at the sites. This is seen at Site II, where surface water and groundwater flow approximately parallel to each other, and the stream subsurface was more dominated by surface water than at either of the other two sites. Sites I and III, where perpendicular relationships between groundwater and surface water exist, showed much stronger groundwater signatures in the chemistry of the water collected from their banks.

More complex spatial variability is seen in that the concentration of groundwater in each hyporheic zone water sample usually did not decrease with increasing proximity to the creek at Sites I and II. This is in contrast with the findings of Triska et al. [1989], who concluded that all well locations within 3.5 meters of the wetted channel at Little Lost Man Creek contained at least 80% stream water. An example of this variability is at sample site (IA-GW 3) below the center of the creek at Site I, which was found to consistently contain proportions of groundwater similar to or higher than those found in the east bank samples. The bead column which was set into the creek bottom a few centimeters away from the IA-3 water tube was found to have a large mixing zone as suggested by the thick and long (at least 30 cm) band of precipitation visible on the column. The solid and dissolved chemistry collected at this location show that zones of high groundwater concentrations are found 0-30 cm under the creek channel and not exclusively in the banks or at deeper levels below the creek bed. The water sampling tubes in the center of the creek at the other 2 transects (IB- and IC- GW3) at the site were set in slightly coarser-grained sediments and had concentrations nearly identical to those in the surface water, and the mixing equation showed no groundwater component in these samples. In these places, the grain size is largest and the sediments least consolidated, allowing for a less obstructed infiltration of surface water. This exemplifies the amount of spatial variability found at the sites, as well as the importance that small scale physical heterogeneities in the streambed sediments can have in controlling the degree and depth of surface water - groundwater mixing. Such physical controls by streambed topography and sediment size have been credited by other researchers as controlling the extent of surface water - groundwater interaction as well [*Bencala*, 1984; *Savant et al.*, 1987; *Thiobodeaux and Boyle*, 1987; *Valett et al.*, 1990;

*Harvey and Bencala,* 1993; *White,* 1993; *Pusch,* 1996; *Henry et al.,* 1984; *Vervier et al.,* 1992].

Physical factors may also complicate mixing within the banks. The sediments within the floodplain of Silver Bow Creek contain complex layers of variably sized grains due to the history of meandering and flooding of the creek. Thus, the mixing between surface water and groundwater within the banks of the creek is thought to take place in a series of complex settings which provide for variably sized and conductive flowpaths through which the waters can travel and mix. Evidence for this is seen in that a few of the bead columns exhibited two separate bands of precipitation (Figure 10) which are thought to be a product of the small scale interfingering of the chemically distinct surface and groundwaters. The importance of floodplain stratigraphy and permeability in controlling the spatial distribution of the hyporheic zone has been noted by other researchers as well [*Stanford and Ward,* 1993]. For instance, Ward et al. [1994] contend that the abundance of invertebrates residing within the Flathead River floodplain is largely determined by site-specific geomorphic and hydrogeologic features, as opposed to mere distance from the river channel. Similarly, Triska et al. [1993] reported that distance from the channel accounted for only 40% of the variance in nominal travel time of a chloride tracer injected into Little Lost Man Creek in California. They credited the rest of the variance to the complex flowpaths caused by heterogeneous structure, size, and hydraulic conductivity of the floodplain sediments.

In some places, such small scale flowpaths appear to have a stronger control on the mixing zone than do the general groundwater and surface water flow direction relationships. This is seen in the downgradient west bank of Site I, where all the bead columns (IA-1, IB-1, and IC-1) emerged with zones of precipitation on them at the surface water - substrate boundary, despite physical and chemical evidence from the water suggesting that the creek is recharging this area. A reddish streak on the surface water portion of the bead column IC-1 was noted, and the precipitation sequence on IB-1 implies that groundwater-rich water is infiltrating the surface water. Thus, groundwater flow may be strongly controlled by small scale flowpaths that defy the larger-scale flow directions and water with large groundwater compositions may be entering the creek along some portions of the downgradient banks. This means that the surface water is not uniformly dominating the chemistry in the west bank hyporheic zone, which was found by Benner et al. [1995] to be comprised almost entirely of inflowing surface water up to about 1 m in depth. Instead, the mixing zone appears to vary in width on the scale of centimeters. In some areas it may be a lot smaller and shallower than previously thought, with groundwater located much closer to the creek than indicated in the previous study.

Temporal variability in the Silver Bow Creek hyporheic zone is irregular as well. The amount of groundwater in the shallow hyporheic zone generally did not decrease with respect to increasing flow volumes in the creek. For example, transect IA was sampled four times, during which the flow rate measured 1050, 1250, 2800 and 6100 l/s in the creek. The amount of groundwater in the hyporheic zone was different at each location during each flow event, (according to the mixing ratios) and the concentrations of non-conservative elements changed as well. However, these changes did not form any particular patterns with the flow volume in the creek. The percent of groundwater calculated to be present at a rate of 6100 L/s was about 14%; at a rate of 2800 L/s, there was 58%; during a rate of 1250, there was 66%, and finally, during rate of 1050 there was 30% (Figure 18). This indicates that during high flow events, the hyporheic zone is not flushed out by the surface water, and mixing with groundwater continues. This is similar to the findings of Harvey et al. [1996], who found that hyporheic exchange occurred during both low and high base flow in St.Kevin Gulch, and in contrast to those of Legrand-Marcq and Laudelot [1985], who concluded that the influence of transient storage mechanisms are greatest during low flow. The hyporheic zone in Silver Bow Creek appears to continue to play a significant and sometimes larger role in solute transport into the creek during high flows, at least along certain portions of the creek. This process can be explained by the close hydrologic connection between the groundwater and the creek. Shay [1997] reported that rises in the water table of the adjacent aquifer brings larger volumes of groundwater into contact with the tailings, and this process causes the upper 1 m of groundwater to become significantly more contaminated with metals. This more highly contaminated and higher elevation groundwater is thought to continue to interact with the creek during the high flow events, causing the continued-- and in places, more extensive-- contamination of hyporheic zone.

***Groundwater impacts on the surface water:***

If dilution were the only control on the change in surface water chemistry with flow rate, the expected concentration change of conservative elements would be the same as the change in flow rate (a 7.5-fold change over the course of the study period). If the same sources and sinks were working on the system during all flow rate episodes in the creek, then no change in concentration would be observed. Transition metals (e.g. Fe, Cu, and Zn) generally do not have a well defined relationship with discharge, due to the various chemical, physical, and biological factors in the stream that may influence their concentrations at a given time (Forstner and Wittmann, 1979; Wetherbee and Kimball, 1991.) However, conservative elements should not be impacted by chemical changes in the stream. Yet, the concentrations of conservative elements increased by 150% and 170% for Ca and Mg, respectively, when flow rate was only 13% of the highest flow measured (Table 7). This suggests that dilution is not the only control on the surface water chemistry during high flow events and that there exists a source which contributes to the changing chemistry with flow rate.

Thus, this portion of Silver Bow Creek is not a losing reach, rather it was gaining dissolved Ca and Mg from some source, assumed to be the groundwater. Surface runoff was not observed on any surface water sampling dates, and thus it is assumed that direct floodplain runoff during the sampling period makes up only a small to insignificant portion of the source. Calculations of baseflow estimates, based on Ca and Mg concentrations, were made using the assumption that Ca and Mg behave conservatively and are of consistent concentrations in the groundwater within the entire site area and the upstream portions of the Silver Bow Creek system.

Estimates of the groundwater component (baseflow) in the surface water were made using the following mixing equation:

$$\%GW=[LF]-[HF]/[GW]-[HF] * 100$$

where
% GW= percent groundwater (baseflow) during low flow
[LF] = concentration of conservative element in surface water during low flow, when highest concentration was found
[HF]=concentration of conservative element in surface water during high flow, when lowest concentration was found
[GW]= average concentration of conservative element in groundwater (Ca = 175mg/l, Mg= 43 mg/l; Na = 65 mg/l; from Shay [1997])

As a conservative lower range estimate, the amount of Ca in the surface water high flow (35 mg/l) is assumed to not be of groundwater origin at all; thus, the equation yields 16% as a low-end estimate for the percent of groundwater in the surface water during low flow. Using Mg, the same percentage is found. For the high-end estimate, it is assumed that all the Ca and Mg come from the groundwater alone, and thus [HF]=0. In this case, the estimated percent groundwater in the surface water is calculated to be 33% according to Ca, and 30% according to Mg. Na concentrations show slightly higher percentages of baseflow, with 23% for the low end estimate and 43% for the high end estimate.

Due to the extent of contamination of the groundwater, this amount of loading into the surface water likely accounts for a significant amount of the contamination in the water and sediment of Silver Bow Creek.

## CONCLUSIONS

The quality of water in the hyporheic zone is impacted by the groundwater to a significant extent in many portions of the study area at Silver Bow Creek. High concentrations of metals were present during both low and high flows in this shallow subsurface periphery of the streambed. According to conservative element mixing calculations, half of the hyporheic zone samples (<30 cm below the creek bed) were composed of at least 20% groundwater. Many of the metals remained in their dissolved phases throughout the hyporheic zone and precipitated only once in the surface water or just a few centimeters below. The precipitation reactions appeared to be most strongly controlled by changes in pH. In some cases, Fe and associated elements were found to precipitate out deeper in the substrate than other more mobile metals such as Cu, Mn, and Zn, suggesting that groundwater is moving into the more neutral and oxic creek.

The heterogeneity of the subsurface water chemistry and the differences in precipitation on the beads illustrate the need for very detailed sampling in order to capture the small-scale flowpaths which appear to regulate the nature and magnitude of surface water and groundwater mixing. Sampling of a small area during a limited time cannot be used to adequately represent the entire system. Variations in local groundwater metal concentrations need to be considered as well as the physical controls on the extent of mixing between the surface water and the groundwater. In some locations, groundwater appears to infiltrate the creek even from downgradient locations. This indicates that small scale flowpaths on the scale of centimeters may have stronger controls on groundwater interaction with the hyporheic zone and surface water despite the larger scale flow paths in the adjacent alluvial aquifer.

Thus, the mixing of the groundwater with the surface water takes place in a series of complex physical settings which create a chemically heterogeneous hyporheic zone underlying and lateral to the creek bed. The product of the interaction is a transfer of metals into various depths of the hyporheic zone and into the stream channel, primarily into the solid phase. This precipitation of groundwater-borne metals onto stream and hyporheic zone sediments appears to be a constant source of pollution to the creek and must be recognized in remediation designs. In addition, the geochemical environment in the hyporheic zone creates a area in which As was found to be present in solution, although it is not found in solution in either the surface water or groundwater. Therefore, the hyporheic zone is a spatially and temporally heterogeneous, geochemically distinct environment in which metals and arsenic undergo chemical transformations which significantly control contaminant cycling between surface water and groundwater in the Silver Bow Creek hydrologic system.

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## Water levels at each site (Piezometers and staff gauges)

**SITE 1** (measurements in meters above sea level)

| **DATE** | Top of casing | 5/9/95 | 5/15/95 | 5/22/95 | 5/30/95 | 6/12/95 | 6/20/95 | 6/23/95 | 6/28/95 | 7/6/95 | 7/12/95 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **P-44 (E bank)** | 1602.952 | 1602.038 | 1602.075 | 1601.986 | 1601.895 | 1602.151 | 1602.038 | 1602.007 | 1601.953 | | 1602.050 |
| **Staff Gauge1** | 1603.083 | | | | | | | | | | |
| **P-38 (W bank)** | 1602.587 | 1601.916 | 1601.998 | 1601.895 | 1601.806 | 1602.081 | 1601.947 | 1601.916 | 1601.855 | 1601.767 | |
| ***L/s in creek*** | | *5437* | *5465* | *5295* | *4701* | *8297* | *6088* | *5295* | *4842* | *2888* | *5465* |
| | | | | | | | P38inSBC | | | | |
| **DATE** | | 7/19/95 | 8/15/95 | 8/24/95 | 8/27/95 | 8/31/95 | 9/27/95 | 10/1/95 | 10/20/95 | 11/3/95 | 11/4/95 |
| **P-44** | | 1601.910 | | | 1601.669 | | | 1601.709 | | | 1601.697 |
| **Staff Gauge 1** | | 1601.901 | 1601.663 | 1601.663 | 1601.657 | 1601.642 | 1601.666 | 1601.706 | 1601.706 | 1601.703 | 1601.383 |
| **P-38** | | 1601.843 | 1601.617 | 1601.593 | 1601.581 | 1601.569 | | 1601.596 | 1601.611 | 1601.587 | 1601.581 |
| ***L/s in creek*** | | *2803* | *1218* | *1048* | | *793* | *1246* | *2577* | *2747* | *2605* | *2662* |

**SITE II**

| **DATE** | Top of casing | 7/6/95 | 7/12/95 | 8/15/95 | 8/24/95 | 8/31/95 | 9/4/95 | 10/20/95 | 11/3/95 | 11/4/95 |
|---|---|---|---|---|---|---|---|---|---|---|
| **D-18 (S bank)** | 1603.278 | 1602.815 | 1602.980 | 1602.657 | 1602.654 | | 1602.635 | 1602.687 | 1602.678 | 1602.675 |
| **Staff Gauge 8** | 1603.617 | | | 1602.675 | 1602.660 | 1602.648 | 1602.648 | 1602.699 | 1602.687 | 1602.702 |
| **D-19 (N bank)** | 1603.778 | 1602.882 | | | | | 1602.666 | 1602.718 | 1602.693 | 1602.693 |
| ***L/s in creek*** | | *2888* | *5465* | *1218* | *1048* | *793* | *793* | *2747* | *2605* | *2662* |

**SITE III**

| **DATE** | Top of casing | 7/11/95 | 7/12/95 | 8/15/95 | 8/24/95 | 8/28/95 | 8/31/95 | 10/20/95 | 11/3/95 | 11/4/95 |
|---|---|---|---|---|---|---|---|---|---|---|
| **D-30 (W bank)** | 1604.269 | 1603.714 | 1603.708 | 1603.397 | 1603.388 | 1603.379 | 1603.379 | 1603.440 | 1603.419 | 1603.422 |
| **Staff gauge 10** | 1604.391 | | | 1603.385 | 1603.361 | 1603.355 | 1603.355 | 1603.413 | 1603.397 | 1603.391 |
| **D-31 (E bank)** | 1604.357 | 1603.742 | | | 1603.400 | 1603.397 | 1603.388 | 1603.452 | 1603.437 | 1603.431 |
| ***L/s in creek*** | | *5182* | *5465* | *1218* | *1048* | | *793* | *2747* | *2605* | *2662* |

| # | Sample Name | Sample Date | Analysis Date | Analysis Time | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Tl | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ICAPES data from water sample analysis on 7/5/95 | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | STD1 Blank | | | | 0.04847 | 0.0045 | 0.0114 | 0.00047 | 0.0009 | 0.25171 | 0.00095 | 0.00295 | 0 | 0.00042 | 0.00009 | 0.07376 | 0.00228 | 0.10319 | 0.03738 | 0.00495 | 0.02171 | 0.01985 | 0.0018 |
| 2 | STD2 | | 7/5/95 | 9:21 | | | 21.0062 | 2.30695 | 2.85233 | | 1.29247 | | 3.98757 | 2.13333 | | | | | 8.75271 | | 17.217 | | 3.0629 |
| 3 | STD3 | | 7/5/95 | 9:24 | 1.92266 | | | | | | | 1.60704 | | | 2.41338 | 10.0201 | 1.98399 | | | | | 2.66623 | |
| 4 | STD4 | | 7/5/95 | 9:27 | | 1.52071 | | | | 9.00252 | | | | | | | | 0.9028 | | 12.0843 | | | |
| 5 | STD8 | | 7/5/95 | 9:31 | | | | | | | | | | | | | | | | | | | |
| 6 | BLANK | | 7/5/95 | 9:34 | 0.006 | 0.001 | 0.062 | 0.0017 | 0.0018 | 0.0089 | 0.014 | -0.015 | 0.004 | -0.0004 | 0.0035 | 0.019 | 0.002 | 0.07 | -0.002 | 0.007 | -0.0009 | -0.002 | 0.0026 |
| 7 | USGS T107 | | 7/5/95 | 9:38 | 0.23 | 0.014 | 13.4 | 0.0181 | 0.0149 | 0.0451 | 0.0347 | 0.042 | 2.34 | 0.0522 | 0.018 | 23.2 | 0.032 | 0.15 | 0.026 | 0.441 | 0.066 | 0.0036 | 0.0908 |
| 8 | USGS T117 | | 7/5/95 | 9:42 | 0.073 | -0.003 | 23.6 | 0.0035 | 0.0065 | 0.0385 | 0.0059 | 0.502 | 11 | 0.2434 | 0.013 | 21.9 | 0.015 | 0.34 | 0.003 | 0.657 | 0.2777 | 0.0025 | 0.2008 |
| 9 | BLANK | 6/20/95 | 7/5/95 | 9:48 | 0.004 | 0.014 | 0.112 | 0.0009 | 0.0008 | 0.0196 | 0.0147 | 0.032 | 0.031 | 0.0127 | 0.0008 | 0.381 | 0.004 | 0.1 | 0.005 | 0.02 | 0.0015 | 0.0011 | 0.0394 |
| 10 | BLANK | 6/28/95 | 7/5/95 | 9:52 | 0 | 0.005 | 0.01 | 0.0006 | 0.0003 | 0.0191 | 0.0015 | -0.012 | 0.013 | 0.0007 | 0.0025 | 0.136 | 0.002 | 0.08 | 0 | 0.017 | 0.0011 | 0.0007 | 0.0103 |
| 11 | IA SWIII | 6/20/95 | 7/5/95 | 9:55 | 0.046 | 0.012 | 35.3 | 0.0018 | 0.0005 | 0.0274 | 0.0966 | 0.331 | 7.68 | 0.4445 | 0.0076 | 16.5 | 0.002 | 0.25 | 0 | 1.43 | 0.2007 | 0.0022 | 0.3831 |
| 12 | IB SWIII | 6/26/95 | 7/5/95 | 9:58 | 0.051 | 0.026 | 38.3 | 0.0027 | 0.0007 | 0.0231 | 0.1069 | 0.279 | 8.24 | 0.5197 | 0.0085 | 17.6 | 0.006 | 0.28 | -0.013 | 1.37 | 0.2161 | 0.0007 | 0.3993 |
| 13 | IC SWIII | 6/28/95 | 7/5/95 | 10:02 | 0.043 | 0.03 | 38.2 | 0.0033 | 0.0008 | 0.0229 | 0.1106 | 0.357 | 8.14 | 0.5555 | 0.0047 | 17.1 | 0.005 | 0.25 | -0.012 | 1.37 | 0.2105 | 0.0011 | 0.4996 |
| 14 | IA SWII | 6/20/95 | 7/5/95 | 10:05 | 0.063 | 0.013 | 35.3 | 0.0024 | 0.0015 | 0.0236 | 0.0962 | 0.338 | 7.71 | 0.4436 | 0.0074 | 16.5 | 0.004 | 0.26 | -0.019 | 1.42 | 0.2021 | 0.0018 | 0.3932 |
| 15 | IB SWII | 6/26/95 | 7/5/95 | 10:08 | 0.043 | 0.001 | 38.1 | 0.0025 | 0.0007 | 0.0205 | 0.09 | 0.261 | 8.16 | 0.4952 | 0.0085 | 17.5 | 0.006 | 0.26 | 0.002 | 1.36 | 0.2155 | 0.0004 | 0.3567 |
| 16 | IC SWII | 6/28/95 | 7/5/95 | 10:11 | 0.048 | 0.02 | 38.2 | 0.0027 | 0.0018 | 0.0263 | 0.1121 | 0.333 | 8.09 | 0.5546 | 0.0078 | 17.2 | 0.007 | 0.3 | 0.011 | 1.36 | 0.2101 | 0.0011 | 0.5289 |
| 17 | IA SWI | 6/20/95 | 7/5/95 | 10:14 | 0.048 | 0.005 | 34.5 | 0.0027 | 0.0008 | 0.022 | 0.0925 | 0.352 | 7.54 | 0.4709 | 0.0076 | 16.3 | 0.002 | 0.25 | -0.01 | 1.39 | 0.1981 | 0.0011 | 0.3708 |
| 18 | IB SWI | 6/26/95 | 7/5/95 | 10:17 | 0.041 | 0.021 | 37.9 | 0.0027 | 0.0012 | 0.0217 | 0.0811 | 0.249 | 8.1 | 0.4874 | 0.0041 | 17.3 | 0.004 | 0.24 | 0.001 | 1.35 | 0.2143 | 0 | 0.3344 |
| 19 | USGS T107 | | 7/5/95 | 10:21 | 0.238 | 0.015 | 12.8 | 0.0185 | 0.0132 | 0.0355 | 0.0317 | 0.039 | 2.23 | 0.0513 | 0.0154 | 22.5 | 0.037 | 0.1 | 0.036 | 0.417 | 0.0638 | 0.0011 | 0.0862 |
| 20 | BLANK | | 7/5/95 | 10:24 | 0.02 | -0.002 | 0.086 | 0.001 | 0.0005 | 0.0016 | 0.0096 | -0.01 | 0.014 | 0 | 0.0012 | 0.027 | 0.003 | 0.05 | -0.009 | 0.001 | 0.0006 | -0.0043 | 0.0019 |
| 21 | IC SWI | 6/28/95 | 7/5/95 | 10:28 | 0.043 | 0.028 | 38.3 | 0.0023 | 0.0013 | 0.027 | 0.0889 | 0.283 | 8.14 | 0.5836 | 0.0059 | 17.4 | 0.01 | 0.27 | -0.012 | 1.37 | 0.2099 | 0.0022 | 0.4419 |
| 22 | IA SWIV | 6/20/95 | 7/5/95 | 10:31 | 0.1 | 0.012 | 35.2 | 0.0024 | 0.0018 | 0.0276 | 0.1213 | 0.463 | 7.62 | 0.5238 | 0.0046 | 16.6 | -0.001 | 0.28 | -0.002 | 1.41 | 0.1979 | 0.0029 | 0.4725 |
| 23 | IB SWIV | 6/26/95 | 7/5/95 | 10:34 | 0.043 | 0.01 | 37.6 | 0.0032 | 0.0007 | 0.022 | 0.0859 | 0.275 | 8.01 | 0.4889 | 0.0067 | 17.4 | 0.003 | 0.26 | 0.009 | 1.34 | 0.2122 | 0.0007 | 0.3483 |
| 24 | IC SWIV | 6/28/95 | 7/5/95 | 10:37 | 0.05 | 0.012 | 37.5 | 0.0028 | 0.0005 | 0.0222 | 0.1066 | 0.332 | 7.97 | 0.5492 | 0.0076 | 17.1 | 0.004 | 0.4 | -0.02 | 1.34 | 0.2081 | 0.0004 | 0.5091 |
| 25 | IB SW0 | 6/26/95 | 7/5/95 | 10:40 | 0.051 | 0.016 | 38.4 | 0.0028 | 0.0017 | 0.0268 | 0.0852 | 0.198 | 8.1 | 0.4914 | 0.0062 | 17.3 | 0.004 | 0.28 | -0.016 | 1.35 | 0.2143 | 0.0016 | 0.3226 |
| 26 | IC SW0 | 6/28/95 | 7/5/95 | 10:43 | 0.052 | 0.016 | 37.6 | 0.0024 | 0.0028 | 0.023 | 0.0892 | 0.284 | 8 | 0.6568 | 0.0056 | 17.3 | 0.003 | 0.29 | 0.002 | 1.34 | 0.2077 | 0.0007 | 0.4344 |
| 27 | IA GW3 | 6/20/95 | 7/5/95 | 10:46 | 0.165 | 0.002 | 50.7 | 0.025 | 0.0099 | 0.0367 | 0.6017 | 7.15 | 11.9 | 4.425 | 0.0139 | 27.6 | 0.015 | 0.23 | -0.004 | 1.63 | 0.2768 | 0.0011 | 4.143 |
| 28 | IB GW3 | 6/26/95 | 7/5/95 | 10:49 | 0.034 | 0.003 | 37.4 | 0.0076 | 0.0028 | 0.0281 | 0.0656 | 0.186 | 8.04 | 0.5459 | 0.005 | 17.9 | 0.006 | 0.22 | 0.001 | 1.37 | 0.205 | 0.0014 | 0.4415 |
| 29 | IC GW3 | 6/26/95 | 7/5/95 | 10:51 | 0.024 | 0.039 | 37.4 | 0.0026 | 0.0025 | 0.024 | 0.0361 | 5.18 | 7.66 | 1.422 | 0.0135 | 16.8 | 0.005 | 0.25 | -0.017 | 1.51 | 0.1992 | 0 | 0.5782 |
| 30 | IA GW2 | 6/20/95 | 7/5/95 | 10:55 | 0.079 | 0.008 | 34.4 | 0.0024 | 0.0008 | 0.0216 | 0.1128 | 0.395 | 7.5 | 0.4474 | 0.0081 | 16.4 | 0 | 0.28 | -0.004 | 1.4 | 0.1976 | 0.0014 | 0.3955 |
| 31 | IB GW2 | 6/26/95 | 7/5/95 | 10:58 | 0.04 | 0.169 | 37.6 | 0.0018 | 0.0035 | 0.031 | 0.0225 | 6.36 | 7.81 | 1.886 | 0.017 | 18 | 0.006 | 0.26 | -0.001 | 1.35 | 0.2311 | 0.0018 | 0.2904 |
| 32 | IB GW2(2) | 6/26/95 | 7/5/95 | 11:01 | 0.025 | 0.11 | 36.4 | 0.0008 | 0.001 | 0.0244 | 0.0184 | 2.32 | 7.64 | 1.536 | 0.0114 | 17.8 | 0.005 | 0.21 | -0.006 | 1.31 | 0.2203 | 0.0011 | 0.2285 |
| 33 | IC GW2 | 6/28/95 | 7/5/95 | 11:04 | 0.038 | 0.13 | 44.8 | 0.0023 | 0.0025 | 0.0375 | 0.0059 | 29 | 8.8 | 4.206 | 0.0472 | 18.6 | 0.003 | 0.79 | 0.009 | 1.87 | 0.273 | 0.0014 | 0.0381 |
| 34 | IC GW2(2) | 6/28/95 | 7/5/95 | 11:07 | 0.026 | 0.108 | 41.8 | 0 | 0.0012 | 0.0384 | 0.0015 | 25.4 | 8.09 | 3.966 | 0.042 | 18 | 0.003 | 0.56 | 0.003 | 1.79 | 0.2449 | 0.0018 | 0.0415 |
| 35 | USGS T107 | | 7/5/95 | 11:10 | 0.246 | 0.013 | 12.7 | 0.0172 | 0.0142 | 0.0354 | 0.0306 | 0.081 | 2.2 | 0.0567 | 0.0179 | 22.5 | 0.034 | 0.17 | 0.015 | 0.413 | 0.0636 | 0.0013 | 0.0855 |
| 36 | BLANK | | 7/5/95 | 11:13 | 0.016 | -0.015 | 0.095 | 0.0005 | -0.0017 | 0.0075 | 0.0085 | -0.002 | -0.022 | 0.0009 | 0.0004 | 0.058 | 0 | 0.13 | -0.006 | 0.001 | 0.0009 | -0.0029 | 0.0022 |
| 37 | IA SW0 | 6/20/95 | 7/5/95 | 11:17 | 0.103 | 0.012 | 36 | 0.0026 | 0.0015 | 0.0317 | 0.1136 | 0.455 | 7.67 | 0.4776 | 0.007 | 16.8 | 0.006 | 0.73 | 0.005 | 1.43 | 0.2017 | 0.0047 | 0.4582 |
| 38 | USGS T117 | | 7/5/95 | 11:20 | 0.099 | 0.016 | 23.1 | 0.0044 | 0.0057 | 0.0374 | 0.0074 | 0.487 | 10.7 | 0.2402 | 0.0128 | 21.8 | 0.014 | 0.41 | 0.006 | 0.628 | 0.2733 | 0.0029 | 0.1997 |
| 39 | IA GW4 | 6/20/95 | 7/5/95 | 11:23 | 0.042 | 0.66 | 84.7 | 0.0028 | 0.0438 | 0.1835 | -0.017 | 396 | 22.5 | 35.36 | 0.86 | 63.8 | 0.01 | 0.21 | 0.042 | 2.09 | 0.4461 | 0.0004 | 1.337 |
| 40 | IB GW4 | 6/26/95 | 7/5/95 | 11:31 | 0.035 | 0.07 | 56.4 | 0.0007 | 0.0075 | 0.0529 | 0.0022 | 61.6 | 13.7 | 7.332 | 0.1899 | 36.5 | 0.007 | 0.28 | 0.006 | 1.64 | 0.3071 | 0.0007 | 0.1966 |
| 41 | IC GW4 | 6/28/95 | 7/5/95 | 11:33 | 0.062 | 0.058 | 34.7 | 0.0018 | 0.0008 | 0.0287 | 0.0354 | 7.82 | 7.28 | 0.8341 | 0.0569 | 17.5 | 0.001 | 0.4 | -0.012 | 1.25 | 0.1837 | 0.0029 | 0.1099 |
| 42 | IA GW1 | 6/20/95 | 7/5/95 | 11:36 | 0.055 | 0.796 | 79.3 | 0.0032 | 0.0085 | 0.0762 | 0.0258 | 88.6 | 14.3 | 15.37 | 0.1879 | 24.1 | 0.002 | 0.63 | 0.006 | 1.78 | 0.342 | 0.0025 | 0.1514 |
| 43 | IC GW1/2 | 6/28/95 | 7/5/95 | 11:39 | 29.4 | 0.021 | 162 | 0.1022 | 0.0755 | 0.126 | 18.22 | 26 | 25.5 | 29.72 | 0.0467 | 40.5 | 0.064 | 1.1 | -0.033 | 5.05 | 0.3078 | 0.0144 | 26.39 |
| 44 | IA GW6 | 6/20/95 | 7/5/95 | 11:42 | 20 | 0.016 | 107 | 0.1725 | 0.06 | 0.1328 | 13.67 | 114 | 28.8 | 25.67 | 0.1673 | 74.9 | 0.063 | 0.79 | 0.011 | 5.05 | 0.2565 | 0.0153 | 32.42 |
| 45 | IB GW6 | 6/26/95 | 7/5/95 | 11:45 | 23.2 | 0.005 | 93.2 | 0.1294 | 0.067 | 0.144 | 11.35 | 227 | 26.5 | 22.78 | 0.3225 | 74.1 | 0.061 | 0.61 | 0.025 | 4.82 | 0.2927 | 0.0061 | 24.17 |
| 46 | IC GW6 | 6/28/95 | 7/5/95 | 11:48 | 32.7 | 0.018 | 183 | 0.1177 | 0.0888 | 0.147 | 20.37 | 29.1 | 28.9 | 34.96 | 0.0488 | 43.1 | 0.073 | 1.2 | -0.024 | 5.49 | 0.3474 | 0.0173 | 29.27 |
| 47 | BLANK | | 7/5/95 | 11:51 | 0.087 | 0.008 | 0.367 | 0.0005 | 0.0007 | 0.0095 | 0.0428 | 0.099 | 0.064 | 0.0605 | 0.0157 | 0.103 | 0 | 0.13 | -0.014 | 0.009 | 0.0014 | -0.0022 | 0.0524 |
| 48 | BLANK | | 7/5/95 | 11:54 | 0.03 | 0.019 | 0.07 | 0.0014 | 0.0003 | 0.0093 | 0.0147 | 0.018 | 0.026 | 0.0127 | 0.0077 | 0.035 | 0.001 | 0.14 | 0.018 | 0 | 0.0005 | -0.002 | 0.011 |
| 49 | USGS T117 | | 7/5/95 | 11:57 | 0.099 | -0.01 | 23.9 | 0.0038 | 0.0043 | 0.0422 | 0.0088 | 0.518 | 11 | 0.248 | 0.0199 | 22.5 | 0.016 | 0.43 | 0.012 | 0.647 | 0.2807 | 0.004 | 0.2076 |
| 50 | USGS T107 | | 7/5/95 | 12:00 | 0.245 | 0.009 | 13 | 0.0179 | 0.0125 | 0.0389 | 0.0336 | 0.045 | 2.21 | 0.0516 | 0.0245 | 23.1 | 0.031 | 0.2 | 0.016 | 0.417 | 0.0646 | 0.0018 | 0.0869 |
| 51 | IB GW1 | 6/26/95 | 7/5/95 | 12:04 | 0.393 | 1.62 | 109 | 0.0033 | 0.0179 | 0.0876 | 0.1748 | 71.3 | 20.7 | 19.9 | 0.1508 | 31.1 | 0.011 | 0.35 | 0.042 | 2.05 | 0.6179 | 0.0164 | 0.3843 |
| 52 | IC GW1 | 6/28/95 | 7/5/95 | 12:08 | 0.189 | 0.149 | 124 | 0.0007 | 0.0033 | 0.0923 | 0.0413 | 175 | 21.5 | 13.1 | 0.2533 | 41 | 0.048 | 0.21 | 0.04 | 2.39 | 1.453 | 0.0122 | 0.1391 |
| 53 | IA GW5 | 6/20/95 | 7/5/95 | 12:11 | 3.72 | 0.06 | 62.6 | 0.0041 | 0.0309 | 0.0639 | 0.0454 | 54.2 | 14.8 | 10.63 | 0.0786 | 35 | 0.039 | 0.21 | -0.004 | 2.33 | 0.3054 | 0.0014 | 13.46 |
| 54 | IB GW5 | 6/26/95 | 7/5/95 | 12:14 | 20.2 | 0.079 | 119 | 0.0828 | 0.0643 | 0.1246 | 2.702 | 181 | 32.9 | 23.65 | 0.2561 | 70.1 | 0.068 | 0.36 | 0.082 | 3.81 | 0.4873 | 0.0022 | 17.25 |
| 55 | IC GW5 | 6/28/95 | 7/5/95 | 12:18 | 0.256 | 0.006 | 30.7 | 0.0024 | 0.0025 | 0.0281 | 0.1434 | 1.57 | 7.08 | 0.4282 | 0.0083 | 17.7 | -0.002 | 0.27 | 0.009 | 1.05 | 0.1441 | 0.0061 | 0.2258 |
| 56 | IA GW1/2 | 6/20/95 | 7/5/95 | 12:21 | 0.144 | 0.058 | 41.4 | 0.027 | 0.0112 | 0.0449 | 0.1803 | 3.61 | 7.32 | 8.153 | 0.0092 | 22 | 0.011 | 0.27 | -0.011 | 1.61 | 0.1893 | 0.0029 | 13 |
| 57 | IB GW1/2 | 6/26/95 | 7/5/95 | 12:24 | 0.04 | 0.191 | 45.4 | 0.0014 | 0.0005 | 0.0276 | 0.0122 | 6.26 | 7.94 | 1.33 | 0.0202 | 16.4 | 0.004 | 0.67 | -0.011 | 1.51 | 0.2098 | 0.0022 | 0.0689 |

ICAPES data from water sample analyses on 7/23/95 and 7/24/95

| # | Sample Name | Sample date | Analysis Date | Analysis Time | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Tl | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 219 | IA-SW1(2) | 7/19/95 | 7/23/95 | 16:46 | 0.051 | 0.022 | 46.4 | 0.0034 | 0.0009 | -0.0062 | 0.1262 | 0.145 | 10.1 | 0.8257 | 0.0056 | 21.6 | 0.006 | 0.09 | -0.01 | 1.41 | 0.2598 | -0.0026 | 0.7043 |
| 273 | IA-SWII | 7/19/95 | 7/24/95 | 14:30 | 0.059 | 0.011 | 45 | 0.0026 | -0.0001 | 0.01 | 0.1299 | 0.163 | 9.66 | 0.8158 | 0.0049 | 20.7 | 0.001 | 0.17 | 0.012 | 1.35 | 0.2489 | 0.0013 | 0.7249 |
| 289 | IA-SWII | 7/19/95 | 7/24/95 | 15:19 | 0.063 | 0.016 | 45.9 | 0.0028 | 0.001 | 0.0136 | 0.1313 | 0.173 | 9.66 | 0.8352 | 0.0064 | 21 | 0.002 | 0.21 | 0.015 | 1.37 | 0.2528 | 0.002 | 0.7358 |
| 304 | IA-SWII | 7/19/95 | 7/24/95 | 16:09 | 0.073 | 0.014 | 46.4 | 0.0024 | 0.0004 | 0.0102 | 0.1342 | 0.172 | 9.68 | 0.8438 | 0.0072 | 21.5 | 0.002 | 0.19 | -0.008 | 1.38 | 0.2558 | 0.001 | 0.7418 |
| 319 | IA-SWII | 7/19/95 | 7/24/95 | 16:53 | 0.079 | 0.007 | 46.6 | 0.0027 | 0.001 | 0.012 | 0.1363 | 0.172 | 9.6 | 0.85 | 0.0061 | 21.5 | 0.004 | 0.21 | 0.013 | 1.38 | 0.2551 | 0.0013 | 0.7403 |
| 334 | IA-SWII | 7/19/95 | 7/24/95 | 17:40 | 0.084 | 0.011 | 45.1 | 0.003 | -0.0004 | 0.014 | 0.1306 | 0.169 | 9.22 | 0.8221 | 0.0057 | 20.9 | -0.001 | 0.26 | -0.003 | 1.33 | 0.2457 | 0.0016 | 0.7161 |
| 349 | IA-SWII | 7/19/95 | 7/24/95 | 18:24 | 0.084 | 0.016 | 45.2 | 0.003 | 0.0007 | 0.0141 | 0.1313 | 0.177 | 9.12 | 0.8235 | 0.0059 | 21 | 0.004 | 0.26 | 0.002 | 1.33 | 0.2456 | 0.0016 | 0.7145 |
| 363 | IA-SWII | 7/19/95 | 7/24/95 | 19:05 | 0.091 | 0.011 | 45.7 | 0.0026 | 0.0001 | 0.0136 | 0.1335 | 0.186 | 9.19 | 0.8346 | 0.0056 | 21.3 | 0.003 | 0.27 | 0.004 | 1.34 | 0.2481 | 0.0013 | 0.7214 |
| 375 | IA-SWII | 7/19/95 | 7/24/95 | 19:40 | 0.088 | 0.007 | 45.4 | 0.0027 | 0.0013 | 0.0181 | 0.1313 | 0.187 | 9.07 | 0.8308 | 0.0034 | 21.1 | 0.003 | 0.31 | 0.004 | 1.33 | 0.2453 | 0.002 | 0.7144 |
| 206 | BLANK C | 7/11/95 | 7/23/95 | 16:02 | 0.018 | 0.009 | 0.006 | -0.0001 | 0.0006 | -0.0062 | -0.0003 | 0.001 | 0.026 | 0.0012 | 0 | -0.006 | 0.001 | -0.03 | -0.016 | 0.003 | -0.0003 | -0.0018 | 0.0087 |
| 207 | BLANK A | 7/17/95 | 7/23/95 | 16:06 | 0.009 | -0.01 | 0.039 | 0.001 | 0.0005 | -0.0005 | 0.0007 | 0 | 0.014 | 0.0012 | 0.0009 | 0.057 | 0.004 | 0.01 | -0.001 | 0.005 | 0.0001 | -0.0002 | 0.0352 |
| 208 | BLANK C | 7/17/95 | 7/23/95 | 16:09 | 0.023 | 0.017 | 0.11 | 0.001 | 0.0026 | -0.0051 | 0.0063 | 0.018 | 0.034 | 0.0062 | 0.0014 | 0.044 | 0.001 | 0 | 0.012 | 0.011 | 0.0002 | 0.0011 | 0.0427 |
| 341 | IA-GW1 | 7/19/95 | 7/24/95 | 18:01 | 0.069 | 0.26 | 68.1 | 0.0008 | 0.0007 | 0.0437 | 0.0007 | 77.4 | 11.7 | 8.373 | 0.1176 | 29.1 | 0.002 | 0.76 | 0.011 | 1.62 | 0.4956 | 0.0016 | 0.0636 |
| 313 | IA-GW2 | 7/19/95 | 7/24/95 | 16:35 | 0.06 | 0.355 | 86.4 | 0.0014 | 0.0037 | 0.0479 | 0 | 73.1 | 14.6 | 9.63 | 0.1143 | 29.8 | 0.003 | 0.98 | 0.022 | 1.76 | 0.652 | 0.002 | 0.0723 |
| 310 | IA-GW3 | 7/19/95 | 7/24/95 | 16:27 | 1.43 | 0.009 | 105 | 0.1108 | 0.0362 | 0.0684 | 1.806 | 55.8 | 25.5 | 16.29 | 0.0823 | 60.1 | 0.042 | 0.18 | 0.042 | 2.32 | 0.5375 | 0.0013 | 13.28 |
| 325 | IA-GW4 | 7/19/95 | 7/24/95 | 17:14 | 0.072 | 0.765 | 63.8 | 0.0025 | 0.0177 | 0.149 | -0.0242 | 418 | 20 | 28.57 | 0.6077 | 80.9 | 0.001 | 0.02 | 0.07 | 2.16 | 0.3434 | 0.001 | 0.5324 |
| 338 | IA-GW5 | 7/19/95 | 7/24/95 | 17:52 | 20.6 | 0.112 | 85.3 | 0.0076 | 0.0548 | 0.0919 | -0.0042 | 125 | 23.1 | 21.07 | 0.1764 | 65.1 | 0.062 | 0.18 | 0.055 | 4.4 | 0.3891 | 0.0012 | 26.9 |
| 374 | IA-GW5 | 7/19/95 | 7/24/95 | 19:37 | 19.9 | 0.097 | 84.4 | 0.0076 | 0.0548 | 0.0937 | 0.0042 | 124 | 22.3 | 20.89 | 0.1743 | 64.5 | 0.062 | 0.2 | 0.035 | 4.32 | 0.3823 | 0.0016 | 26.34 |
| 352 | IA-GW6 | 7/19/95 | 7/24/95 | 18:33 | 21.6 | 0.041 | 140 | 0.2694 | 0.0708 | 0.1484 | 15.42 | 112 | 37.3 | 37.01 | 0.1587 | 100 | 0.079 | 1.2 | 0.024 | 5.37 | 0.469 | 0.0153 | 43.7 |
| 366 | IA-SW1 | 7/19/95 | 7/24/95 | 19:14 | 0.081 | 0.006 | 46.4 | 0.0027 | 0 | 0.0154 | 0.1261 | 0.201 | 9.31 | 0.8237 | 0.0053 | 21.4 | 0.003 | 0.29 | 0.004 | 1.36 | 0.2518 | 0.002 | 0.7128 |
| 227 | IA-SW1 | 7/19/95 | 7/23/95 | 17:10 | 0.052 | 0.02 | 46.7 | 0.0032 | 0.0008 | -0.001 | 0.1322 | 0.193 | 10.1 | 0.8324 | 0.0058 | 21.4 | 0.004 | 0.14 | -0.004 | 1.43 | 0.259 | -0.001 | 0.7409 |
| 298 | IB-GW1 | 7/19/95 | 7/24/95 | 15:47 | 0.723 | 1.88 | 139 | 0.0056 | 0.0108 | 0.1082 | 0.3308 | 159 | 23.9 | 23.54 | 0.2593 | 39.9 | 0.005 | 0.36 | 0.123 | 2.23 | 0.9619 | 0.0385 | 0.3675 |
| 312 | IB-GW2 | 7/19/95 | 7/24/95 | 16:33 | 0.067 | 0.098 | 42.9 | 0.0009 | 0.0016 | 0.0183 | 0.0214 | 10.7 | 8.47 | 2.322 | 0.0218 | 21.4 | 0 | 0.21 | 0.001 | 1.39 | 0.2575 | 0.0016 | 0.2702 |
| 322 | IB-GW3 | 7/19/95 | 7/24/95 | 17:05 | 0.085 | 0.02 | 42.8 | 0.0029 | 0.0025 | 0.0122 | 0.0913 | 1.2 | 8.8 | 0.7739 | 0.0086 | 21.1 | 0.001 | 0.19 | 0.004 | 1.33 | 0.2316 | 0.0016 | 0.5112 |
| 323 | IB-GW4 | 7/19/95 | 7/24/95 | 17:08 | 0.067 | 0.045 | 60.8 | 0.0011 | 0.0099 | 0.0436 | 0.0126 | 63.5 | 14.3 | 7.726 | 0.0942 | 36.2 | 0.007 | 0.27 | 0.027 | 1.68 | 0.3109 | 0.0013 | 0.4897 |
| 353 | IB-GW6 | 7/19/95 | 7/24/95 | 18:35 | 16.1 | 0.079 | 98.5 | 0.1382 | 0.0601 | 0.1444 | 4.575 | 317 | 27.6 | 24.25 | 0.4467 | 79 | 0.061 | 0.35 | 0.058 | 5.46 | 0.3203 | 0.0044 | 23.81 |
| 262 | IB-SW1 | 7/19/95 | 7/24/95 | 13:58 | 0.054 | 0.024 | 45.7 | 0.0025 | 0.0006 | 0.0097 | 0.1229 | 0.215 | 9.92 | 0.7943 | 0.0075 | 20.6 | 0.001 | 0.13 | 0.019 | 1.38 | 0.2553 | 0.001 | 0.6293 |
| 271 | IA-SWIII | 7/19/95 | 7/24/95 | 14:24 | 0.073 | 0.019 | 45.4 | 0.0029 | 0.0003 | 0.0098 | 0.1447 | 0.298 | 9.74 | 0.8669 | 0.0086 | 21.1 | 0.003 | 0.17 | 0.019 | 1.37 | 0.251 | 0.001 | 0.8368 |
| 221 | IA-SWII(2) | 7/19/95 | 7/23/95 | 16:52 | 0.056 | 0.022 | 45.3 | 0.003 | 0.0008 | -0.0034 | 0.1382 | 0.238 | 9.77 | 0.8251 | 0.0048 | 21 | 0.006 | 0.14 | -0.012 | 1.38 | 0.2512 | -0.001 | 0.7492 |
| 261 | IA-SWII(3) | 7/19/95 | 7/24/95 | 13:55 | 0.058 | 0.015 | 45.7 | 0.003 | -0.0006 | 0.0091 | 0.1352 | 0.245 | 9.88 | 0.8235 | 0.0058 | 20.8 | 0 | 0.14 | 0.003 | 1.38 | 0.253 | 0.002 | 0.7476 |
| 210 | IA-SW1 | 7/19/95 | 7/23/95 | 16:17 | 0.042 | 0.016 | 46.3 | 0.0036 | 0.0009 | -0.0006 | 0.1309 | 0.195 | 10.1 | 0.8184 | 0.0067 | 21.1 | -0.001 | 0.11 | -0.012 | 1.41 | 0.2554 | -0.0008 | 0.7346 |
| 188 | BLANK | 7/11/95 | 7/23/95 | 15:02 | 0.03 | -0.008 | -0.001 | 0.0003 | -0.0001 | 0.0204 | -0.048 | 0.001 | -0.017 | -0.0011 | -0.0007 | -0.07 | 0 | 0.14 | -0.006 | 0.001 | 0.0009 | 0.0032 | -0.0078 |
| 186 | BLANK | 7/17/95 | 7/23/95 | 14:55 | 0.013 | 0.005 | 0.032 | 0.0008 | 0 | 0.0209 | -0.0501 | -0.001 | -0.014 | -0.0002 | -0.0023 | -0.005 | 0 | 0.14 | -0.012 | 0.002 | 0.0011 | 0.0035 | 0.0212 |
| 189 | BLANK | 7/19/95 | 7/23/95 | 15:05 | 0.024 | 0.009 | 0.029 | 0.0015 | 0.0009 | 0.0195 | -0.0476 | 0.008 | 0.002 | 0.0004 | -0.0005 | -0.041 | -0.004 | 0.16 | -0.007 | 0.001 | 0.001 | 0.0035 | 0.0128 |
| 190 | BLANK | 7/17/95 | 7/23/95 | 15:08 | 0.021 | -0.003 | 0.006 | 0.0002 | 0.0003 | 0.0198 | -0.049 | 0 | -0.024 | -0.0015 | -0.0009 | -0.031 | 0.001 | 0.13 | -0.005 | 0.002 | 0.0009 | 0.0032 | -0.0081 |
| 295 | IIIA-GW1 | 7/10/95 | 7/24/95 | 15:37 | 0.21 | 0.152 | 245 | 0.0008 | 0.0113 | 0.05 | -0.006 | 35.1 | 59.3 | 5.04 | 0.0538 | 210 | 0.016 | 0.22 | 0.008 | 2 | 2.176 | 0.0036 | 2.584 |
| 316 | IIIB-GW1 | 7/11/95 | 7/24/95 | 16:44 | 0.083 | 0.191 | 170 | 0.001 | 0.0062 | 0.0614 | -0.0025 | 104 | 42.9 | 9.615 | 0.1548 | 159 | -0.002 | 1.5 | 0.034 | 2.12 | 1.218 | 0.003 | 0.1674 |
| 369 | IIIB-GW1 | 7/17/95 | 7/24/95 | 19:23 | 0.13 | 0.228 | 174 | -0.0002 | 0.0061 | 0.0659 | 0.006 | 115 | 42.1 | 9.415 | 0.1713 | 159 | 0.003 | 1.1 | 0.023 | 2.22 | 1.26 | 0.0095 | 0.1914 |
| 292 | IIIB-GW1 | 7/17/95 | 7/24/95 | 15:27 | 0.107 | 0.229 | 173 | 0.0009 | 0.0052 | 0.0636 | 0.0049 | 112 | 44.1 | 9.334 | 0.1672 | 155 | 0.004 | 1.1 | 0.018 | 2.25 | 1.271 | 0.0097 | 0.1942 |
| 318 | IIIA-GW2 | 7/10/95 | 7/24/95 | 16:50 | 0.143 | 0.09 | 173 | 0.0009 | 0.0557 | 0.0568 | -0.007 | 57.4 | 37.4 | 10.39 | 0.0862 | 112 | 0.026 | 0.16 | 0.003 | 1.98 | 1.667 | 0.0021 | 14.89 |
| 302 | IIIB-GW2 | 7/17/95 | 7/24/95 | 16:02 | 0.055 | 0.012 | 96.7 | 0.0008 | 0.0012 | 0.0197 | 0.0232 | 3.55 - | 23 | 2.64 | 0.0075 | 79.2 | -0.001 | 0.21 | -0.005 | 1.08 | 0.8377 | 0.0016 | 0.4111 |
| 314 | IIIA-GW2(2) | 7/10/95 | 7/24/95 | 16:39 | 0.129 | 0.097 | 170 | 0.0009 | 0.0534 | 0.0564 | -0.0077 | 59.8 | 37 | 10.33 | 0.0923 | 111 | 0.023 | 0.13 | 0.024 | 1.98 | 1.653 | 0.0015 | 14.5 |
| 303 | IIIA-GW3 | 7/10/95 | 7/24/95 | 16:06 | 0.059 | 0.011 | 46.3 | 0.0023 | 0.0084 | 0.0197 | 0.0471 | 6.83 | 9.88 | 1.737 | 0.0167 | 24.2 | 0.002 | 0.18 | 0.013 | 1.35 | 0.3225 | 0.002 | 2.869 |
| 309 | IIIB-GW3 | 7/11/95 | 7/24/95 | 16:24 | 0.088 | 0.026 | 56.2 | 0.0016 | 0.0117 | 0.0296 | 0.0443 | 17.4 | 13.4 | 4.401 | 0.0278 | 29.7 | 0.006 | 0.14 | 0.016 | 1.54 | 0.426 | 0.003 | 2.782 |
| 308 | IIIB-GW3 | 7/17/95 | 7/24/95 | 16:21 | 0.07 | 0.027 | 46.4 | 0.0016 | 0.0036 | 0.0144 | 0.0513 | 0.903 | 10.2 | 1.601 | 0.0087 | 22 | 0.004 | 0.16 | 0.006 | 1.43 | 0.2887 | 0.002 | 0.8178 |
| 373 | IIIA-GW4 | 7/10/95 | 7/24/95 | 19:34 | 0.327 | 0.26 | 154 | 0.001 | 0.0045 | 0.0779 | 0.1377 | 117 | 36.3 | 15.04 | 0.1742 | 81.5 | 0.007 | 0.45 | 0.064 | 2.36 | 1.381 | 0.0156 | 0.228 |
| 327 | IIIA-GW4 | 7/10/95 | 7/24/95 | 17:20 | 0.276 | 0.259 | 158 | 0.001 | 0.0053 | 0.0758 | 0.1356 | 121 | 37.9 | 15.39 | 0.1823 | 82.7 | 0.004 | 0.44 | 0.074 | 2.41 | 1.431 | 0.0125 | 0.2315 |
| 311 | IIIB-GW4 | 7/11/95 | 7/24/95 | 16:30 | 0.138 | 0.111 | 147 | -0.0001 | 0.0441 | 0.065 | -0.0039 | 72.6 | 35.5 | 12.91 | 0.1068 | 78.1 | 0.016 | 1.3 | 0.018 | 2.34 | 1.338 | 0.0021 | 6.39 |
| 329 | IIIB-GW4 | 7/17/95 | 7/24/95 | 17:25 | 0.156 | 0.117 | 152 | 0.0003 | 0.0441 | 0.0676 | -0.0105 | 79.4 | 36.2 | 13.11 | 0.1149 | 80.6 | 0.021 | 1.4 | 0.017 | 2.36 | 1.391 | 0.002 | 6.347 |
| 342 | IIIA-GW5 | 7/10/95 | 7/24/95 | 18:04 | 0.055 | 0.416 | 156 | 0.0003 | 0.0224 | 0.1344 | -0.0214 | 318 | 45.6 | 23.25 | 0.4579 | 84.9 | 0.004 | 0.35 | 0.051 | 2.17 | 0.6998 | 0.0016 | 0.3936 |
| 344 | IIIB-GW5 | 7/11/95 | 7/24/95 | 18:10 | 0.077 | 0.328 | 159 | 0.001 | 0.0142 | 0.1607 | -0.0267 | 350 | 42 | 34.55 | 0.5082 | 93 | 0 | 0.63 | 0.042 | 2.2 | 0.7599 | 0.002 | 0.0482 |
| 340 | IIIB-GW5 | 7/17/95 | 7/24/95 | 17:58 | 0.173 | 0.299 | 152 | 0.0005 | 0.0126 | 0.1524 | 0.0386 | 339 | 39.7 | 31.45 | 0.4919 | 93.1 | -0.001 | 0.02 | 0.065 | 2.19 | 0.7932 | 0.0049 | 0.1977 |
| 339 | IB-GW5 | 7/19/95 | 7/24/95 | 17:55 | 11.5 | 0.078 | 105 | 0.0599 | 0.0456 | 0.0995 | 0.9349 | 148 | 27.6 | 20.66 | 0.2082 | 72.5 | 0.045 | 0.2 | 0.097 | 3.5 | 0.4378 | 0.002 | 12.72 |
| 226 | IB-SWII | 7/19/95 | 7/23/95 | 17:06 | 0.076 | 0.011 | 45.9 | 0.0025 | -0.0014 | -0.0065 | 0.1481 | 0.428 | 9.98 | 0.8178 | 0.0062 | 21.5 | 0.006 | 0.12 | 0.005 | 1.41 | 0.2585 | -0.0011 | 0.6834 |
| 371 | IIIB-SWI | 7/17/95 | 7/24/95 | 19:29 | 0.106 | 0.018 | 45 | 0.0029 | 0 | 0.0168 | 0.1177 | 0.312 | 9.04 | 0.8348 | 0.0059 | 20.1 | 0.001 | 0.3 | -0.007 | 1.36 | 0.2467 | 0.0044 | 0.6469 |
| 270 | IB-SWIII | 7/19/95 | 7/24/95 | 14:21 | 0.08 | 0.028 | 45.1 | 0.0025 | 0.0021 | 0.0124 | 0.1243 | 0.276 | 9.66 | 0.8058 | 0.007 | 20.3 | 0 | 0.17 | 0.014 | 1.35 | 0.2493 | 0.002 | 0.6629 |
| 272 | IB-SWIII | 7/19/95 | 7/24/95 | 14:26 | 0.069 | 0.013 | 45.4 | 0.0026 | 0.0006 | 0.0126 | 0.1433 | 0.299 | 9.72 | 0.8665 | 0.0074 | 20.9 | 0.003 | 0.14 | 0.017 | 1.37 | 0.2498 | 0.002 | 0.8374 |
| 222 | IIIB-SWI | 7/17/95 | 7/23/95 | 16:55 | 0.057 | 0.008 | 45.5 | 0.0031 | 0.0003 | -0.005 | 0.1233 | 0.3 | 9.88 | 0.8428 | 0.0079 | 20.4 | 0.007 | 0.13 | -0.009 | 1.43 | 0.2564 | 0.0008 | 0.6757 |
| 223 | IIIB-SWI | 7/11/95 | 7/23/95 | 16:57 | 0.34 | 0.027 | 36.5 | 0.0032 | 0.0014 | -0.0031 | 0.2177 | 0.432 | 7.88 | 0.7243 | 0.0056 | 21.1 | 0.003 | 0.21 | 0.011 | 1.34 | 0.2086 | 0.0092 | 0.5286 |

| # | Sample Name | Sample date | Analysis Date | Analysis Time | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 266 | IIIB-SWII | 7/17/95 | 7/24/95 | 14:09 | 0.282 | 0.037 | 36.6 | 0.0026 | 0.0019 | 0.0146 | 0.1654 | 0.346 | 7.87 | 0.6703 | 0.0043 | 19.3 | 0.002 | 0.29 | 0.02 | 1.31 | 0.2051 | 0.0099 | 0.4851 |
| 224 | IIIB-SWII | 7/17/95 | 7/23/95 | 17:00 | 0.053 | 0.024 | 45.5 | 0.0034 | 0.0008 | -0.0023 | 0.1332 | 0.23 | 9.9 | 0.7876 | 0.0067 | 20.3 | 0.004 | 0.17 | -0.007 | 1.45 | 0.2566 | -0.0011 | 0.7142 |
| 263 | IIIB-SWIII | 7/17/95 | 7/24/95 | 14:01 | 0.06 | 0.02 | 45.3 | 0.0036 | 0.0001 | 0.0129 | 0.1247 | 0.257 | 9.82 | 0.7889 | 0.0049 | 19.7 | 0 | 0.19 | 0.006 | 1.41 | 0.2538 | 0.0023 | 0.7118 |
| 211 | IIIB-SW0 | 7/11/95 | 7/23/95 | 16:20 | 0.155 | 0.02 | 36.3 | 0.0034 | 0.0015 | -0.0039 | 0.2624 | 0.296 | 7.83 | 0.9625 | 0.0041 | 21.2 | 0.006 | 0.11 | 0.004 | 1.3 | 0.1995 | 0.0019 | 0.6107 |
| 260 | IA-SW-II | 7/19/95 | 7/24/95 | 13:52 | 0.051 | 0.013 | 45.8 | 0.0033 | 0.0019 | 0.0146 | 0.1335 | 0.168 | 9.9 | 0.8267 | 0.0077 | 20.8 | 0.003 | 0.16 | 0.012 | 1.38 | 0.2519 | 0.0021 | 0.7361 |
| 268 | IIIB-SWIII | 7/11/95 | 7/24/95 | 14:15 | 0.245 | 0.021 | 36.7 | 0.0027 | 0.001 | 0.0091 | 0.1988 | 0.372 | 7.82 | 0.8962 | 0.0049 | 19.5 | 0.003 | 0.24 | 0.021 | 1.29 | 0.2039 | 0.0079 | 0.5997 |
| 147 | Std 1-(blank) | | 7/23/95 | 12:50 | 0.009 | -0.002 | 0.011 | 0.001 | 0.0017 | 0.0067 | 0.0101 | 0.003 | -0.015 | -0.0013 | 0.0012 | -0.049 | 0 | 0.03 | -0.003 | 0.016 | 0.0004 | 0.001 | 0.0012 |
| 150 | STD 2 | | 7/23/95 | 13:01 | -0.112 | 0.008 | 101 | 10.06 | 10.1 | 0.0561 | 10.12 | 0.033 | 99.7 | 10.11 | 0.0028 | 0.025 | 0.004 | 0.4 | 10 | 0.014 | 10.05 | 0.0029 | 10.07 |
| 143 | STD1-Blank | | 7/23/95 | 12:35 | 0.04776 | -0.0025 | 0.0111 | 0.00052 | 0.00095 | 0.2519 | 0.00809 | 0.00066 | 0.00099 | 0.00066 | 0.00009 | 0.08938 | 0.00257 | 0.10899 | 0.02785 | 0.00323 | 0.02214 | 0.01947 | 0.00757 |
| 196 | STD1-Blank | | 7/23/95 | 15:31 | 0.05209 | 0.0041 | 0.0128 | 0.00047 | 0.0008 | 0.27457 | 0.00119 | 0.00033 | -0.0003 | 0.00028 | -0.0002 | 0.08242 | 0.00176 | 0.12528 | 0.02485 | 0.00138 | 0.02409 | 0.02076 | 0.00161 |
| 253 | STD1-Blank | | 7/24/95 | 13:30 | 0.03952 | -0.0047 | -0.0115 | 0.00042 | 0.00071 | 0.31895 | 0.00133 | 0.00047 | 0.00033 | 0.00028 | 0 | 0.09761 | 0.00204 | 0.13004 | 0.0158 | 0.00461 | 0.02785 | 0.02414 | 0.00161 |
| 144 | STD2 | | 7/23/95 | 12:38 | | | 22.4144 | 2.39352 | 3.0168 | | 1.37804 | | 4.19557 | 2.19423 | | | | | 9.48161 | | 18.7241 | | 3.30738 |
| 199 | STD2 | | 7/23/95 | 15:41 | | | 23.1393 | 2.52742 | 3.09214 | | 1.43828 | | 4.09552 | 2.28752 | | | | | 9.23514 | | 19.1751 | | 3.32447 |
| 254 | STD2 | | 7/24/95 | 13:33 | | | 24.1922 | 2.62876 | 3.20919 | | 1.35723 | | 4.2539 | 2.282 | | | | | 10.5704 | - | 17.86 | | 3.62757 |
| 145 | STD3 | | 7/23/95 | 12:43 | 2.10057 | | | | | | | 1.72561 | | | 2.73652 | 10.7705 | 2.15228 | | | | | 2.98171 | |
| 200 | STD3 | | 7/23/95 | 15:44 | 2.00785 | | | | | | | 1.79738 | | | 2.76342 | 11.2097 | 2.31542 | | | | | 2.97123 | |
| 255 | STD3 | | 7/24/95 | 13:36 | 2.0258 | | | | | | | 1.74652 | | | 2.87038 | 10.01 | 2.2618 | | | | | 2.92114 | |
| 146 | STD4 | | 7/23/95 | 12:47 | | 1.74714 | | | | 9.56995 | | | | | | | | 1.00457 | | 12.7652 | | | |
| 201 | STD4 | | 7/23/95 | 15:47 | | 1.83166 | | | | 9.93447 | | | | | | | | 1.03814 | | 12.8493 | | | |
| 252 | STD4 | | 7/24/95 | 13:24 | | 1.89828 | | | | 9.85652 | | | | | | | | 1.09266 | | 13.1886 | | | |
| 256 | STD4 | | 7/24/95 | 13:39 | | 1.92857 | | | | 9.99914 | | | | | | | | 1.09666 | | 13.3682 | | | |
| 174 | STSD 2 | | 7/23/95 | 14:18 | 189 | 0.419 | 94.7 | 0.0114 | 0.1612 | 0.518 | 0.4571 | 370 | 94.6 | 7.177 | 0.6461 | 2.09 | 0.383 | 12 | 0.893 | 0.938 | 1.049 | 7.622 | 1.966 |
| 177 | USGS SED 2A | | 7/23/95 | 14:27 | 54.3 | 1.5 | 161 | 0.0834 | 0.0901 | 0.2052 | 11.17 | 209 | 42.8 | 14.35 | 0.3228 | 1.11 | 0.095 | 7.7 | 1.49 | 0.296 | 0.4505 | 3.743 | 14.35 |
| 148 | USGS T107 | | 7/23/95 | 12:54 | 0.232 | 0.011 | 13.3 | 0.0172 | 0.0126 | 0.0374 | -0.016 | 0.06 | 2.29 | 0.0508 | 0.0164 | 22.8 | 0.028 | 0.06 | 0.031 | 0.429 | 0.0655 | 0.0051 | 0.0736 |
| 181 | USGS T107 | | 7/23/95 | 14:39 | 0.244 | 0.006 | 13.5 | 0.0179 | 0.0126 | 0.0391 | -0.0139 | 0.067 | 2.26 | 0.0521 | 0.0185 | 23.6 | 0.033 | 0.15 | 0.037 | 0.425 | 0.0663 | 0.0048 | 0.083 |
| 198 | USGS T107 | | 7/23/95 | 15:36 | 0.229 | 0.009 | 13.2 | 0.018 | 0.0134 | 0.0137 | 0.0342 | 0.06 | 2.22 | 0.0527 | 0.0147 | 23.2 | 0.038 | 0.01 | 0.025 | 0.414 | 0.0638 | -0.0006 | 0.0886 |
| 203 | USGS T107 | | 7/23/95 | 15:53 | 0.254 | 0.016 | 12.9 | 0.0174 | 0.014 | 0.0158 | 0.0338 | 0.059 | 2.27 | 0.0512 | 0.0159 | 22.4 | 0.033 | 0.01 | 0.035 | 0.416 | 0.0625 | 0 | 0.0917 |
| 218 | USGS T107 | | 7/23/95 | 16:41 | 0.244 | 0.017 | 12.9 | 0.0164 | 0.012 | 0.0067 | 0.0318 | 0.057 | 2.27 | 0.0516 | 0.0156 | 23.1 | 0.035 | -0.01 | 0.018 | 0.418 | 0.0635 | -0.0021 | 0.0881 |
| 229 | USGS T107 | | 7/23/95 | 17:16 | 0.248 | 0.014 | 12.7 | 0.0168 | 0.0126 | 0.0024 | 0.0321 | 0.055 | 2.23 | 0.0514 | 0.0175 | 23.1 | 0.031 | -0.03 | 0.021 | 0.413 | 0.0627 | -0.0027 | 0.0868 |
| 258 | USGS T107 | | 7/24/95 | 13:45 | 0.246 | 0.025 | 12.7 | 0.0172 | 0.0144 | 0.0244 | 0.0316 | 0.057 | 2.24 | 0.0499 | 0.017 | 22.4 | 0.032 | 0.03 | 0.048 | 0.406 | 0.0629 | 0.0026 | 0.0861 |
| 274 | USGS T107 | | 7/24/95 | 14:32 | 0.241 | 0.017 | 12.4 | 0.0169 | 0.0117 | 0.018 | 0.0288 | 0.055 | 2.15 | 0.0497 | 0.0157 | 22.1 | 0.026 | 0.05 | 0.036 | 0.396 | 0.0615 | 0.001 | 0.0827 |
| 290 | USGS T107 | | 7/24/95 | 15:22 | 0.256 | 0.016 | 12.7 | 0.0164 | 0.0132 | 0.0246 | 0.0299 | 0.058 | 2.15 | 0.0501 | 0.017 | 22.4 | 0.03 | 0.08 | 0.033 | 0.402 | 0.0624 | 0.002 | 0.0846 |
| 305 | USGS T107 | | 7/24/95 | 16:12 | 0.26 | 0.014 | 12.9 | 0.0167 | 0.0134 | 0.0213 | 0.0302 | 0.059 | 2.18 | 0.0513 | 0.0173 | 23 | 0.032 | 0.09 | 0.035 | 0.409 | 0.0634 | 0.001 | 0.0863 |
| 320 | USGS T107 | | 7/24/95 | 16:57 | 0.282 | 0.011 | 13 | 0.0182 | 0.0135 | 0.0213 | 0.0295 | 0.061 | 2.17 | 0.0528 | 0.0177 | 23.3 | 0.031 | 0.09 | 0.032 | 0.409 | 0.0639 | 0 | 0.0876 |
| 335 | USGS T107 | | 7/24/95 | 17:43 | 0.267 | 0.01 | 12.8 | 0.0168 | 0.012 | 0.0214 | 0.0295 | 0.059 | 2.11 | 0.0511 | 0.0172 | 23 | 0.031 | 0.11 | 0.04 | 0.401 | 0.0626 | 0.001 | 0.0843 |
| 350 | USGS T107 | | 7/24/95 | 18:27 | 0.261 | 0.014 | 12.5 | 0.0164 | 0.012 | 0.0231 | 0.0281 | 0.059 | 2.05 | 0.0505 | 0.0147 | 22.5 | 0.029 | 0.16 | 0.029 | 0.39 | 0.061 | 0.0013 | 0.083 |
| 364 | USGS T107 | | 7/24/95 | 19:08 | 0.275 | 0.017 | 12.7 | 0.0174 | 0.0129 | 0.0226 | 0.0302 | 0.061 | 2.08 | 0.0515 | 0.0168 | 22.8 | 0.035 | 0.16 | 0.03 | 0.395 | 0.0618 | 0.001 | 0.0842 |
| 376 | USGS T107 | | 7/24/95 | 19:43 | 0.266 | 0.003 | 12.5 | 0.0168 | 0.0116 | 0.026 | 0.0295 | 0.058 | 2.03 | 0.0501 | 0.015 | 22.6 | 0.033 | 0.18 | 0.026 | 0.388 | 0.0607 | 0.0013 | 0.0822 |
| 149 | USGS T117 | | 7/23/95 | 12:58 | 0.079 | 0.014 | 23.7 | 0.0025 | 0.0041 | 0.034 | -0.0424 | 0.511 | 11.2 | 0.2438 | 0.0147 | 21.8 | 0.01 | 0.3 | -0.002 | 0.64 | 0.2792 | 0.0051 | 0.1874 |
| 182 | USGS T117 | | 7/23/95 | 14:42 | 0.099 | -0.007 | 24.4 | 0.0042 | 0.0047 | 0.0377 | -0.042 | 0.56 | 11.1 | 0.2509 | 0.013 | 22.5 | 0.01 | 0.37 | -0.002 | 0.644 | 0.2848 | 0.0051 | 0.1965 |
| 204 | USGS T117 | | 7/23/95 | 15:56 | 0.088 | 0.008 | 23.4 | 0.0045 | 0.0048 | 0.014 | 0.008 | 0.513 | 11 | 0.2419 | 0.0111 | 21.7 | 0.011 | 0.23 | -0.007 | 0.633 | 0.2732 | 0.0008 | 0.204 |
| 259 | USGS T117 | | 7/24/95 | 13:49 | 0.091 | 0.004 | 22.8 | 0.0029 | 0.0055 | 0.0181 | 0.006 | 0.5 | 10.8 | 0.2362 | 0.0153 | 21.4 | 0.011 | 0.22 | 0.028 | 0.611 | 0.2707 | 0.0023 | 0.1964 |
| 151 | BLANK | | 7/23/95 | 13:04 | 0.006 | -0.001 | 0.016 | -0.0002 | 0.0005 | 0.0053 | 0.0278 | 0.002 | -0.006 | -0.0009 | 0 | -0.066 | -0.001 | 0.05 | -0.007 | 0.002 | 0.0006 | 0.0006 | 0.001 |
| 179 | BLANK | | 7/23/95 | 14:34 | 0.044 | 0.004 | 0.032 | 0.0004 | 0.0005 | 0.0088 | 0.0261 | 0.067 | 0.003 | 0.0026 | 0.0017 | -0.101 | -0.004 | 0.09 | -0.002 | 0.001 | 0.0005 | 0.0013 | 0.0157 |
| 180 | BLANK | | 7/23/95 | 14:35 | 0.029 | -0.006 | 0.021 | 0.001 | 0 | 0.0086 | 0.032 | 0.027 | -0.006 | -0.0002 | 0.0004 | -0.097 | 0.002 | 0.11 | 0.006 | 0.001 | 0.0005 | 0.001 | 0.0091 |
| 192 | BLANK | | 7/23/95 | 15:14 | 0.037 | 0.016 | 0.014 | 0.0011 | 0.0006 | 0.002 | 0.0184 | 0.004 | -0.015 | -0.0015 | 0 | -0.101 | 0.001 | 0.13 | 0.001 | 0.001 | 0.0001 | -0.0013 | 0.0017 |
| 193 | BLANK | | 7/23/95 | 15:17 | 0.038 | 0.013 | -0.006 | 0.0003 | -0.0009 | 0.0053 | 0.0052 | 0 | -0.014 | 0.0009 | -0.0005 | -0.104 | -0.002 | 0.12 | -0.009 | -0.001 | 0.0001 | -0.0006 | 0.0007 |
| 195 | BLANK | | 7/23/95 | 15:28 | 0.03 | 0.017 | -0.007 | 0.0005 | -0.0009 | 0.006 | -0.0056 | 0 | -0.015 | -0.0017 | -0.0009 | -0.101 | 0.001 | 0.15 | -0.002 | -0.001 | 0.0001 | -0.0003 | 0.0013 |
| 197 | BLANK | | 7/23/95 | 15:33 | 0 | 0.006 | 0 | 0.0008 | 0 | -0.0027 | 0.0003 | 0 | 0.022 | 0 | 0.0014 | -0.003 | 0.006 | 0 | -0.01 | 0 | -0.0001 | -0.0008 | 0.0006 |
| 202 | BLANK | | 7/23/95 | 15:50 | 0.012 | 0.004 | 0.005 | 0.0011 | 0.0014 | -0.0011 | 0.003 | 0.002 | 0.008 | -0.0002 | 0.0005 | 0.017 | 0.004 | 0 | -0.006 | 0.009 | 0.0001 | 0.0002 | 0.0014 |
| 217 | BLANK | | 7/23/95 | 16:38 | 0.024 | 0.004 | 0.006 | 0.0009 | 0.0001 | -0.0116 | 0.0003 | 0.001 | -0.005 | 0 | 0 | -0.007 | 0.002 | -0.01 | -0.026 | 0.001 | -0.0005 | -0.0031 | 0.0011 |
| 228 | BLANK | | 7/23/95 | 17:13 | 0.025 | 0.002 | 0.007 | 0.0011 | -0.0001 | -0.0119 | 0.0033 | 0.001 | 0.035 | 0 | 0.0009 | -0.008 | 0 | 0.02 | 0.008 | 0.001 | -0.0006 | -0.0031 | 0.002 |
| 257 | BLANK | | 7/24/95 | 13:42 | 0.005 | 0.007 | 0.003 | 0.0001 | 0.0001 | 0.0107 | 0.0018 | -0.001 | -0.018 | -0.0006 | 0.0012 | 0.025 | 0 | 0.01 | 0.002 | 0.012 | 0.0006 | 0.0023 | -0.0008 |
| 275 | BLANK | | 7/24/95 | 14:37 | 0.018 | -0.009 | 0.019 | 0.0006 | -0.0001 | 0.0034 | 0.0042 | -0.001 | -0.009 | 0 | 0.001 | -0.002 | -0.002 | 0.04 | 0.007 | -0.001 | 0.0012 | 0 | 0.0024 |
| 291 | BLANK | | 7/24/95 | 15:24 | 0.034 | -0.003 | 0.008 | 0.0004 | -0.0003 | 0.0054 | -0.0004 | 0.001 | -0.007 | 0 | 0.0008 | 0.017 | -0.003 | 0.06 | 0.001 | -0.002 | 0.0012 | 0 | -0.0004 |
| 306 | BLANK | | 7/24/95 | 16:15 | 0.044 | 0.003 | 0.009 | 0.0007 | -0.0001 | 0.0065 | 0.0011 | 0.001 | 0.001 | 0.0002 | -0.0023 | -0.007 | -0.001 | 0.11 | 0 | -0.002 | 0.0002 | 0 | 0.0013 |
| 321 | BLANK | | 7/24/95 | 17:01 | 0.055 | -0.003 | 0.011 | 0.0002 | -0.0001 | 0.0048 | 0.0035 | 0 | 0.003 | 0 | 0.0003 | -0.007 | -0.001 | 0.12 | -0.002 | -0.002 | 0.0001 | -0.0003 | 0.0058 |
| 336 | BLANK | | 7/24/95 | 17:46 | 0.065 | 0.008 | 0.014 | 0.001 | -0.0004 | 0.0087 | 0.0014 | 0.001 | 0.011 | 0.0006 | -0.0013 | 0.008 | 0.001 | 0.14 | 0.004 | -0.002 | 0.0003 | 0.0003 | 0.0051 |
| 351 | BLANK | | 7/24/95 | 18:30 | 0.058 | 0.003 | 0.009 | 0.0005 | -0.0003 | 0.0037 | 0.0007 | 0 | 0.001 | 0 | -0.0012 | -0.01 | -0.002 | 0.14 | 0.001 | -0.002 | 0.0001 | -0.0007 | 0.0037 |
| 365 | BLANK | | 7/24/95 | 19:11 | 0.073 | 0.003 | 0.01 | 0.0009 | -0.0004 | 0.0098 | 0.0007 | 0.003 | 0.008 | 0.0002 | 0.0012 | -0.008 | 0.002 | 0.17 | -0.005 | -0.002 | 0.0002 | 0.0007 | 0.001 |
| 377 | BLANK | | 7/24/95 | 19:47 | 0.08 | -0.005 | 0.012 | 0.0008 | 0.0004 | 0.0103 | -0.0014 | 0.001 | -0.003 | 0.0004 | -0.0017 | 0 | -0.002 | 0.18 | 0.001 | -0.002 | 0.0003 | 0.001 | 0.0013 |

ICAPES data from water sample analysis on 8/30/95

| Sample Name | Sample Date | Analysis Date | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Tl | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BLANK | | 8/30/95 | 0 | 0.008 | 0.003 | 0.001 | 0.0011 | 0.0019 | -0.0047 | 0.003 | -0.001 | -0.0011 | 0.0002 | -0.005 | 0.005 | -0.01 | 0.012 | 0.037 | 0.0001 | 0 | 0.001 |
| USGS T107 | | 8/30/95 | 0.227 | 0.019 | 13.4 | 0.0175 | 0.0153 | 0.0346 | 0.0128 | 0.054 | 23 | 0.0525 | 0.0168 | 23 | 0.031 | 0.07 | 0.05 | 0.447 | 0.0651 | 0.0045 | -0.0497 |
| USGS T117 | | 8/30/95 | 0.065 | 0.012 | 23.7 | 0.0015 | 0.0059 | 0.0269 | -0.0131 | 0.513 | 11.2 | 0.2443 | 0.0135 | 22 | 0.014 | 0.26 | 0.014 | 0.651 | 0.2782 | 0.004 | 0.0672 |
| USGS T107 | | 8/30/95 | 0.228 | 0.003 | 13.1 | 0.0175 | 0.0129 | 0.0206 | 0.0313 | 0.057 | 2.29 | 0.0519 | 0.0164 | 22.5 | 0.032 | -0.01 | 0.021 | 0.415 | 0.0637 | 0.0016 | 0.081 |
| BLANK | | 8/30/95 | 0.001 | 0.02 | -0.001 | 0.0006 | 0.0003 | 0.0005 | 0.001 | 0 | 0.008 | 0.0004 | 0.0004 | -0.006 | 0.003 | -0.02 | 0.003 | -0.002 | 0 | 0 | 0.0011 |
| FIELD BLANK 1 | 8/27/95 | 8/30/95 | 0.004 | 0.014 | 0.012 | -0.0001 | -0.0005 | 0.0045 | 0.002 | 0.002 | 0.017 | 0.0015 | -0.0004 | 0.02 | 0.002 | 0 | 0.008 | -0.003 | 0.0003 | 0.0011 | 0.059 |
| FIELD BLANK | 8/27/95 | 8/30/95 | 0.002 | 0.002 | 0.009 | 0.0002 | -0.001 | 0.004 | 0.0013 | 0.004 | 0.005 | 0.0013 | 0.0006 | 0.016 | 0 | 0.01 | 0.008 | -0.004 | 0.0003 | 0.0008 | 0.041 |
| BLANK 1 | 8/28/95 | 8/30/95 | 0.01 | 0.017 | 0.054 | 0.0005 | 0.0014 | 0.0008 | 0.0034 | 0.019 | 0.015 | 0.006 | 0.0006 | 0.103 | -0.005 | -0.01 | 0.004 | -0.004 | 0.0003 | 0.0002 | 0.0219 |
| BLANK 2 | 8/27/95 | 8/30/95 | 0 | 0.016 | 0.014 | 0.0005 | 0.0008 | 0.0037 | 0.001 | 0.001 | 0.012 | 0.0028 | 0.0004 | 0.003 | 0.001 | 0.02 | -0.009 | 0.005 | 0.0003 | 0.001 | 0.012 |
| 8-1A-SWI | 8/24/95 | 8/30/95 | 0.029 | 0.005 | 55.8 | 0.0024 | 0.0002 | 0.0104 | 0.1616 | 0.1 | 12.5 | 1.141 | 0.0053 | 26 | 0.003 | 0.04 | -0.005 | 1.27 | 0.3032 | 0.0011 | 0.7957 |
| 8-1A-SWII | 8/24/95 | 8/30/95 | 0.03 | 0.014 | 55.7 | 0.0032 | -0.0003 | 0.0126 | 0.1657 | 0.102 | 12.4 | 1.146 | 0.0051 | 25.8 | 0.004 | 0.09 | -0.001 | 1.27 | 0.3004 | 0.0013 | 0.9802 |
| 8-1A-SWIII(2) | 8/24/95 | 8/30/95 | 0.023 | 0.004 | 55.3 | 0.0031 | 0.0005 | 0.0096 | 0.1455 | 0.087 | 12.4 | 1.117 | 0.0068 | 25.6 | 0.001 | 0.07 | 0.011 | 1.26 | 0.3015 | 0.0011 | 0.6584 |
| 8-1A-SWIII | 8/24/95 | 8/30/95 | 0.028 | 0.014 | 55.2 | 0.0032 | 0.0006 | 0.0098 | 0.1798 | 0.096 | 12.3 | 1.163 | 0.007 | 26 | 0.004 | 0.07 | 0.006 | 1.26 | 0.3 | 0.0008 | 1 |
| 8-1B-SWI | 8/27/95 | 8/30/95 | 0.035 | 0.005 | 57.7 | 0.0021 | 0.0014 | 0.0099 | 0.1468 | 0.091 | 13 | 1.144 | 0.0048 | 26.6 | 0.002 | 0.08 | -0.005 | 1.33 | 0.3224 | 0.001 | 0.5314 |
| 8-1B-SWII | 8/27/95 | 8/30/95 | 0.025 | 0.002 | 56.8 | 0.0035 | 0.0003 | 0.0076 | 0.1478 | 0.099 | 12.8 | 1.152 | 0.0054 | 26.3 | 0.005 | 0.05 | 0.012 | 1.32 | 0.3191 | 0.0003 | 0.6589 |
| 8-1B-SWIII | 8/27/95 | 8/30/95 | 0.03 | 0.006 | 56.4 | 0.0032 | 0.0003 | 0.0089 | 0.1606 | 0.123 | 12.7 | 1.153 | 0.0061 | 26.1 | 0.004 | 0.08 | 0.005 | 1.31 | 0.3154 | 0.0003 | 0.6858 |
| 8-1B-SWIII(2) | 8/27/95 | 8/30/95 | 0.027 | 0.012 | 58.3 | 0.0026 | 0.001 | 0.0108 | 0.1647 | 0.039 | 13.1 | 1.16 | 0.004 | 26.9 | 0.006 | 0.06 | 0.008 | 1.34 | 0.3261 | 0.0011 | 0.4645 |
| 8-1C-SWI | 8/27/95 | 8/30/95 | 0.023 | 0.011 | 56.1 | 0.0011 | 0.001 | 0.0068 | 0.0601 | 0.181 | 12.8 | 1.161 | 0.0056 | 26.5 | 0.002 | 0.03 | 0.007 | 1.31 | 0.3205 | 0.0002 | 0.3225 |
| 8-1C-SWII | 8/27/95 | 8/30/95 | 0.051 | 0.012 | 57.4 | 0.0034 | 0.0002 | 0.0122 | 0.1616 | 0.155 | 13 | 1.128 | 0.0044 | 26.2 | 0 | 0.09 | 0.008 | 1.33 | 0.3228 | 0.0018 | 0.6406 |
| 8-1C-SWIII | 8/27/95 | 8/30/95 | 0.048 | 0.019 | 57.3 | 0.0024 | 0.0006 | 0.0082 | 0.1267 | 0.105 | 13 | 1.19 | 0.0047 | 26.3 | 0.002 | 0.05 | 0.028 | 1.32 | 0.3227 | 0.0008 | 0.5629 |
| 8-IIIA-SWI | 8/28/95 | 8/30/95 | 0.03 | 0.013 | 57.8 | 0.0028 | 0.0008 | 0.0068 | 0.1294 | 0.087 | 13.2 | 1.129 | 0.0056 | 27.7 | 0.002 | 0.06 | 0.013 | 1.33 | 0.3301 | 0.0002 | 0.5063 |
| 8-IIIA-SWII | 8/28/95 | 8/30/95 | 0.029 | 0.006 | 57.8 | 0.0018 | 0.0002 | 0.0092 | 0.129 | 0.085 | 13.1 | 1.126 | 0.005 | 27.4 | 0.001 | 0.07 | 0.007 | 1.32 | 0.327 | 0.0008 | 0.5148 |
| 8-IIIA-SWIII | 8/28/95 | 8/30/95 | 0.035 | 0.01 | 57.4 | 0.0023 | 0.0005 | 0.0085 | 0.1532 | 0.135 | 13 | 1.181 | 0.0055 | 27 | 0.003 | 0.1 | 0.013 | 1.32 | 0.322 | 0.001 | 0.7711 |
| 8-IIIB-SWI | 8/28/95 | 8/30/95 | 0.037 | 0.008 | 58.1 | 0.0029 | 0.0006 | 0.0125 | 0.1183 | 0.212 | 13 | 1.27 | 0.0074 | 26.9 | 0.002 | 0.07 | 0.004 | 1.33 | 0.3224 | 0.001 | 0.6065 |
| 8-1A-SWI | 8/24/95 | 8/30/95 | 0.028 | 0.002 | 56.3 | 0.0031 | 0.0003 | 0.0094 | 0.164 | 0.103 | 12.6 | 1.152 | 0.006 | 26.3 | -0.003 | 0.1 | -0.012 | 1.28 | 0.3076 | 0.0011 | 0.8057 |
| 8-IIIB-SWII | 8/28/95 | 8/30/95 | 0.027 | 0.012 | 56.3 | 0.0026 | 0.001 | 0.0081 | 0.1737 | 0.143 | 12.7 | 1.199 | 0.0041 | 26.9 | 0.002 | 0.08 | 0.016 | 1.31 | 0.3143 | 0.001 | 0.9975 |
| 8-IIIB-SWIII | 8/28/95 | 8/30/95 | 0.032 | 0.001 | 57.6 | 0.0035 | 0.0002 | 0.0095 | 0.168 | 0.125 | 13 | 1.257 | 0.0049 | 27.3 | -0.004 | 0.09 | -0.007 | 1.33 | 0.3192 | 0.001 | 1.021 |
| 8-1A-GWI | 8/24/95 | 8/30/95 | 0.018 | 0.089 | 57.2 | 0.0003 | 0.0003 | 0.0161 | 0.0097 | 26.2 | 11.6 | 3.883 | 0.0422 | 27.8 | 0.001 | 0.84 | 0.01 | 1.58 | 0.3626 | 0.0013 | 0.0784 |
| 8-1A-GW1REP | 8/24/95 | 8/30/95 | 0.006 | 0.016 | 57.2 | -0.0009 | -0.0003 | 0.0156 | -0.0013 | 15.3 | 11.7 | 4.189 | 0.0275 | 27.8 | 0 | 0.01 | 0.009 | 1.51 | 0.3659 | -0.0002 | 0.1958 |
| 8-1A-GW2 | 8/24/95 | 8/30/95 | 0.006 | 0.108 | 87.8 | 0.0012 | 0.0013 | 0.0369 | -0.0047 | 50.6 | 15.8 | 8.607 | 0.0773 | 32.1 | 0.001 | 0.04 | -0.001 | 1.7 | 0.6734 | 0.001 | 0.0415 |
| 8-1A-GW2REP | 8/24/95 | 8/30/95 | 0.001 | 0.01 | 87.8 | -0.0011 | 0.001 | 0.0279 | 0.0017 | 18.3 | 16.2 | 8.614 | 0.031 | 33.1 | 0.008 | 0 | 0.01 | 1.47 | 0.6741 | 0.0003 | 0.0378 |
| BLANK | | 8/30/95 | 0.001 | 0.025 | 0.003 | -0.0002 | -0.0006 | -0.0024 | 0.0003 | 0.001 | 0.019 | 0.0004 | -0.0008 | -0.014 | 0.001 | -0.02 | -0.01 | -0.01 | 0 | -0.0006 | 0.0005 |
| 8-1A-SWI | 8/24/95 | 8/30/95 | 0.027 | 0.007 | 57 | 0.0023 | 0 | 0.0114 | 0.1657 | 0.103 | 12.7 | 1.164 | 0.006 | 26.5 | -0.001 | 0.06 | 0.018 | 1.29 | 0.3106 | 0.0011 | 0.8162 |
| 8-1A-GW3 | 8/24/95 | 8/30/95 | 10.4 | 0.005 | 111 | 0.1165 | 0.0452 | 0.0778 | 2.833 | 93.2 | 29.9 | 20.52 | 0.1296 | 65.7 | 0.044 | 0.03 | 0.367 | 3.3 | 0.5427 | 0.0013 | 16.65 |
| 8-1A-GW3REP | 8/24/95 | 8/30/95 | 4.98 | 0.012 | 104 | 0.1586 | 0.0418 | 0.0753 | 17.1 | 88.9 | 28.1 | 19.21 | 0.1243 | 61.9 | 0.046 | 0.33 | 0.405 | 3.02 | 0.5111 | 0.0019 | 17.41 |
| 8-1A-GW3(2) | 8/24/95 | 8/30/95 | 9.63 | 0.014 | 111 | 0.1406 | 0.0432 | 0.08 | 6.706 | 89.1 | 29.9 | 20.23 | 0.1238 | 65.8 | 0.045 | 0.09 | 0.37 | 3.25 | 0.543 | 0.0054 | 17.12 |
| 8-1A-GW3(2)REP | 8/24/95 | 8/30/95 | 6.11 | 0.006 | 107 | 0.1371 | 0.0431 | 0.0783 | 17.19 | 90.2 | 28.8 | 19.62 | 0.1272 | 63.1 | 0.05 | 0.32 | 0.327 | 3.07 | 0.5221 | 0.0024 | 17.01 |
| 8-1A-GW4 unfilt. | 8/24/95 | 8/30/95 | 0.288 | 0.539 | 45.3 | 0.0029 | 0.0037 | 0.0737 | 0.2527 | 201 | 14.9 | 15.4 | 0.2957 | 49.1 | -0.002 | 0.7 | 0.183 | 2.07 | 0.2023 | 0.0087 | 0.2403 |
| 8-1A-GW4REP | 8/24/95 | 8/30/95 | 0.002 | 0.086 | 43.6 | 0.0014 | 0.004 | 0.068 | -0.0188 | 162 | 14.5 | 14.79 | 0.2434 | 47.8 | 0 | -0.11 | 0.021 | 1.87 | 0.1889 | 0 | 0.059 |
| 8-1A-GW4 | 8/27/95 | 8/30/95 | 0.007 | 0.516 | 48 | 0.0019 | 0.0027 | 0.074 | -0.0074 | 199 | 15.9 | 16.43 | 0.2909 | 51.8 | 0.003 | 0 | 0.035 | 2.01 | 0.2152 | -0.0008 | 0.1564 |
| 8-1A-GW5 | 8/24/95 | 8/30/95 | 23.8 | 0.069 | 108 | 0.0036 | 0.0526 | 0.1051 | 0.0141 | 146 | 30.8 | 25.37 | 0.2036 | 71.7 | 0.058 | 0.02 | 0.043 | 4.9 | 0.463 | 0.0021 | 27.17 |
| 8-1B-GW2 | 8/27/95 | 8/30/95 | 0.029 | 0.135 | 51.4 | 0 | 0.0003 | 0.0154 | 0.0578 | 6.38 | 11.6 | 2.808 | 0.0155 | 25.8 | 0.006 | 0.26 | 0.003 | 1.31 | 0.2872 | 0.0029 | 0.1603 |
| 8-1B-GW3 | 8/27/95 | 8/30/95 | 0.002 | 0.007 | 50.9 | 0.0025 | -0.0002 | 0.0066 | 0.0494 | 0.404 | 11.2 | 0.899 | 0.0071 | 25.1 | 0.007 | 0.05 | 0.016 | 1.26 | 0.2728 | 0.0008 | 0.2961 |
| 8-1B-GW4 | 8/27/95 | 8/30/95 | 0.008 | 0.025 | 61.7 | 0 | 0.0027 | 0.0302 | 0.0242 | 50.8 | 15.6 | 6.712 | 0.0762 | 36.1 | 0.004 | 0.11 | -0.006 | 1.55 | 0.3218 | 0.0006 | 0.288 |
| 8-1B-GW5 | 8/27/95 | 8/30/95 | 2.5 | 0.088 | 124 | 0.0186 | 0.05 | 0.1383 | 0.0101 | 319 | 37 | 26.76 | 0.4447 | 81.8 | 0.052 | -0.1 | 0.057 | 3.62 | 0.4846 | 0.0016 | 9.933 |
| 8-1B-GW5(2) | 8/27/95 | 8/30/95 | 1.54 | 0.112 | 123 | 0.0176 | 0.0529 | 0.1374 | 0.0057 | 312 | 37.6 | 27.21 | 0.4358 | 84.7 | 0.044 | -0.15 | 0.041 | 3.66 | 0.4837 | 0.0019 | 10.71 |
| 8-1A-SWI | 8/24/95 | 8/30/95 | 0.022 | 0.006 | 55 | 0.0025 | 0.0005 | 0.0099 | 0.1606 | 0.11 | 12.4 | 1.118 | 0.0047 | 25.7 | 0.001 | 0.04 | -0.013 | 1.26 | 0.3 | 0.0014 | 0.7919 |
| 8-1C-GW2 | 8/27/95 | 8/30/95 | 0.004 | 0.195 | 67.5 | 0.0001 | 0.0003 | 0.0323 | 0.0034 | 54.6 | 12.7 | 7.498 | 0.0821 | 26.8 | 0.001 | 0.71 | 0.005 | 1.91 | 0.4727 | 0.0019 | 0.0631 |
| 8-1C-GW3 | 8/27/95 | 8/30/95 | 0.003 | 0.103 | 51.5 | 0.0006 | 0.0014 | 0.0138 | 0.0323 | 10.1 | 11.8 | 3.788 | 0.0208 | 26.3 | -0.001 | 0.23 | -0.011 | 1.45 | 0.2955 | 0.0006 | 0.1639 |
| USGS T107 | | 8/30/95 | 0.22 | 0.01 | 12.8 | 0.0159 | 0.0117 | 0.019 | 0.0316 | 0.06 | 2.28 | 0.0506 | 0.017 | 22.2 | 0.03 | -0.01 | 0.034 | 0.4 | 0.063 | 0.0016 | 0.0802 |
| BLANK | | 8/30/95 | 0.015 | 0.013 | 0.002 | 0.0003 | -0.0018 | -0.0001 | 0.0003 | 0.002 | 0 | 0.0002 | 0.0018 | 0 | -0.001 | -0.04 | -0.01 | -0.01 | 0.0001 | 0.0002 | 0.0005 |
| USGS T107 | | 8/30/95 | 0.219 | 0.006 | 12.6 | 0.0165 | 0.0114 | 0.015 | 0.0306 | 0.06 | 2.26 | 0.05 | 0.0154 | 22.1 | 0.028 | -0.02 | 0.011 | 0.395 | 0.0622 | 0.0011 | 0.0793 |
| 8-1C-GW4 | 8/27/95 | 8/30/95 | 0.06 | 0.067 | 64.3 | 0.0003 | 0.0045 | 0.0178 | 0.0534 | 9.42 | 14.4 | 3.24 | 0.0188 | 27.5 | 0.005 | 0.2 | 0 | 1.59 | 0.3568 | 0.0051 | 0.5604 |
| 8-1C-GW5 | 8/27/95 | 8/30/95 | 9.78 | 0.016 | 73.4 | 0.0732 | 0.0503 | 0.0646 | 8.381 | 70 | 20.2 | 16 | 0.0978 | 34.6 | 0.046 | 0.2 | 0.043 | 3.84 | 0.316 | 0.0022 | 18.69 |
| 8-IIIA-GW1 | 8/28/95 | 8/30/95 | 0.044 | 0.041 | 238 | 0.0001 | 0.0045 | 0.0156 | 0 | 16.6 | 61.1 | 4.832 | 0.0254 | 193 | 0.01 | 0.04 | 0.011 | 1.84 | 2.2 | 0.0021 | 0.3286 |
| 8-IIIA-GW2 | 8/28/95 | 8/30/95 | 0.086 | 0.046 | 166 | -0.0001 | 0.0534 | 0.053 | -0.0054 | 59.8 | 37.5 | 10.03 | 0.0885 | 103 | 0.018 | 0.08 | -0.005 | 1.99 | 1.628 | 0.0022 | 12.7 |
| 8-IIIA-GW3 | 8/28/95 | 8/30/95 | 0.009 | -0.003 | 62.7 | 0.0006 | 0.0103 | 0.0128 | 0.0366 | 9.69 | 14.5 | 2.469 | 0.0173 | 34.3 | 0.008 | 0 | -0.012 | 1.37 | 0.4716 | 0.001 | 3.499 |
| 8-IIIA-GW4 | 8/28/95 | 8/30/95 | 0.06 | 0.054 | 118 | -0.0008 | 0.0019 | 0.0373 | 0.0672 | 16.2 | 36.2 | 11.08 | 0.0282 | 72.8 | 0.003 | 0.08 | 0.011 | 1.83 | 1.244 | 0.0029 | 0.2673 |
| 8-IIIB-GW1 | 8/28/95 | 8/30/95 | 0.079 | 0.171 | 187 | 0.0005 | 0.0024 | 0.0513 | 0.0397 | 80.9 | 46.6 | 10.77 | 0.1275 | 150 | 0 | 0.1 | 0.029 | 1.93 | 1.672 | 0.0046 | 0.135 |
| 8-IIIB-GW2 | 8/28/95 | 8/30/95 | 0.011 | 0.037 | 116 | 0.0001 | -0.001 | 0.0329 | 0.0037 | 13.9 | 26.5 | 9.943 | 0.023 | 112 | 0.002 | 0.29 | -0.005 | 2.47 | 1.163 | 0.0013 | 0.0728 |
| 8-IIIB-GW3 | 8/28/95 | 8/30/95 | 0.771 | 0.011 | 88 | 0.0036 | 0.0246 | 0.039 | 0.4395 | 17.7 | 21.5 | 9.462 | 0.0293 | 41.6 | 0.009 | 0.17 | 0.052 | 1.67 | 0.6533 | 0.0335 | 7.306 |
| 8-IIIB-GW4 | 8/28/95 | 8/30/95 | 0.056 | 0.079 | 140 | 0 | 0.0244 | 0.0571 | -0.0047 | 56.4 | 36.1 | 12.11 | 0.0814 | 76.7 | 0.013 | 1.6 | -0.003 | 2.36 | 1.264 | 0.0032 | 0.4134 |
| 8-1A-SWI | 8/24/95 | 8/30/95 | 0.019 | 0.009 | 54.3 | 0.0025 | -0.0003 | 0.0097 | 0.1576 | 0.103 | 12.2 | 1.102 | 0.0056 | 25.5 | 0.002 | 0.05 | 0.016 | 1.24 | 0.2962 | 0.0018 | 0.786 |

| ICAPES data from water sample analysis on 9/25/95 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Name | Sample Date | Analysis Date | Analysis Time | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
| USGS T107 | | 9/25/95 | 13:39 | 0.25 | -0.003 | 12.4 | 0.0168 | 0.012 | 0.0052 | 0.0321 | 0.07 | 2.13 | 0.0506 | 0.0137 | 23.8 | 0.03 | 0.02 | 0.025 | 4.04 | 0.0619 | -0.002 | 0.087 |
| BLANK | | 9/25/95 | 13:44 | 0.03 | -0.018 | 0.005 | 0.0006 | -0.001 | -0.01 | -0.0024 | 0.008 | -0.014 | -0.0002 | -0.001 | -0.023 | -0.003 | 0.02 | 0 | 0 | -4.00E-04 | -0.003 | 0.0024 |
| USGS T107 | | 9/25/95 | 13:47 | 0.25 | -0.004 | 12.3 | 0.0164 | 0.0127 | 0.0068 | 0.0303 | 0.06 | 2.11 | 0.0492 | 0.0131 | 23.3 | 0.033 | 0.04 | 0.022 | 3.98 | 0.0607 | -0.002 | 0.0832 |
| FIELD BLANK 1 | 8/31/95 | 9/25/95 | 13:56 | 0.03 | -0.022 | 0.013 | 0.0008 | -0.0002 | -0.0139 | -0.0017 | 0.044 | -0.033 | 0.0009 | -0.0039 | 0.031 | -0.001 | 0.04 | -0.003 | 0.008 | -4.00E-04 | -0.003 | 0.0281 |
| 8-IIA-SWI | 8/31/95 | 9/25/95 | 13:59 | 0.11 | -0.006 | 54.4 | 0.0026 | 0.0009 | -0.0022 | 0.1669 | 0.409 | 12 | 1.104 | 0.0012 | 28.3 | -0.001 | 0.15 | -0.015 | 12.9 | 0.306 | 0.003 | 0.7471 |
| 8-IIA-SWII | 8/31/95 | 9/25/95 | 14:02 | 0.07 | -0.008 | 54.1 | 0.003 | -0.001 | -0.0013 | 0.1526 | 0.163 | 11.9 | 1.073 | 0.0023 | 28.1 | 0.001 | 0.13 | -0.006 | 12.7 | 0.3037 | -0.002 | 0.6191 |
| 8-IIA-SWIII | 8/31/95 | 9/25/95 | 14:05 | 0.07 | 0 | 53.4 | 0.0021 | 0.0007 | -0.0022 | 0.139 | 0.168 | 11.8 | 1.069 | 0.0017 | 28.1 | 0.005 | 0.12 | -0.009 | 12.6 | 0.3025 | -0.002 | 0.5414 |
| 8-IIB-SWI | 9/4/95 | 9/25/95 | 14:08 | 0.05 | 0.004 | 54.1 | 0.0029 | -0.0012 | -0.002 | 0.1516 | 0.072 | 12 | 1.041 | 0.0016 | 28.3 | -0.001 | 0.14 | -0.027 | 12.8 | 0.3114 | -0.002 | 0.455 |
| 8-IIB-SWII | 9/4/95 | 9/25/95 | 14:10 | 0.06 | -0.009 | 53.6 | 0.0028 | -0.0002 | 0.0001 | 0.1313 | 0.15 | 11.8 | 1.067 | 0.0023 | 27.8 | 0.002 | 0.17 | -0.003 | 12.8 | 0.3064 | -0.001 | 0.681 |
| 8-IIB-SWIII | 9/4/95 | 9/25/95 | 14:13 | 0.05 | 0.005 | 53.7 | 0.0027 | 0.0003 | -0.0015 | 0.1195 | 0.164 | 11.9 | 1.063 | 0.003 | 27.8 | -0.001 | 0.14 | -0.009 | 12.8 | 0.3098 | -0.002 | 0.5443 |
| 8-IIA-SWIII(2) | 8/31/95 | 9/25/95 | 14:16 | 0.06 | -0.006 | 53.9 | 0.0015 | 0 | -0.0019 | 0.1 | 0.114 | 11.9 | 1.077 | -0.0007 | 28.5 | -0.002 | 0.14 | -0.013 | 12.6 | 0.3058 | -0.002 | 0.3782 |
| 8-IIIC-SWI | 8/31/95 | 9/25/95 | 14:19 | 0.06 | -0.008 | 52 | 0.0041 | 0.0003 | 0.0002 | 0.1732 | 0.19 | 11.4 | 1.108 | 0.0026 | 27.4 | 0 | 0.17 | -0.017 | 12.3 | 0.2898 | -0.002 | 1.134 |
| 8-IIIC-SWII | 8/31/95 | 9/25/95 | 14:24 | 0.05 | -0.009 | 52.9 | 0.0036 | -0.0003 | -0.0024 | 0.1773 | 0.183 | 11.6 | 1.126 | 0.0022 | 28.2 | 0 | 0.12 | -0.002 | 12.6 | 0.2965 | -0.003 | 1.109 |
| 8-IIIC-SWI CHK | | 9/25/95 | 14:27 | 0.07 | 0.015 | 53.1 | 0.0039 | 0.0009 | 0.0007 | 0.177 | 0.194 | 11.6 | 1.132 | 0.0003 | 28 | -0.002 | 0.16 | -0.017 | 12.5 | 0.2956 | -0.002 | 1.156 |
| 8-IIB-SWI DUP | | 9/25/95 | 14:30 | 0.05 | 0.004 | 53.6 | 0.0027 | -0.0002 | -0.002 | 0.1523 | 0.071 | 11.8 | 1.033 | 0.0037 | 28.2 | 0.001 | 0.13 | 0 | 12.8 | 0.3089 | -0.002 | 0.4519 |
| USGS T107 | | 9/25/95 | 14:32 | 0.24 | -0.003 | 12 | 0.0162 | 0.0113 | 0.0063 | 0.0272 | 0.052 | 2.03 | 0.0486 | 0.0116 | 22.9 | 0.032 | 0.06 | 0.008 | 3.9 | 0.0594 | -0.002 | 0.0817 |
| IIIC-SWIII | 8/31/95 | 9/25/95 | 14:36 | 0.05 | 0.004 | 52.1 | 0.0033 | 0 | 0.001 | 0.1662 | 0.149 | 11.3 | 1.101 | 0.0011 | 27.3 | 0 | 0.18 | -0.007 | 12.3 | 0.2887 | -0.002 | 1.044 |
| IIIC-SWI DUP | 8/31/95 | 9/25/95 | 14:39 | 0.06 | -0.013 | 52 | 0.003 | 0.0002 | -0.0009 | 0.1746 | 0.189 | 11.4 | 1.112 | 0.0028 | 27.7 | 0.002 | 0.17 | 0.008 | 12.4 | 0.2905 | -0.002 | 1.138 |
| IIIC-SWII DUP | 8/31/95 | 9/25/95 | 14:42 | 0.07 | -0.005 | 53.3 | 0.0042 | 0.0007 | 0.0011 | 0.1777 | 0.184 | 11.5 | 1.132 | 0.0034 | 27.9 | 0.003 | 0.18 | 0.005 | 12.6 | 0.2952 | -0.002 | 1.114 |
| IIA-GW2 | 8/31/95 | 9/25/95 | 14:45 | 0.06 | 0.214 | 76.6 | 0.0004 | 0.0015 | 0.0204 | 0.0153 | 21.5 | 10.5 | 7.788 | 0.0356 | 26.8 | 0.002 | 0.28 | 0.004 | 20.3 | 0.4504 | -0.001 | 0.1661 |
| 8-IIA-GW3 | 8/31/95 | 9/25/95 | 14:47 | 0.05 | 0.015 | 48.4 | 0.0003 | -0.0012 | -0.0061 | 0.0439 | 0.999 | 10.7 | 0.9367 | 0.0046 | 27.5 | 0.001 | 0.16 | -0.001 | 13 | 0.2841 | -0.002 | 0.3736 |
| 8-IIA-GW4 | 8/31/95 | 9/25/95 | 14:50 | 0.06 | 0.136 | 61.2 | -4E-04 | 0.0019 | 0.0214 | 0.007 | 46.3 | 11.3 | 6.033 | 0.067 | 27 | 0.002 | 1.2 | 0.003 | 18.5 | 0.4374 | ###### | 0.1156 |
| 8-IIB-GW3 | 9/4/95 | 9/25/95 | 14:53 | 0.06 | 0 | 52.9 | 0.0021 | 0.0003 | -0.0018 | 0.1136 | 0.15 | 11.7 | 0.7139 | 0.0017 | 28 | 0.001 | 0.17 | -0.004 | 12.7 | 0.3004 | -0.002 | 0.567 |
| 8-IIB-GWI | 9/4/95 | 9/25/95 | 14:56 | 0.05 | 0.014 | 54.6 | 0.003 | -0.0002 | -0.0031 | 0.1171 | 0.17 | 12 | 1.057 | 0.0019 | 28.7 | 0.001 | 0.16 | -0.014 | 12.8 | 0.3142 | -0.002 | 1.078 |
| 8-IIB-GW2 | 9/4/95 | 9/25/95 | 14:59 | 0.09 | 0.724 | 54.5 | -3E-04 | 0.0019 | 0.0099 | 0.039 | 15.3 | 11.7 | 3.954 | 0.0297 | 27.7 | 0.002 | 0.16 | 0.001 | 12.4 | 0.3628 | 0.002 | 0.4714 |
| 8-IIB-GW4 | 9/4/95 | 9/25/95 | 15:02 | 0.05 | 0.06 | 68.6 | -1E-04 | 0.0005 | 0.0197 | 0.0063 | 37.9 | 13.8 | 5.888 | 0.0546 | 33.2 | 0.003 | 0.31 | 0.001 | 16.2 | 0.4894 | ###### | 0.243 |
| 8-IIA-GW3 | 8/31/95 | 9/25/95 | 15:04 | 0.06 | 0.019 | 48.6 | 0.0001 | 0 | -0.0042 | 0.0446 | 1 | 10.7 | 0.9408 | 0.0025 | 27.6 | -0.002 | 0.17 | 0.017 | 13.1 | 0.2841 | -0.002 | 0.3754 |
| 8-IIC-GW3 | 9/4/95 | 9/25/95 | 15:07 | 0.18 | 0.005 | 54.3 | 0.0042 | 0.0015 | 0.0021 | 0.2212 | 0.565 | 11.9 | 0.944 | 0.0029 | 28.4 | 0.001 | 0.25 | -0.004 | 13.3 | 0.3102 | 0.004 | 1.235 |
| 8-IIC-GW4 | 9/4/95 | 9/25/95 | 15:10 | 0.05 | 0.061 | 53 | -5E-04 | 0.0003 | 0.0047 | 0.0125 | 3.63 | 11.7 | 3.157 | 0.009 | 29 | 0.001 | 0.98 | -0.009 | 13.9 | 0.3034 | -0.002 | 0.0642 |
| 8-IIIC-GW3 | 8/31/95 | 9/25/95 | 15:13 | 0.12 | -0.012 | 104 | 0.0089 | 0.0355 | 0.0214 | 0.1996 | 16.6 | 24 | 6.738 | 0.0248 | 56.1 | 0.022 | 0.15 | 0.001 | 15.3 | 0.8486 | -0.002 | 13.74 |
| 8-IIA-SWI DUP | 8/31/95 | 9/25/95 | 15:16 | 0.12 | -0.015 | 54 | 0.0035 | 0 | 0.003 | 0.1658 | 0.401 | 11.7 | 1.099 | 0.0025 | 27.9 | 0 | 0.18 | -0.013 | 12.8 | 0.3005 | 0.004 | 0.7452 |
| 8-IIA-SWI DUP | 8/31/95 | 9/25/95 | 15:18 | 0.11 | 0.009 | 53.2 | 0.0037 | 0.0007 | 0.0023 | 0.1641 | 0.395 | 11.5 | 1.084 | 0.0012 | 27.6 | 0 | 0.18 | -0.019 | 12.6 | 0.2968 | 0.004 | 0.7352 |
| 8-IIIC-GW4 | 8/31/95 | 9/25/95 | 15:21 | 0.08 | 0.242 | 64.8 | 0.001 | 0.0103 | 0.0268 | 0.0425 | 22.8 | 14.5 | 10.15 | 0.0463 | 31.5 | 0.004 | 0.26 | 0 | 14.7 | 0.4184 | ###### | 0.4874 |
| 8-IIIC-GW5 | 8/31/95 | 9/25/95 | 15:24 | 0.05 | 0.392 | 63.6 | -4E-04 | 0.023 | 0.0545 | 0.0118 | 38.1 | 12.1 | 18.8 | 0.0634 | 32.5 | 0.002 | 0.12 | -0.014 | 20.6 | 0.38 | ###### | 1.75 |
| 8-IIIC-GW2 | 8/31/95 | 9/25/95 | 15:27 | 0.07 | 0.459 | 154 | 0.0006 | 0.0046 | 0.0764 | 0.0111 | 89.9 | 40.4 | 20.14 | 0.1353 | 130 | 0 | 1.9 | 0.021 | 26.2 | 1.217 | 5E-04 | 0.0929 |
| 8-IIC-GW2 | 9/4/95 | 9/25/95 | 15:30 | 2.6 | 0.32 | 76 | 0.0029 | 0.0033 | 0.0366 | 1.035 | 68.4 | 14.3 | 9.626 | 0.096 | 32.5 | 0.002 | 0.74 | 0.462 | 19.4 | 0.6133 | 0.119 | 0.8309 |
| 8-IIA-SWI DUP | 8/31/95 | 9/25/95 | 15:37 | 0.12 | 0.008 | 53.5 | 0.0037 | 0.0009 | -0.0019 | 0.1665 | 0.406 | 11.7 | 1.092 | 0.0021 | 28.2 | 0.001 | 0.16 | -0.003 | 12.7 | 0.301 | 0.004 | 0.742 |
| USGS T107 | | 9/25/95 | 15:40 | 0.25 | -0.002 | 12.2 | 0.0166 | 0.0118 | 0.0057 | 0.0272 | 0.056 | 2.05 | 0.0497 | 0.0118 | 23.4 | 0.033 | 0.12 | 0.005 | 3.98 | 0.0601 | -0.002 | 0.0833 |
| USGS T117 | | 9/25/95 | 15:43 | 0.12 | -0.002 | 22.1 | 0.0025 | 0.0039 | 0.0079 | 0.0021 | 0.506 | 9.96 | 0.2342 | 0.0085 | 22.3 | 0.008 | 0.31 | 0.002 | 6.02 | 0.2612 | ###### | 0.1956 |

**June/July 1995 Laboratory duplicates (water samples); Calculations worksheet**

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | |
| **Sample Name** | **IIA-SWI** | **IIA-SWI** | **%CHG** | **IIA-SWII** | **IIA-SWII** | **%CHG** | **IIIA-GW4** | **IIIA-GW4** | **%CHG** | **IB-SWIII** | **IB-SWIII** | **%CHG** | **IA-GW5** | **IA-GW5** | **%CHG** | **IA-SWII** | **IA-SWII** | **%CHG** | **IA-SWII** | **IA-SWII** | **%CHG** |
| **Sample Date** | 7/6/95 | 7/6/95 | | 7/6/95 | 7/6/95 | | | | | | | | | | | | | | | | |
| **Analysis Date** | 7/23/95 | 7/23/95 | | 7/24/95 | 7/24/95 | | 7/24/95 | 7/24/95 | | 7/24/95 | 7/24/95 | | 7/24/95 | 7/24/95 | | 7/24/95 | 7/24/95 | | 7/24/95 | 7/24/95 | |
| **Analysis Time** | 16:14 | 16:23 | | | 19:17 | | 19:34 | 17:20 | | 14:21 | 14:26 | | 17:52 | 19:37 | | 14:30 | 15:19 | | 16:09 | 16:53 | |
| **Al** | BDL | BDL | BDL | 0.065 | 0.091 | BDL | 0.327 | 0.276 | 16.915 | 0.08 | 0.069 | 14.765 | 20.6 | 19.9 | 3.457 | 0.059 | 0.063 | BDL | 0.073 | 0.079 | BDL |
| **As** | BDL | BDL | BDL | 0.015 | 0.009 | BDL | 0.26 | 0.259 | 0.385 | 0.028 | 0.013 | BDL | 0.112 | 0.097 | 14.354 | 0.011 | 0.016 | BDL | 0.014 | 0.007 | BDL |
| **Ca** | 42.9 | 42.5 | 0.937 | 41.9 | 41.8 | 0.239 | 154 | 158 | 2.564 | 45.1 | 45.4 | 0.663 | 85.3 | 84.4 | 1.061 | 45 | 45.9 | 1.980 | 46.4 | 46.6 | 0.430 |
| **Cd** | BDL | BDL | BDL | 0.0019 | 0.0026 | BDL | 0.001 | 0.001 | BDL | 0.0025 | 0.0026 | BDL | 0.0076 | 0.0076 | BDL | 0.0026 | 0.0028 | BDL | 0.0024 | 0.0027 | BDL |
| **Co** | BDL | BDL | BDL | 0.0007 | 0 | BDL | 0.0045 | 0.0053 | BDL | 0.0021 | 0.0006 | BDL | 0.0548 | 0.0548 | 0 | -0.0001 | 0.001 | BDL | 0.0004 | 0.001 | BDL |
| **Cu** | 0.0905 | 0.0898 | 0.776 | 0.1124 | 0.1117 | 0.625 | 0.1377 | 0.1356 | 1.537 | 0.1243 | 0.1433 | 14.200 | 0.0042 | -0.0042 | BDL | 0.1299 | 0.1313 | 1.072 | 0.1342 | 0.1363 | 1.553 |
| **Fe** | 0.26 | 0.255 | 1.942 | 0.223 | 0.234 | 4.814 | 117 | 121 | 3.361 | 0.276 | 0.299 | 8 | 125 | 124 | 0.803 | 0.163 | 0.173 | 5.952 | 0.172 | 0.172 | 0 |
| **Mg** | 9.04 | 9.01 | 0.332 | 8.71 | 8.12 | 7.011 | 36.3 | 37.9 | 4.313 | 9.66 | 9.72 | 0.619 | 23.1 | 22.3 | 3.524 | 9.66 | 9.66 | 0 | 9.68 | 9.6 | 0.830 |
| **Mn** | 0.6746 | 0.6696 | 0.744 | 0.6547 | 0.6566 | 0.290 | 15.04 | 15.39 | 2.300 | 0.8058 | 0.8665 | 7.259 | 21.07 | 20.89 | 0.858 | 0.8158 | 0.8352 | 2.350 | 0.8438 | 0.85 | 0.732 |
| **Mo** | BDL | BDL | BDL | 0.007 | 0.0042 | BDL | 0.1742 | 0.1823 | 4.544 | 0.007 | 0.0074 | BDL | 0.1764 | 0.1743 | 1.198 | 0.0049 | 0.0064 | BDL | 0.0072 | 0.0061 | BDL |
| **Na** | 19.1 | 19 | 0.525 | 19 | 19.2 | 1.047 | 81.5 | 82.7 | 1.462 | 20.3 | 20.9 | 2.913 | 65.1 | 64.5 | 0.926 | 20.7 | 21 | 1.439 | 21.5 | 21.5 | 0 |
| **Ni** | BDL | BDL | BDL | 0 | -0.003 | BDL | 0.007 | 0.004 | BDL | 0 | 0.003 | BDL | 0.062 | 0.062 | 0 | 0.001 | 0.002 | BDL | 0.002 | 0.004 | BDL |
| **Pb** | BDL | BDL | BDL | 0.002 | 0.005 | BDL | 0.064 | 0.074 | BDL | 0.014 | 0.017 | BDL | 0.055 | 0.035 | BDL | 0.012 | 0.015 | BDL | 0.008 | 0.013 | BDL |
| **Si** | 1.27 | 1.26 | 0.791 | 1.24 | 1.21 | 2.449 | 2.36 | 2.41 | 2.096 | 1.35 | 1.37 | 1.471 | 4.4 | 4.32 | 1.835 | 1.35 | 1.37 | 1.471 | 1.38 | 1.38 | 0 |
| **Sr** | 0.229 | 0.2284 | 0.262 | 0.2264 | 0.2211 | 2.369 | 1.381 | 1.431 | 3.556 | 0.2493 | 0.2498 | 0.200 | 0.3891 | 0.3823 | 1.763 | 0.2489 | 0.2528 | 1.555 | 0.2558 | 0.2551 | 0.274 |
| **Ti** | BDL | BDL | BDL | 0.001 | 0.0013 | BDL | 0.0156 | 0.0125 | 22.064 | 0.002 | 0.002 | BDL | 0.0012 | 0.0016 | BDL | 0.0013 | 0.002 | BDL | 0.001 | 0.0013 | BDL |
| **Zn** | 0.4606 | 0.4587 | 0.413 | 0.62 | 0.6042 | 2.581 | 0.228 | 0.2315 | 1.523 | 0.6629 | 0.8374 | 23.262 | 26.9 | 26.34 | 2.104 | 0.7249 | 0.7358 | 1.492 | 0.7418 | 0.7403 | 0.202 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Lab Dupl. | | Lab Dupl. | Lab Dupl. | | Lab Dupl. | Lab Dupl. | | | Lab Dupl. | Lab Dupl. | | | | Lab Dupl. | | | Lab Dupl. | |
| **Sample Name** | **IA-SWII** | **IA-SWII** | **%CHG** | **IA-SWII** | **IA-SWII** | **%CHG** | **IA-SWII** | **IA-SWII** | **%CHG** | **IA-SWI** | **IA-SWI** | **IA-SWI** | **%CHG** | **%CHG** | **IIIB-GWI** | **IIIB-GWI** | **%CHG** | **IIIB-SWI** | **IIIB-SWI** | **%CHG** |
| **Sample Date** | | | | | | | | | | | | | | | | | | | | |
| **Analysis Date** | 7/24/95 | 7/24/95 | | 7/24 95 | 7/24/95 | | 7/24/95 | 7/24/95 | | 7/24/95 | 7/23/95 | 7/23/95 | | | 7/24/95 | 7/24/95 | | 7/24/95 | 7/23/95 | |
| **Analysis Time** | 16:09 | 16:53 | | 17:40 | 18:24 | | 19:05 | 19:40 | | 19:14 | 17:10 | 16:17 | | | 19:23 | 15:27 | | 19.29 | 16:55 | |
| **Al** | 0.073 | 0.079 | BDL | 0.084 | 0.084 | 0 | 0.091 | 0.088 | 3.352 | 0.081 | 0.052 | 0.042 | BDL | BDL | 0.13 | 0.107 | 19.409 | 0.106 | 0.057 | BDL |
| **As** | 0.014 | 0.007 | BDL | 0.011 | 0.016 | BDL | 0.011 | 0.007 | BDL | 0.006 | 0.02 | 0.016 | BDL | BDL | 0.228 | 0.229 | 0.438 | 0.018 | 0.008 | BDL |
| **Ca** | 46.4 | 46.6 | 0.430 | 45.1 | 45.2 | 0.221 | 45.7 | 45.4 | 0.659 | 46.4 | 46.7 | 46.3 | 0.860 | 0.216 | 174 | 173 | 0.576 | 45 | 45.5 | 1.105 |
| **Cd** | 0.0024 | 0.0027 | BDL | 0.003 | 0.003 | BDL | 0.0026 | 0.0027 | BDL | 0.0027 | 0.0032 | 0.0036 | BDL | BDL | -0.0002 | 0.0009 | BDL | 0.0029 | 0.0031 | BDL |
| **Co** | 0.0004 | 0.001 | BDL | -0.0004 | 0.0007 | BDL | 0.0001 | 0.0013 | BDL | 0 | 0.0008 | 0.0009 | BDL | BDL | 0.0061 | 0.0052 | BDL | 0 | 0.0003 | BDL |
| **Cu** | 0.1342 | 0.1363 | 1.553 | 0.1306 | 0.1313 | 0.535 | 0.1335 | 0.1313 | 1.662 | 0.1261 | 0.1322 | 0.1309 | 0.988 | 3.735 | 0.006 | 0.0049 | BDL | 0.1177 | 0.1233 | 4.647 |
| **Fe** | 0.172 | 0.172 | 0 | 0.169 | 0.177 | 4.624 | 0.186 | 0.187 | 0.536 | 0.201 | 0.193 | 0.195 | 1.031 | 3.030 | 115 | 112 | 2.643 | 0.312 | 0.3 | 3.922 |
| **Mg** | 9.68 | 9.6 | 0.830 | 9.22 | 9.12 | 1.091 | 9.19 | 9.07 | 1.314 | 9.31 | 10.1 | 10.1 | 0 | 8.140 | 42.1 | 44.1 | 4.640 | 9.04 | 9.88 | 8.879 |
| **Mn** | 0.8438 | 0.85 | 0.732 | 0.8221 | 0.8235 | 0.170 | 0.8346 | 0.8308 | 0.456 | 0.8237 | 0.8324 | 0.8184 | 1.696 | 0.646 | 9.415 | 9.334 | 0.864 | 0.8348 | 0.8428 | 0.954 |
| **Mo** | 0.0072 | 0.0061 | BDL | 0.0057 | 0.0059 | BDL | 0.0056 | 0.0034 | BDL | 0.0053 | 0.0058 | 0.0067 | BDL | BDL | 0.1713 | 0.1672 | 2.422 | 0.0059 | 0.0079 | BDL |
| **Na** | 21.5 | 21.5 | 0 | 20.9 | 21 | 0.477 | 21.3 | 21.1 | 0.943 | 21.4 | 21.4 | 21.1 | 1.412 | 1.412 | 159 | 155 | 2.548 | 20.1 | 20.4 | 1.481 |
| **Ni** | 0.002 | 0.004 | BDL | 0.001 | 0.004 | BDL | 0.003 | 0.003 | BDL | 0.003 | 0.004 | -0.001 | BDL | BDL | 0.003 | 0.004 | BDL | 0.001 | 0.007 | BDL |
| **Pb** | -0.008 | 0.013 | BDL | 0.003 | 0.002 | BDL | -0.004 | 0.004 | BDL | -0.004 | -0.004 | -0.012 | BDL | BDL | 0.023 | 0.018 | BDL | -0.007 | -0.009 | BDL |
| **Si** | 1.38 | 1.38 | 0 | 1.33 | 1.33 | 0 | 1.34 | 1.33 | 0.749 | 1.36 | 1.43 | 1.41 | 1.408 | 3.610 | 2.22 | 2.25 | 1.342 | 1.36 | 1.43 | 5.018 |
| **Sr** | 0.2558 | 0.2551 | 0.274 | 0.2457 | 0.2456 | 0.041 | 0.2481 | 0.2453 | 1.135 | 0.2518 | 0.259 | 0.2554 | 1.400 | 1.420 | 1.26 | 1.271 | 0.869 | 0.2467 | 0.2564 | 3.856 |
| **Ti** | 0.001 | 0.0013 | BDL | 0.0016 | 0.0016 | BDL | 0.0013 | 0.002 | BDL | 0.002 | -0.001 | -0.0008 | BDL | BDL | 0.0095 | 0.0097 | 2.083 | 0.0044 | 0.0008 | BDL |
| **Zn** | 0.7418 | 0.7403 | 0.202 | 0.7161 | 0.7145 | 0.224 | 0.7214 | 0.7144 | 0.975 | 0.7128 | 0.7409 | 0.7346 | 0.854 | 3.012 | 0.1914 | 0.1942 | 1.452 | 0.6469 | 0.6757 | 4.36 |

## Aug/Sept1995 Laboratory duplicates (water samples): Calculations worksheet

| | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | | Lab Dupl. | | Lab Dupl. | Lab Dupl. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Name | IA-SWI | IA-SWI | %CHG | IA-SWII | IA-SWII | %CHG | IIB-SWI | IIB-SWI | %CHG | IIIC-SWI | IIIC-SWI | %CHG | IIIC-SWII | IIIC-SWII | %CHG | IIA-GW3 | IIA-GW3 | %CHG | IIA-SWI | IIA-SWI | %CHG | IA-SWI | IA-SWI | %CHG | IA-SWI | IA-SWI | %CHG |
| Sample Date | 9/27/95 | 9/27/95 | | 9/27/95 | 9/27/95 | | 9/4/95 | 9/4/95 | | 8/31/95 | 8/31/95 | | 8/31/95 | 8/31/95 | | | | | 8/31/95 | 8/31/95 | | 8/24/95 | 8/24/95 | | 8/24/95 | 8/24/95 | |
| Analysis Date | | | | | | | | | | | | | | | | 9/25/95 | 9/25/95 | | 9/25/95 | 9/25/95 | | | | | | | |
| Analysis Time | | | | | | | | | | | | | | | | 14:47 | 15:04 | | 15:16 | 15:18 | | | | | | | |
| Al | 0.022 | 0.014 | BDL | 0.018 | 0.021 | BDL | 0.05 | 0.054 | BDL | 0.057 | 0.07 | BDL | 0.053 | 0.065 | BDL | 0.053 | 0.061 | BDL | 0.115 | 0.11 | 4.444 | 0.029 | 0.027 | BDL | 0.022 | 0.019 | BDL |
| As | 0.006 | 0.008 | BDL | 0.01 | -0.003 | BDL | 0.004 | 0.004 | BDL | -0.008 | 0.015 | BDL | 0.009 | -0.005 | BDL | 0.015 | 0.019 | BDL | -0.015 | 0.009 | BDL | 0.005 | -0.007 | BDL | 0.006 | -0.009 | BDL |
| Ca | 57.3 | 56.9 | 0.701 | 56.9 | 56.5 | 0.705 | 54.1 | 53.6 | 0.929 | 52 | 53.1 | 2.093 | 52.9 | 53.3 | 0.753 | 48.4 | 48.6 | 0.412 | 54 | 53.2 | 1.493 | 55.8 | 57 | 2.128 | 55 | 54.3 | 1.281 |
| Cd | 0.0034 | 0.0045 | BDL | 0.0039 | 0.004 | BDL | 0.0029 | 0.0027 | BDL | 0.0041 | 0.0039 | BDL | 0.0036 | 0.0042 | BDL | 0.0003 | 0.0001 | BDL | 0.0035 | 0.0037 | BDL | 0.0024 | 0.0023 | BDL | 0.0025 | 0.0025 | BDL |
| Co | 0.0007 | -0.0022 | BDL | 0.0005 | -0.0007 | BDL | 0.0012 | -0.0002 | BDL | 0.0003 | 0.0009 | BDL | -0.0003 | 0.0007 | BDL | 0.0012 | 0 | BDL | 0 | 0.0007 | BDL | 0.0002 | 0 | BDL | 0.0005 | -0.0003 | BDL |
| Cu | 0.1788 | 0.1785 | 0.168 | 0.1879 | 0.1892 | 0.689 | 0.1516 | 0.1523 | 0.461 | 0.1732 | 0.177 | 2.170 | 0.1773 | 0.1777 | 0.225 | 0.0439 | 0.0446 | 1.582 | 0.1658 | 0.1641 | 1.031 | 0.1616 | 0.1657 | 2.505 | 0.1606 | 0.1576 | 1.886 |
| Fe | 0.047 | 0.051 | 8.163 | 0.151 | 0.153 | 1.316 | 0.072 | 0.071 | 1.399 | 0.19 | 0.194 | 2.083 | 0.183 | 0.184 | 0.545 | 0.999 | 1 | 0.100 | 0.401 | 0.395 | 1.508 | 0.1 | 0.103 | 2.956 | 0.11 | 0.103 | 6.573 |
| Mg | 12.6 | 12.5 | 0.797 | 12.5 | 12.6 | 0.797 | 12 | 11.8 | 1.681 | 11.4 | 11.6 | 1.739 | 11.6 | 11.5 | 0.866 | 10.7 | 10.7 | 0 | 11.7 | 11.5 | 1.724 | 12.5 | 12.7 | 1.587 | 12.4 | 12.2 | 1.626 |
| Mn | 1.326 | 1.318 | 0.605 | 1.324 | 1.319 | 0.378 | 1.041 | 1.033 | 0.771 | 1.108 | 1.132 | 2.143 | 1.126 | 1.132 | 0.531 | 0.9367 | 0.9408 | 0.437 | 1.099 | 1.084 | 1.374 | 1.141 | 1.164 | 1.996 | 1.118 | 1.102 | 1.441 |
| Mo | 0.0054 | 0.0049 | BDL | 0.0058 | 0.0063 | BDL | 0.0016 | 0.0037 | BDL | 0.0026 | 0.0003 | BDL | 0.0022 | 0.0034 | BDL | 0.0046 | 0.0025 | BDL | 0.0025 | 0.0012 | BDL | 0.0053 | 0.006 | BDL | 0.0047 | 0.0056 | BDL |
| Na | 29.1 | 29.1 | 0 | 28.9 | 29.4 | 1.715 | 28.3 | 28.2 | 0.354 | 27.4 | 28 | 2.166 | 28.2 | 27.9 | 1.070 | 27.5 | 27.6 | 0.363 | 27.9 | 27.6 | 1.081 | 26 | 26.5 | 1.905 | 25.7 | 25.5 | 0.781 |
| Ni | 0.002 | 0.002 | BDL | 0 | 0.003 | BDL | 0.001 | 0.001 | BDL | 0 | -0.002 | BDL | 0 | 0.003 | BDL | 0.001 | -0.002 | BDL | 0 | 0 | BDL | 0.003 | 0.001 | BDL | 0.001 | 0.002 | BDL |
| Pb | 0.004 | -0.016 | BDL | 0.019 | -0.01 | BDL | 0.027 | 0 | BDL | -0.017 | 0.017 | BDL | 0.007 | 0.005 | BDL | 0.001 | 0.017 | BDL | 0.013 | -0.019 | BDL | 0.005 | 0.018 | BDL | 0.013 | 0.016 | BDL |
| Si | 15.6 | 15.4 | 1.290 | 15.5 | 15.4 | 0.647 | 12.8 | 12.8 | 0 | 12.3 | 12.5 | 1.613 | 12.6 | 12.6 | 0 | 13 | 13.1 | 0.766 | 12.8 | 12.6 | 1.575 | 1.27 | 1.29 | 1.563 | 1.26 | 1.24 | 1.6 |
| Sr | 0.3303 | 0.3294 | 0.273 | 0.329 | 0.3304 | 0.425 | 0.3114 | 0.3089 | 0.806 | 0.2898 | 0.2956 | 1.982 | 0.2965 | 0.2952 | 0.439 | 0.2841 | 0.2841 | 0 | 0.3005 | 0.2968 | 1.239 | 0.3032 | 0.3106 | 2.411 | 0.3 | 0.2962 | 1.275 |
| Ti | 0.0039 | 0.0035 | BDL | 0.0035 | 0.0035 | BDL | 0.002 | -0.002 | BDL | 0.002 | -0.002 | BDL | -0.003 | -0.002 | BDL | -0.002 | -0.002 | BDL | 0.0043 | 0.0043 | BDL | 0.0011 | 0.0011 | BDL | 0.0014 | 0.0018 | BDL |
| Zn | 1.203 | 1.184 | 1.592 | 1.308 | 1.293 | 1.153 | 0.455 | 0.4519 | 0.684 | 1.134 | 1.156 | 1.921 | 1.109 | 1.114 | 0.450 | 0.3736 | 0.3754 | 0.481 | 0.7452 | 0.7352 | 1.351 | 0.7957 | 0.8162 | 2.544 | 0.7919 | 0.786 | 0.748 |

## Compilation of all laboratory duplicates (water samples)

| | JUN/JUL95 | | | | | | | | | | | | | AUG/SEP95 | | | | | | | | | STATISTICS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | MEAN | STAND. DEV. | MEAN+ ST.DEV | #OF DATA | STD. ERROR | 95% CONF. OF MEAN |
| Al | | | 16.92 | 14.77 | 3.46 | | 7.89 | 0.00 | 3.35 | | | 19.41 | | | | | | | | 4.44 | | | 8.8 | 7.3 | 16.0 | 8 | 0.9 | 10.6 |
| As | | | 0.39 | | 14.35 | | | | | | | 0.44 | | | | | | | | | | | 5.1 | 8.0 | 13.1 | 3 | 2.7 | 10.3 |
| Ca | 0.94 | 0.24 | 2.56 | 0.66 | 1.06 | 1.98 | 0.43 | 0.22 | 0.66 | 0.86 | 0.22 | 0.58 | 1.10 | 0.70 | 0.71 | 0.93 | 2.09 | 0.75 | 0.41 | 1.49 | 2.13 | 1.28 | 1.0 | 0.7 | 1.7 | 22 | 0.0 | 1.1 |
| Cd | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | |
| Co | | | | | 0.00 | | | | | | | | | | | | | | | | | | 0.0 | | | 1 | 0.0 | 0.0 |
| Cu | 0.78 | 0.62 | 1.54 | 14.20 | | 1.07 | 1.55 | 0.53 | 1.66 | 0.99 | 3.74 | | 4.65 | 0.17 | 0.69 | 0.46 | 2.17 | 0.23 | 1.58 | 1.03 | 2.51 | 1.89 | 2.1 | 3.1 | 5.2 | 20 | 0.2 | 2.4 |
| Fe | 1.94 | 4.81 | 3.36 | 8.00 | 0.80 | 5.95 | 0.00 | 4.62 | 0.54 | 1.03 | 3.03 | 2.64 | 3.92 | 8.16 | 1.32 | 1.40 | 2.08 | 0.54 | 0.10 | 1.51 | 2.96 | 6.57 | 3.0 | 2.5 | 5.4 | 22 | 0.1 | 3.2 |
| Mg | 0.33 | 7.01 | 4.31 | 0.62 | 3.52 | 0.00 | 0.83 | 1.09 | 1.31 | 0.00 | 8.14 | 4.64 | 8.88 | 0.80 | 0.80 | 1.68 | 1.74 | 0.87 | 0.00 | 1.72 | 1.59 | 1.63 | 2.3 | 2.6 | 5.0 | 22 | 0.1 | 2.6 |
| Mn | 0.74 | 0.29 | 2.30 | 7.26 | 0.86 | 2.35 | 0.73 | 0.17 | 0.46 | 1.70 | 0.65 | 0.86 | 0.95 | 0.61 | 0.38 | 0.77 | 2.14 | 0.53 | 0.44 | 1.37 | 2.00 | 1.44 | 1.3 | 1.5 | 2.8 | 22 | 0.1 | 1.5 |
| Mo | | | 4.54 | | 1.20 | | | | | | | 2.42 | | | | | | | | | | | 2.7 | 1.7 | 4.4 | 3 | 0.6 | 3.8 |
| Na | 0.52 | 1.05 | 1.46 | 2.91 | 0.93 | 1.44 | 0.00 | 0.48 | 0.94 | 1.41 | 1.41 | 2.55 | 1.48 | 0.00 | 1.72 | 0.35 | 2.17 | 1.07 | 0.36 | 1.08 | 1.90 | 0.78 | 1.2 | 0.8 | 2.0 | 22 | 0.0 | 1.3 |
| Ni | | | | | 0.00 | | | | | | | | | | | | | | | | | | 0.0 | | | 1 | 0.0 | 0.0 |
| Pb | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | |
| Si | 0.79 | 2.45 | 2.10 | 1.47 | 1.83 | 1.47 | 0.00 | 0.00 | 0.75 | 1.41 | 3.61 | 1.34 | 5.02 | 1.29 | 0.65 | 0.00 | 1.61 | 0.00 | 0.77 | 1.57 | 1.56 | 1.60 | 1.4 | 1.2 | 2.6 | 22 | 0.1 | 1.5 |
| Sr | 0.26 | 2.37 | 3.56 | 0.20 | 1.76 | 1.55 | 0.27 | 0.04 | 1.13 | 1.40 | 1.42 | 0.87 | 3.86 | 0.27 | 0.42 | 0.81 | 1.98 | 0.44 | 0.00 | 1.24 | 2.41 | 1.27 | 1.3 | 1.1 | 2.3 | 22 | 0.0 | 1.3 |
| Ti | | | 22.06 | | | | | | | | | 2.08 | | | | | | | | | | | 12.1 | 14.1 | 26.2 | 2 | 7.1 | 25.9 |
| Zn | 0.41 | 2.58 | 1.52 | 23.26 | 2.10 | 1.49 | 0.20 | 0.22 | 0.98 | 0.85 | 3.01 | 1.45 | 4.36 | 1.59 | 1.15 | 0.68 | 1.92 | 0.45 | 0.48 | 1.35 | 2.54 | 0.75 | 2.4 | 4.8 | 7.2 | 22 | 0.2 | 2.9 |

## June/July 1995 Field duplicates (water samples): Calculations worksheet

| | | Field Dupl. | | |
|---|---|---|---|---|
| Sample Name | IC GW2 | IC-GW2(2) | %CHG | |
| Sample Date | 6/28/95 | 6/28/95 | | |
| Analysis Date | 7/5/95 | 7/5/95 | | |
| Analysis Time | 11 07 | 11.10 | | |
| Al | 0.038 | 0 026 | 37 50 | BDL |
| As | 0 13 | 0.108 | 18.49 | |
| Ca | 44 8 | 41 8 | 6.93 | |
| Cd | 0.0023 | 0 | 200 | BDL |
| Co | 0 0025 | 0 0012 | 70.27 | BDL |
| Cu | 0.0059 | 0 0015 | 119 | BDL |
| Fe | 29 | 25.4 | 13 24 | |
| Mg | 8 8 | 8.09 | 8 41 | |
| Mn | 4 206 | 3 966 | 5 87 | |
| Mo | 0 0472 | 0 042 | 11.66 | |
| Na | 18 6 | 18 | 3 28 | |
| Ni | 0.003 | 0.003 | 0 00 | BDL |
| Pb | 0 009 | 0 003 | 100 | BDL |
| Si | 1 87 | 1 79 | 4.37 | |
| Sr | 0 273 | 0 2449 | 10.85 | |
| Ti | 0 0014 | 0 0018 | 25.00 | BDL |
| Zn | 0 0381 | 0 0415 | 8.54 | |
| D.O. | 1 4 | 2 8 | 66 67 | |
| pH | 6 73 | 6 82 | 1 33 | |
| Cond. | 0 425 | 0 443 | 4 15 | |
| Alk. | 164 | 228 | 32.65 | |
| Cl | | | | |
| NO3 N | 0.15 | 0 335 | 76 29 | DL |
| PO4 P | 0 | 0.295 | 200.00 | BDL |
| SO4 | 19.179 | 30.548 | 45.73 | |

| | | Lab Dupl. | Lab Dupl. | AVG. | Field Dupl. | | |
|---|---|---|---|---|---|---|---|
| Sample Name | IA SW1 | IA-SW1 | IA-SW1 | IA-SW1 | IA-SW1(2) | %CHG | |
| Sample Date | 7/19/09 | 7/19/09 | 7/19/95 | | 7/19/95 | | |
| Analysis Date | 7/24/95 | 7/23/95 | 7/23/95 | | 7/23/95 | | |
| Analysis Time | 19:14 | 17:10 | 16.17 | | 16:46 | | |
| Al | 0.081 | 0.052 | 0 042 | 0.0583 | 0.051 | 13.41 | BDL |
| As | 0 006 | 0.02 | 0.016 | 0.014 | 0.022 | 44.44 | BDL |
| Ca | 46.4 | 46.7 | 46.3 | 46.467 | 46.4 | 0.14 | |
| Cd | 0.0027 | 0.0032 | 0 0036 | 0.0032 | 0.0034 | 7.11 | BDL |
| Co | 0 | 0 0008 | 0 0009 | 0.0006 | 0 0009 | 45.45 | BDL |
| Cu | 0 1261 | 0.1322 | 0 1309 | 0 1297 | 0.1262 | 2.76 | |
| Fe | 0 201 | 0 193 | 0 195 | 0.1963 | 0.145 | 30.08 | |
| Mg | 9.31 | 10.1 | 10.1 | 9.8367 | 10.1 | 2.64 | |
| Mn | 0.8237 | 0.8324 | 0.8184 | 0 8248 | 0.8257 | 0 11 | |
| Mo | 0 0053 | 0 0058 | 0 0067 | 0.0059 | 0.0056 | 5 78 | BDL |
| Na | 21.4 | 21.4 | 21.1 | 21.3 | 21.6 | 1.40 | |
| Ni | 0.003 | 0.004 | -0 001 | 0.002 | 0.006 | 100.00 | BDL |
| Pb | -0.004 | -0.004 | 0 012 | -0 007 | -0.01 | -40.00 | BDL |
| Si | 1.36 | 1.43 | 1.41 | 1 4 | 1.41 | 0.71 | |
| Sr | 0 2518 | 0.259 | 0 2554 | 0 2554 | 0.2598 | 1.71 | |
| Ti | 0.002 | -0.001 | -0.0008 | 0 000 | -0.0026 | -210 53 | BDL |
| Zn | | | 0 7346 | 0.7346 | 0.7043 | 4.21 | |
| D.O. | | | | | | | |
| pH | | | | | | | |
| Cond. | | | | | | | |
| Alk. | | | | | | | |
| Cl | | | | | | | |
| NO3 N | | | | | | | |
| PO4 P | | | | | | | |
| SO4 | | | | | | | |

| | AVG. | Field Dupl. | | |
|---|---|---|---|---|
| Sample Name | IA-SWII | IA-SWII(3) | %CHG | |
| Sample Date | (of lab | 7/19/95 | | |
| Analysis Date | dupl.s) | 7/24/95 | | |
| Analysis Time | | 13:55 | | |
| Al | 0.0728 | 0 058 | 22.63 | BDL |
| As | 0 0128 | 0 015 | 15.83 | BDL |
| Ca | 45.64 | 45.7 | 0.13 | |
| Cd | 0 00281 | 0.003 | 6.54 | BDL |
| Co | 0.00067 | -0.0006 | 3628 57 | BDL |
| Cu | 0.13301 | 0.1352 | 1.63 | |
| Fe | 0 1805 | 0 245 | 30.32 | |
| Mg | 9.487 | 9 88 | 4 06 | |
| Mn | 0 83076 | 0 8235 | 0 88 | |
| Mo | 0.00577 | 0 0058 | 0.52 | BDL |
| Na | 21.08 | 20.8 | 1 34 | |
| Ni | 0 0027 | 0 | 200.00 | BDL |
| Pb | 0 0031 | -0.003 | 12200 00 | BDL |
| Si | 1 357 | 1 38 | 1.68 | |
| Sr | 0 25004 | 0 253 | 1.18 | |
| Ti | 0 00132 | 0 002 | 40 96 | BDL |
| Zn | 0 72945 | 0 7476 | 2.46 | |
| D.O. | 7 7 | 6 | 24.82 | |
| pH | 7.58 | 7 58 | 0.00 | |
| Cond. | | 0 402 | | |
| Alk. | 144 | 176 | 20.00 | |
| Cl | 11 689 | 12.264 | 4 80 | |
| NO3 N | 1.098 | 1.136 | 3 40 | |
| PO4 P | | | | |
| SO4 | 72.702 | 72 688 | 0 02 | |

| | | Field Dupl. | | |
|---|---|---|---|---|
| Sample Name | IIB-GW1 | IIB-GW1(2) | %CHG | |
| Sample Date | 38538 | 33424 | | |
| Analysis Date | 7/24/95 | 7/24/95 | | |
| Analysis Time | 15:41 | 18:56 | | |
| Al | 0.067 | 0.063 | 6 15 | DL |
| As | 0.04 | 0 039 | 2.53 | BDL |
| Ca | 42.6 | 43.1 | 1.17 | |
| Cd | 0.0042 | 0.0051 | 19 35 | BDL |
| Co | 0.0018 | 0.001 | 57.14 | BDL |
| Cu | 0.1335 | 0.1454 | 8.53 | |
| Fe | 0.741 | 0.663 | 11 11 | |
| Mg | 8.48 | 8 24 | 2.87 | |
| Mn | 0 9934 | 0 9379 | 5.75 | |
| Mo | 0 0072 | 0 004 | 57.14 | BDL |
| Na | 19.1 | 19.4 | 1 56 | |
| Ni | 0.002 | -0 001 | 600 00 | BDL |
| Pb | 0 017 | 0.003 | 140 00 | BDL |
| Si | 1 26 | 1 24 | 1 60 | |
| Sr | 0 2233 | 0.2234 | 0 04 | |
| Ti | 0 002 | 0 0012 | 50 00 | BDL |
| Zn | 0 8734 | 1 069 | 20 14 | |
| D.O. | | | | |
| pH | | | | |
| Cond. | | | | |
| Alk. | | | | |
| Cl | | | | |
| NO3 N | | | | |
| PO4 P | | | | |
| SO4 | | | | |

| | | Field Dupl. | | | | Field Dupl. | | |
|---|---|---|---|---|---|---|---|---|
| Sample Name | IIIA-GW2 | IIIA GW2(2) | %CHG | | IIA-SWIII | IIA-SWIII(2) | %CHG | |
| Sample Date | 7/10/95 | 7/10/95 | | | 7/6/95 | 7/6/95 | | |
| Analysis Date | 7/24/95 | 7/24/95 | | | 7/24/95 | 7/24/95 | | |
| Analysis Time | 16:50 | 0 69375 | | | 14:40 | 14:47 | | |
| Al | 0.143 | 0.129 | 10.29 | | 0.057 | 0.055 | 3.57 | BDL |
| As | 0.09 | 0 097 | 7.49 | | 0.012 | 0 012 | 0 00 | BDL |
| Ca | 173 | 170 | 1 75 | | 41.8 | 41.7 | 0.24 | |
| Cd | 0 0009 | 0.0009 | 0 00 | BDL | 0 0021 | 0.0019 | 10.00 | BDL |
| Co | 0.0557 | 0 0534 | 4.22 | | 0.0004 | 0 0012 | 100.00 | BDL |
| Cu | -0 007 | -0.0077 | -9 52 | BDL | 0.1061 | 0 0913 | 14.99 | |
| Fe | 57 4 | 59 8 | 4.10 | | 0 302 | 0.176 | 52.72 | |
| Mg | 37.4 | 37 | 1.08 | | 8.73 | 8.68 | 0.57 | |
| Mn | 10.39 | 10 33 | 0 58 | | 0.6948 | 0 6948 | 0 00 | |
| Mo | 0 0862 | 0.0923 | 6.83 | | 0 0064 | 0.0056 | 13.33 | BDL |
| Na | 112 | 111 | 0.90 | | 19 | 18.9 | 0.53 | |
| Ni | 0.026 | 0 023 | 12.24 | | 0.002 | 0 001 | 66 67 | BDL |
| Pb | 0 003 | 0 024 | 155.56 | BDL | 0.009 | 0 015 | 50 00 | BDL |
| Si | 1 98 | 1 98 | 0 00 | | 1.22 | 1 21 | 0.82 | |
| Sr | 1 667 | 1 653 | 0 84 | | 0 2244 | 0 2239 | 0 22 | |
| Ti | 0 0021 | 0 0015 | 33 33 | BDL | 0.001 | 0.001 | 0 00 | BDL |
| Zn | 14.89 | 14.5 | 2 65 | | 0 5747 | 0.5249 | 9 06 | |
| D.O. | | | | | | | | |
| pH | | | | | | | | |
| Cond. | | | | | | | | |
| Alk. | | | | | | | | |
| Cl | | | | | | | | |
| NO3-N | | | | | | | | |
| PO4 P | | | | | | | | |
| SO4 | | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sample Name | IIIA-GW1 | IIIA-GW1(2) | %CHG | IIIB GW3 | IIIB-GW3(2) | %CHG |
| Sample Date | 7/10/96 | 7/10/96 | | 7/11/95 | 7/11/95 | |
| Analysis Date | 7/24/95 | 7/24/95 | | 7/24/95 | 7/24/95 | |
| Analysis Time | 15:37 | 15:37 | | | | |
| Cl | 72.96 | 78.76 | 7.65 | 13.89 | 11.95 | 15.02 |
| NO3-N | BDL | BDL | | 0.262 | 0.405 | 42.88 |
| PO4 P | BDL | BDL | | | | |
| SO4 | 1136.25 | 1100 | 3.24 | 233 34 | 176.7 | 27.63 |

**Aug/Sept 1995 Field duplicates (water samples): Calcuations worksheet**

| | | Field Dupl. | | Field Dupl. | | | | Field Dupl. | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Name | IB-GW5 | IB-GW5(2) | %CHG | IA-SWIII(2) | IA-SWIII | %CHG | IA-GW3 | IA-GW3(2) | %CHG |
| Sample Date | 8/27/95 | 8/27/95 | | 8/24/95 | 8/24/95 | | 8/24/95 | 8/24/95 | |
| Analysis Date | 8/30/96 | 8/30/96 | | 8/30/96 | 8/30/96 | | 8/30/96 | 8/30/96 | |
| Al | 2.5 | 1.54 | 47.525 | 0.028 | 0.023 | BDL | 10.4 | 9.63 | 7.688 |
| As | 0.088 | 0.112 | 24 | 0 | 0 | BDL | 0.005 | 0.014 | BDL |
| Ca | 124 | 123 | 0.810 | 55.3 | 55.2 | 0.181 | 111 | 111 | 0 |
| Cd | 0.0186 | 0.0176 | 5.525 | 0.0032 | 0.0031 | BDL | 0.1165 | 0.1406 | 18.748 |
| Co | 0.05 | 0.0529 | 5.637 | 0.0006 | 0.0005 | BDL | 0.0452 | 0.0432 | 4.525 |
| Cu | 0.0101 | 0.0057 | BDL | 0.1455 | 0.1798 | 21.088 | 2.833 | 6.706 | 81.203 |
| Fe | 319 | 312 | 2.219 | 0.087 | 0.096 | 9.836 | 93.2 | 89.1 | 4.498 |
| Mg | 37 | 37.6 | 1.609 | 12.4 | 12.3 | 0.810 | 29.9 | 29.9 | 0 |
| Mn | 26.76 | 27.21 | 1.668 | 1.117 | 1.163 | 4.035 | 20.52 | 20.23 | 1.423 |
| Mo | 0.4447 | 0.4358 | 2.022 | 0.007 | 0.0068 | BDL | 0.1296 | 0.1238 | 4.578 |
| Na | 81.8 | 84.7 | 3.483 | 25.6 | 26 | 1.550 | 65.7 | 65.8 | 0.152 |
| Ni | 0.052 | 0.044 | 16.667 | 0.004 | 0.001 | BDL | 0.044 | 0.045 | 2.247 |
| Pb | 0.057 | 0.041 | 32.653 | 0.006 | 0.011 | BDL | 0.367 | 0.37 | 0.814 |
| Si | 3.62 | 3.66 | 1.099 | 1.26 | 1.26 | 0 | 3.3 | 3.25 | 1.527 |
| Sr | 0.4846 | 0.4837 | 0.186 | 0.3015 | 0.3 | 0.499 | 0.5427 | 0.543 | 0.055 |
| Ti | 0.0016 | 0.0019 | BDL | 0.0008 | 0.0011 | BDL | 0.0013 | 0.0054 | BDL |
| Zn | 9.933 | 10.71 | 7.528 | 0.6584 | 1 | 41.196 | 16.65 | 17.12 | 2.784 |
| pH | 5.35 | 5.38 | 0.559 | 6.84 | 6.64 | 2.967 | 4.45 | 4.39 | 1.357 |
| D.O. | 2.7 | 4 | 38.806 | 7.3 | 7 | 4.196 | 1.7 | 2.1 | 21.053 |
| Cond. | 1.95 | 1.94 | 0.514 | 0.489 | 0.492 | 0.612 | 1.36 | 1.35 | 0.738 |
| Alk. | 36 | 36 | 0.000 | 192 | 148 | 25.882 | NA | NA | |
| Cl | 29.033 | 28.816 | 0.750 | 16.908 | 17.124 | 1.269 | 19.501 | 19.697 | 1.000 |
| NO3-N | BDL | BDL | BDL | 1.673 | 1.615 | 3.528 | BDL | BDL | BDL |
| PO4-P | 0.5 | 0.56 | 9.524 | BDL | BDL | BDL | BDL | BDL | BDL |
| SO4 | 1257.03 | 1276.41 | 1.530 | 97.2 | 94.2 | 3.135 | 820.1 | 828.1 | 0.971 |

| | | Field Dupl. | | | Field Dupl. | | | Field Dupl. | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Name | IA-GW5 | GW5(2) | %CHG | IIA-SWIII | IIA-SWIII(2) | %CHG | M.Xing | M. Xing (2) | %CHG |
| Sample Date | 8/24/95 | 8/24/95 | | 8/31/95 | 8/31/95 | | 11/3/95 | 11/3/95 | |
| Analysis Date | 8/30/96 | 8/30/96 | | | | | | | |
| Al | 23.8 | | | 0.07 | 0.062 | BDL | 0.006 | 0.015 | BDL |
| As | 0.069 | | | 0 | -0.006 | BDL | -0.001 | 0.016 | BDL |
| Ca | 108 | | | 53.4 | 53.9 | 0.932 | 54.1 | 54.5 | 0.737 |
| Cd | BDL | | | 0.0021 | 0.0015 | BDL | 0.0023 | 0.0027 | BDL |
| Co | 0.0526 | | | 0.0007 | 0 | BDL | 0.0002 | 0.0024 | BDL |
| Cu | 0.0141 | | | 0.139 | 0.1 | 32.636 | 0.0874 | 0.0867 | 0.804 |
| Fe | 146 | | | 0.168 | 0.114 | 38.298 | 0.051 | 0.044 | 14.737 |
| Mg | 30.8 | | | 11.8 | 11.9 | 0.844 | 12.4 | 12.2 | 1.626 |
| Mn | 25.37 | | | 1.069 | 1.077 | 0.746 | 0.863 | 0.873 | 1.152 |
| Mo | 0.2036 | | | 0.0017 | -7.00E-04 | BDL | 0.0059 | 0.0061 | BDL |
| Na | 71.7 | | | 28.1 | 28.5 | 1.413 | 24.6 | 24.3 | 1.227 |
| Ni | 0.058 | | | 0.005 | -0.002 | BDL | 0.001 | 0.001 | BDL |
| Pb | BDL | | | -0.009 | -0.013 | BDL | 0.01 | -0.009 | BDL |
| Si | 4.9 | | | 12.6 | 12.6 | 0 | 13.8 | 13.7 | 0.727 |
| Sr | 0.463 | | | 0.3025 | 0.3058 | 1.085 | 0.2835 | 0.284 | 0.176 |
| Ti | BDL | | | -0.002 | -0.002 | BDL | 0.0035 | 0.0035 | BDL |
| Zn | 27.17 | | | 0.5414 | 0.3782 | 35.494 | 0.9635 | 0.8558 | 11.840 |
| pH | 3.98 | 4.09 | 2.726 | 8.16 | 8.19 | 0.367 | 7.72 | 7.72 | 0 |
| D.O. | 4.6 | 4.5 | 2.198 | | 8.3 | | 7.5 | 7.5 | 0 |
| Cond. | 1.79 | 1.63 | 9.357 | 0.504 | 0.511 | 1.379 | 0.501 | 0.482 | 3.866 |
| Alk. | NA | NA | | 124 | 128 | 3.175 | 172 | 153 | 12.346 |
| Cl | 22.17 | | | 17.5 | 17.8 | 1.700 | 15.22 | 15.28 | 0.393 |
| NO3-N | BDL | | | 1.68 | 1.74 | 3.509 | 1.401 | 1.469 | 4.739 |
| PO4-P | BDL | | | | | | | | |
| SO4 | 723.02 | | | 102.7 | 104.6 | 1.833 | 85.86 | 86.93 | 1.238 |

**Compilation of all field duplicates (water samples)**

| | JUNE/JULY 1995 | | | | | | | AUGUST/SEPTEMBER 1995 | | | | STATISTICS | STD. | # OF | 95% CONF. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | %CHG | MEAN | DEV. | DATA | OF MEAN |
| pH | 1.3 | | | | | | | 0.559 | 1.357 | 2.726 | 0.367 | 1.2 | 1.2 | 8 | 1.3 |
| D.O. | 66.667 | | | | | | | 38.806 | 21.053 | 2.198 | BDL | 18.7 | 21.5 | 7 | 22.9 |
| Cond. | 4.147 | | | | | | | 0.514 | 0.738 | 9.357 | 1.379 | 2.8 | 2.9 | 7 | 3.4 |
| Alk. | 32.653 | | | | | | | 0.000 | | | 3.175 | 16.9 | 10.9 | 6 | 19.3 |
| Cl | | | | | | 7.646 | 15.015 | 0.750 | 1.000 | | 1.700 | 3.5 | 4.3 | 9 | 4.2 |
| NO3-N | 76.289 | | | | | BDL | 42.879 | BDL | BDL | | 3.509 | 16.2 | 26.0 | 6 | 21.9 |
| PO4-P | 200 | | | | | BDL | BDL | 9.524 | BDL | | BDL | 104.8 | 134.7 | 2 | 236.8 |
| SO4 | 45.726 | | | | | 3.242 | 27.627 | 1.530 | 0.971 | | 1.833 | 7.7 | 13.6 | 10 | 9.7 |
| Al | BDL | BDL | 6.154 | 10.294 | BDL | | | 47.525 | 7.688 | | BDL | 17.9 | 19.8 | 4 | 27.6 |
| As | 18.487 | BDL | BDL | 7.487 | BDL | | | 24.000 | BDL | | BDL | 16.7 | 8.4 | 3 | 22.2 |
| Ca | 6.928 | 0.144 | 1.167 | 1.749 | 0.2 | | | 0.810 | 0.000 | | 0.932 | 1.0 | 1.8 | 11 | 1.3 |
| Cd | BDL | BDL | BDL | BDL | BDL | | | 5.525 | 18.748 | | BDL | 12.1 | 9.3 | 2 | 21.3 |
| Co | BDL | BDL | BDL | 4.22 | BDL | | | 5.637 | 4.525 | | BDL | 4.8 | 0.7 | 3 | 5.3 |
| Cu | BDL | 2.761 | 8.534 | BDL | 14.995 | | | BDL | 81.203 | | 32.636 | 17.0 | 23.8 | 8 | 21.3 |
| Fe | 13.235 | 30.078 | 11.111 | 4.096 | 52.72 | | | 2.219 | 4.498 | | 38.298 | 19.0 | 14.0 | 11 | 21.1 |
| Mg | 8.4 | 2.642 | 2.87 | 1.08 | 0.574 | | | 1.609 | 0.000 | | 0.844 | 2.2 | 2.2 | 11 | 2.5 |
| Mn | 5.874 | 0.1 | 5.7 | 0.6 | 0.00 | | | 1.668 | 1.423 | | 0.746 | 2.0 | 2.0 | 11 | 2.3 |
| Mo | 11.659 | BDL | BDL | 6.83 | BDL | | | 2.022 | 4.578 | | BDL | 6.3 | 4.1 | 4 | 8.3 |
| Na | 3.3 | 1.40 | 1.558 | 0.90 | 0.528 | | | 3.483 | 0.152 | | 1.413 | 1.5 | 0.9 | 11 | 1.6 |
| Ni | BDL | BDL | BDL | 12.245 | BDL | | | 16.667 | 2.247 | | BDL | 10.4 | 7.4 | 3 | 18.2 |
| Pb | BDL | BDL | BDL | BDL | BDL | | | 32.653 | 0.814 | | BDL | 16.7 | 22.5 | 2 | 38.8 |
| Si | 4.372 | 0.712 | 1.6 | 0 | 0.8 | | | 1.099 | 1.527 | | 0.000 | 1.1 | 1.1 | 11 | 1.2 |
| Sr | 10.852 | 1.708 | 0.045 | 0.843 | 0.223 | | | 0.186 | 0.055 | | 1.085 | 1.3 | 2.8 | 11 | 1.7 |
| Ti | BDL | BDL | BDL | BDL | BDL | | | BDL | BDL | | BDL | #DIV/0! | #DIV/0! | 0 | #DIV/0! |
| Zn | 8.54 | 4.2 | 20.14 | 2.654 | 9.058 | | | 7.528 | 2.784 | | 35.494 | 14.4 | 14.4 | 11 | 16.4 |

***Summary of mean (+/- standard deviation) blank concentrations for water and bead analyses .***

| Element | Water field blanks (mg/L) n=11 | Milli-Q lab blanks run with water samples (mg/L) n = 23 | Bead Digest Blanks (ug/ g bead) n=13 | Bead Digest Blanks without beads (mg/L) n=11 | Milli-Q lab blanks run with bead samples (mg/L) n=32 |
|---|---|---|---|---|---|
| Al | *(<0.07)* | *(<0.07)* | 32.13 +/- 29.4 | *(<0.07)* | *(<0.07)* |
| As | *(<0.07)* | *(<0.07)* | *(<0.07)* | *(<0.07)* | *(<0.07)* |
| Ca | *(<0.1)* | *(<0.1)* | 5.55 +/- 4.11 | *(<0.1)* | *(<0.1)* |
| Cd | *(<0.01)* | *(<0.01)* | *(<0.01)* | *(<0.01)* | *(<0.01)* |
| Co | *(<0.01)* | *(<0.01)* | *(<0.01)* | *(<0.01)* | *(<0.01)* |
| Cu | *(<0.01)* | *(<0.01)* | *(<0.01)* | *(<0.01)* | *(<0.01)* |
| Fe | *(<0.03)* | *(<0.03)* | 0.24 +/- 0.25 | *(<0.03)* | *(<0.03)* |
| Mg | *(<0.1)* | *(<0.1)* | 1.32 +/- 0.94 | *(<0.1)* | *(<0.1)* |
| Mn | *(<0.005)* | *(<0.005)* | 0.06 +/- 0.04 | *(<0.005)* | *(<0.005)* |
| Mo | *(<0.01)* | *(<0.01)* | *(<0.01)* | *(<0.01)* | *(<0.01)* |
| Na | *(<0.1)* | *(<0.1)* | 0.96 +/- 0.74 | *(<0.1)* | *(<0.1)* |
| Ni | *(<0.02)* | *(<0.02)* | *(<0.02)* | *(<0.02)* | *(<0.02)* |
| P | *(<0.2)* | *(<0.2)* | *(<0.2)* | *(<0.2)* | *(<0.2)* |
| Pb | *(<0.1)* | *(<0.1)* | *(<0.1)* | *(<0.1)* | *(<0.1)* |
| Si | *(<0.1)* | *(<0.1)* | 6.47 +/- 3.93 | *(<0.1)* | *(<0.1)* |
| Sr | *(<0.005)* | *(<0.005)* | 0.03 +/- 0.02 | *(<0.005)* | *(<0.005)* |
| Ti | *(<0.005)* | *(<0.005)* | 0.09 +/- 0.06 | *(<0.005)* | *(<0.005)* |
| Zn | 0.018 +/- 0.017 | *(<0.005)* | *(<0.005)* | *(<0.005)* | *(<0.005)* |

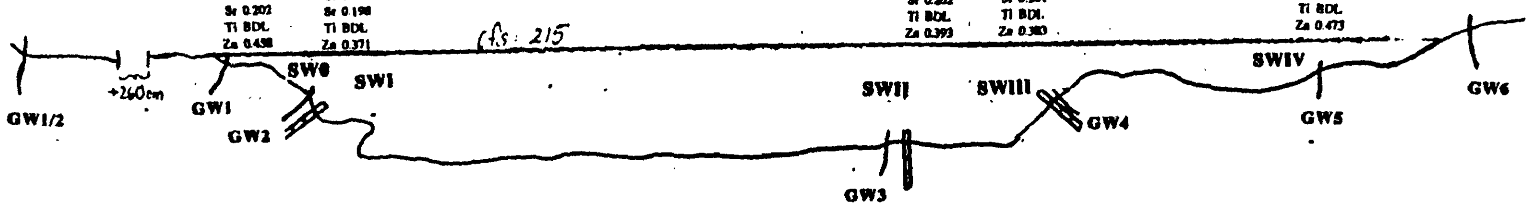
*n= number of samples; numbers in parentheses are the detection limits of the ICAPES.*

**Fe QA/QC: low vs. high concentrations**

| **Conc. range** | **% change btw. duplicates** | **Conc. range** | **% change btw. duplicates** |
|---|---|---|---|
| *319-312* | 2.2 | *0.087-.096* | 9.8 |
| *93.2-89.1* | 4.5 | *0.168-0.114* | 38.3 |
| *29-25.4* | 4.1 | *0.051-0.044* | 14.7 |
| *57.4-59.8* | 13.2 | *0.196-0.145* | 30.1 |
| | | *0.181-0.245* | 30.3 |
| | | *0.741-0.663* | 11.11 |
| | | *0.302-0.176* | 52 |
| *avg* | 6.0 | *avg* | 26.6 |
| *std dev.* | 4.9 | *stdev* | 14.5 |
| *# of data* | 4 | *# of data* | 7 |
| *std.error* | 1.2 | *std.error* | 2.1 |
| *95% conf. mean* | 8.4 | *95% conf. mean* | 30.7 |

# SILVER BOW CREEK
# TRANSECT IA
# 6/20/95

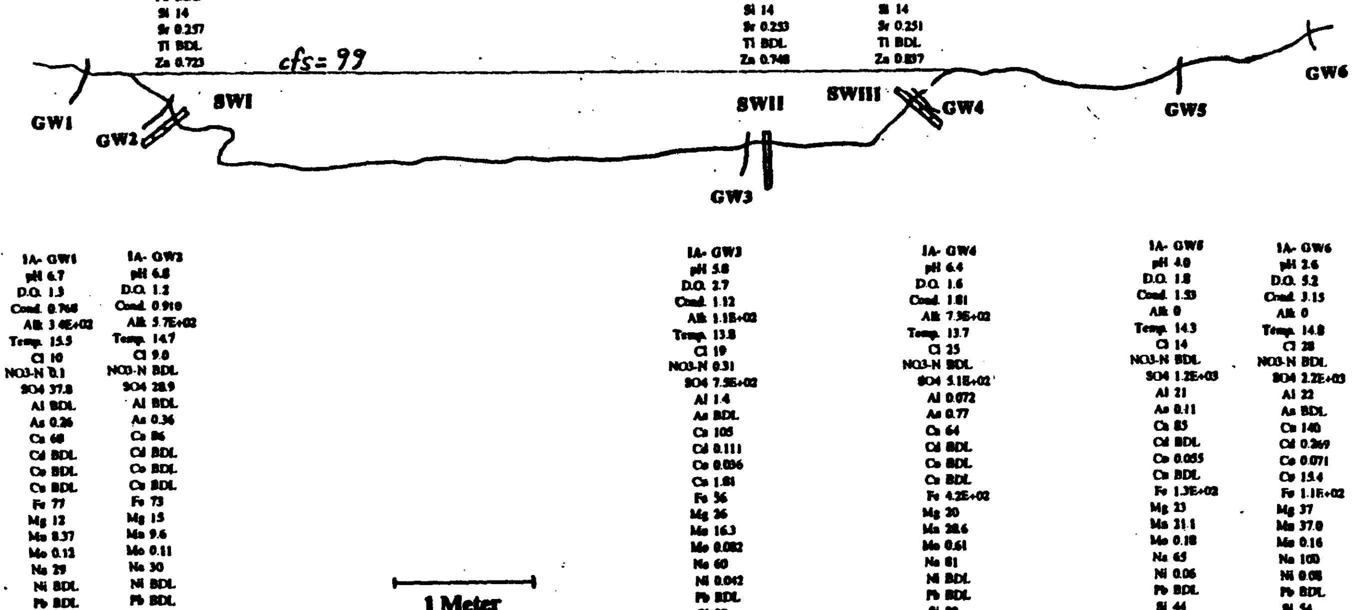
| | IA- SW0 | IA- SW1 | IA- SWII | IA- SWIII | IA- SWIV |
|---|---|---|---|---|---|
| pH | 7.3 | 7.3 | 7.5 | 7.4 | 7.1 |
| D.O. | 11 | 10 | 9.2 | 9.1 | 8.1 |
| Cond. | 0.324 | 0.304 | 0.307 | 0.321 | 0.308 |
| Alk. | | | | | |
| Temp. | 14.8 | 14.9 | 14.8 | 14.9 | 14.8 |
| Cl | 10.12 | 7.4 | 7.6 | 7.5 | 7.6 |
| NO3-N | 0.55 | 0.55 | 0.57 | 0.57 | 0.57 |
| SO4 | 46.8 | 46.8 | 46.8 | 46.9 | 48.5 |
| Al | 0.10 | BDL | BDL | BDL | 0.10 |
| As | BDL | BDL | BDL | BDL | BDL |
| Ca | 36 | 35 | 35 | 35 | 35 |
| Cd | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL |
| Cu | 0.114 | 0.090 | 0.096 | 0.097 | 0.121 |
| Fe | 0.46 | 0.35 | 0.34 | 0.33 | 0.46 |
| Mg | 7.7 | 7.5 | 7.7 | 7.7 | 7.6 |
| Mn | 0.478 | 0.471 | 0.444 | 0.445 | 0.524 |
| Mo | BDL | BDL | BDL | BDL | BDL |
| Na | 17 | 16 | 17 | 17 | 17 |
| Ni | BDL | BDL | BDL | BDL | BDL |
| Pb | BDL | BDL | BDL | BDL | BDL |
| Si | 14 | 14 | 14 | 14 | 14 |
| Sr | 0.202 | 0.198 | 0.202 | 0.201 | 0.198 |
| Ti | BDL | BDL | BDL | BDL | BDL |
| Zn | 0.458 | 0.371 | 0.393 | 0.383 | 0.473 |




| | IA- GW1/2 | IA- GW1 | IA- GW2 | IA- GW3 | IA- GW4 | IA- GW5 | IA- GW6 |
|---|---|---|---|---|---|---|---|
| pH | 5.9 | 6.9 | 7.0 | 6.2 | 6.5 | 4.5 | 2.7 |
| D.O. | 6.0 | 2.4 | 10 | 5.9 | 4.5 | 3.8 | 5.4 |
| Cond. | 0.474 | 1.040 | 0.262 | 0.490 | 1.41 | 0.967 | 2.32 |
| Alk. | | | | | | | |
| Temp. | 13.4 | 11.7 | 11.7 | 11.0 | 10.5 | 10.5 | 10.8 |
| Cl | 7.5 | 58 | 7.5 | 10 | | 9.8 | 21.12 |
| NO3-N | BDL | BDL | 0.55 | 0.54 | BDL | 0.32 | BDL |
| SO4 | 144 | 1.58E+03 | 47.1 | 172 | 93.0 | 4.5E+02 | 3.8E+02 |
| Al | 0.14 | BDL | 0.08 | 0.17 | BDL | 3.7 | 20 |
| As | BDL | 0.80 | BDL | BDL | 0.7 | BDL | BDL |
| Ca | 41 | 79 | 34 | 51 | 85 | 63 | 107 |
| Cd | 0.09 | BDL | BDL | 0.025 | BDL | BDL | 0.173 |
| Co | BDL | BDL | BDL | BDL | 0.044 | 0.031 | 0.06 |
| Cu | 0.180 | 0.026 | 0.113 | 0.602 | BDL | 0.045 | 13.7 |
| Fe | 3.6 | 89 | 0.40 | 7.3 | 4.0E+02 | 54 | 1.1E+02 |
| Mg | 7.3 | 14 | 7.5 | 12 | 23 | 15 | 29 |
| Mn | 8.15 | 15.4 | 0.447 | 4.43 | 35.4 | 10.6 | 25.7 |
| Mo | BDL | 0.19 | BDL | 0.014 | 0.86 | 0.079 | 0.17 |
| Na | 22 | 34 | 16 | 28 | 64 | 35 | 75 |
| Ni | BDL | BDL | BDL | BDL | BDL | 0.039 | 0.06 |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 16 | 18 | 14 | 16 | 21 | 23 | 51 |
| Sr | 0.189 | 0.34 | 0.198 | 0.277 | 0.446 | 0.305 | 0.257 |
| Ti | BDL | BDL | BDL | BDL | BDL | BDL | 0.015 |
| Zn | 13 | 0.151 | 0.396 | 4.14 | 1.34 | 13.5 | 32.4 |

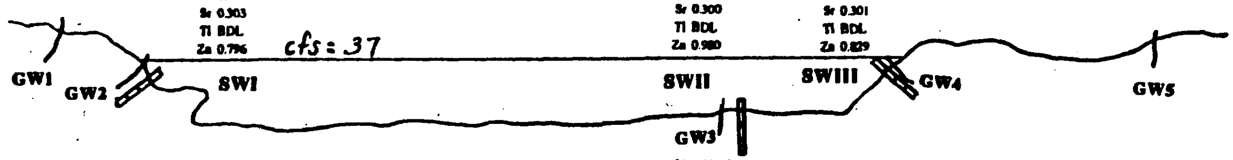
1 Meter

# SILVER BOW CREEK TRANSECT IA 7/19/95




| | IA- SWI | IA- SWII | IA- SWIII | IA- GW1 | IA- GW2 | IA- GW3 | IA- GW4 | IA- GW5 | IA- GW6 |
|---|---|---|---|---|---|---|---|---|---|
| pH | 7.7 | 7.6 | 7.2 | 6.7 | 6.8 | 5.8 | 6.4 | 4.0 | 2.6 |
| D.O. | 6 | 6 | 5.4 | 1.3 | 1.2 | 2.7 | 1.6 | 1.8 | 5.2 |
| Cond. | 0.395 | 0.402 | 0.408 | 0.768 | 0.910 | 1.12 | 1.81 | 1.53 | 3.15 |
| Alk | 1.7E+02 | 1.8E+02 | 1.6E+02 | 3.4E+02 | 5.7E+02 | 1.1E+02 | 7.3E+02 | 0 | 0 |
| Temp. | 16.6 | 16.3 | 16.3 | 15.5 | 14.7 | 13.8 | 13.7 | 14.3 | 14.8 |
| Cl | 12 | 12 | 12 | 10 | 9.0 | 19 | 25 | 14 | 28 |
| NO3-N | 1.09 | 1.14 | 1.13 | 0.1 | BDL | 0.31 | BDL | BDL | BDL |
| SO4 | 72.5 | 72.7 | 73.4 | 37.8 | 28.9 | 7.5E+02 | 5.1E+02 | 1.2E+03 | 2.2E+03 |
| Al | BDL | BDL | 0.073 | BDL | BDL | 1.4 | 0.072 | 21 | 22 |
| As | BDL | BDL | BDL | 0.26 | 0.36 | BDL | 0.77 | 0.11 | BDL |
| Ca | 46 | 46 | 45 | 68 | 86 | 105 | 64 | 85 | 140 |
| Cd | BDL | BDL | BDL | BDL | BDL | 0.111 | BDL | BDL | 0.269 |
| Co | BDL | BDL | BDL | BDL | BDL | 0.036 | BDL | 0.055 | 0.071 |
| Cu | 0.129 | 0.135 | 0.145 | BDL | BDL | 1.81 | BDL | BDL | 15.4 |
| Fe | 0.18 | 0.25 | 0.30 | 77 | 73 | 56 | 4.2E+02 | 1.3E+02 | 1.1E+02 |
| Mg | 9.9 | 9.9 | 9.7 | 12 | 15 | 26 | 20 | 23 | 37 |
| Mn | 0.825 | 0.824 | 0.867 | 8.37 | 9.6 | 16.3 | 28.6 | 21.1 | 37.0 |
| Mo | BDL | BDL | BDL | 0.12 | 0.11 | 0.082 | 0.61 | 0.18 | 0.16 |
| Na | 21 | 21 | 21 | 29 | 30 | 60 | 81 | 65 | 100 |
| Ni | BDL | BDL | BDL | BDL | BDL | 0.042 | BDL | 0.06 | 0.08 |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 14 | 14 | 14 | 16 | 18 | 23 | 22 | 44 | 54 |
| Sr | 0.257 | 0.253 | 0.251 | 0.496 | 0.65 | 0.538 | 0.343 | 0.389 | 0.469 |
| Tl | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.015 |
| Zn | 0.723 | 0.748 | 0.837 | 0.064 | 0.072 | 13.3 | 0.582 | 26.9 | 44 |

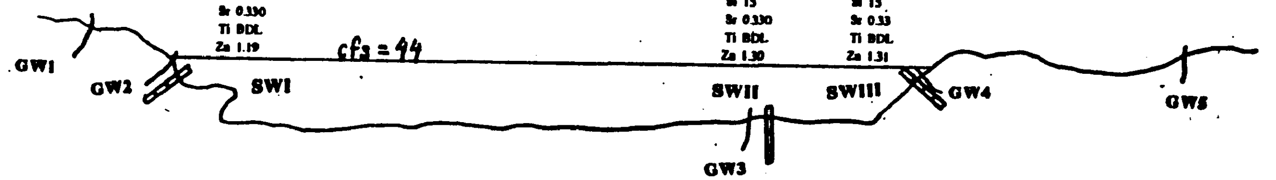
# SILVER BOW CREEK
## TRANSECT IA
## 8/24/95





| | IA- SW1 | IA- SWII | IA- SWIII | IA- GW1 | IA- GW2 | IA- GW 3 | IA- GW4 | IA- GW5 |
|---|---|---|---|---|---|---|---|---|
| pH | 7.4 | 7.3 | 6.7 | 6.4 | 6.7 | 4.4 | 6.4 | 4.0 |
| D.O. | 7.8 | 6.8 | 7.2 | 1.8 | 1.5 | 1.9 | 2.3 | 4.6 |
| Cond. | 0.494 | 0.493 | 0.491 | 0.964 | 0.851 | 1.36 | 1.15 | 1.71 |
| Alk. | 1.2E+02 | 1.2E+02 | 1.7E+02 | 1.8E+02 | 3.7E+02 | 0 | 4.4E+02 | 0 |
| Temp. | 15.5 | 15.4 | 15.3 | 15.2 | 14.7 | 13.0 | 14.6 | 13.7 |
| Cl | 17 | 17 | 17 | 18 | 15 | 20 | 20 | 22 |
| NO3-N | 1.66 | 1.62 | 1.64 | BDL | BDL | 0.13 | BDL | BDL |
| SO4 | 95.4 | 90.7 | 95.7 | 69.2 | 36.4 | 8.2E+02 | 2.0E+02 | 7.2E+02 |
| Al | BDL | BDL | BDL | BDL | BDL | 10 | BDL | 24 |
| As | BDL | BDL | BDL | 0.09 | 0.11 | BDL | 0.52 | 0.069 |
| Ca | 56 | 56 | 55 | 57 | 88 | 111 | 48 | 108 |
| Cd | BDL | BDL | BDL | BDL | BDL | 0.129 | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | 0.044 | BDL | 0.0526 |
| Cu | 0.162 | 0.166 | 0.163 | BDL | BDL | 4.77 | BDL | 0.0141 |
| Fe | 0.10 | 0.10 | 0.092 | 26 | 51 | 91 | 2.0E+02 | 1.5E+02 |
| Mg | 13 | 12 | 12 | 12 | 16 | 30 | 16 | 31 |
| Mn | 1.14 | 1.15 | 1.14 | 3.88 | 8.61 | 20.4 | 16.4 | 25.4 |
| Mo | BDL | BDL | BDL | 0.042 | 0.077 | 0.13 | 0.29 | 0.20 |
| Na | 26 | 26 | 26 | 28 | 32 | 66 | 52 | 72 |
| Ni | BDL | BDL | BDL | BDL | BDL | 0.04 | BDL | 0.058 |
| Pb | BDL | BDL | BDL | BDL | BDL | 0.37 | BDL | BDL |
| Si | 13 | 13 | 13 | 16 | 17 | 33 | 20 | 49 |
| Sr | 0.303 | 0.300 | 0.301 | 0.363 | 0.673 | 0.543 | 0.215 | 0.463 |
| Tl | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Zn | 0.796 | 0.980 | 0.829 | 0.078 | 0.042 | 16.9 | 0.156 | 27.2 |

# SILVER BOW CREEK
## TRANSECT IA
## 9/27/95

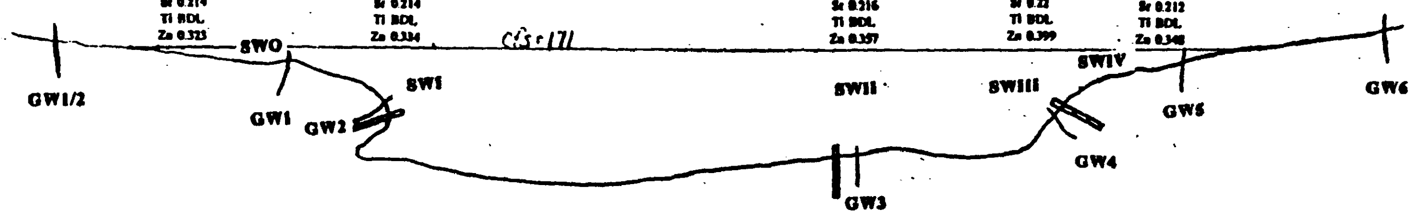



| | IA- SW1 | IA- SWII | IA- SWIII | IA- GW1 | IA- GW2 | IA- GW3 | IA- GW4 | IA- GW5 |
|---|---|---|---|---|---|---|---|---|
| pH | 8.0 | 8.0 | 8.0 | 6.9 | 7.0 | 4.7 | 6.8 | 4.3 |
| D.O. | 6.9 | 7.5 | 7.6 | 1.8 | 1.6 | 2.8 | 1.7 | 5.2 |
| Cond. | 0.520 | 0.511 | 0.545 | 0.533 | 0.742 | 1.06 | 2.39 | 1.59 |
| Alk. | 1.2E+02 | 1.2E+02 | 1.6E+02 | 2.1E+02 | 3.4E+02 | 1.6E+01 | 6.9E+02 | NA |
| Temp. | 13.6 | 13.6 | 13.6 | 10.1 | 10.5 | 11.4 | 10.8 | 9.7 |
| Cl | 17 | 17 | 17 | 16 | 15 | 18 | 28 | 22 |
| NO3-N | 1.90 | 1.89 | 1.89 | BDL | 0.14 | 0.26 | BDL | BDL |
| SO4 | 108 | 109 | 107 | 68.1 | 51.4 | 5.7E+02 | 8.6E+02 | 1.2E+03 |
| Al | BDL | BDL | BDL | BDL | BDL | 7.0 | BDL | 24.9 |
| As | BDL | BDL | BDL | BDL | 0.07 | BDL | 0.53 | 0.09 |
| Ca | 57 | 57 | 56 | 58 | 85 | 81 | 150 | 110 |
| Cd | BDL | BDL | BDL | BDL | BDL | 0.058 | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | 0.029 | BDL | 0.053 |
| Cu | 0.179 | 0.189 | 0.190 | BDL | 0.016 | 3.50 | BDL | BDL |
| Fe | 0.05 | 0.15 | 0.14 | 25 | 54 | 60 | 3.7E+02 | 1.4E+02 |
| Mg | 13 | 13 | 13 | 12 | 14 | 21 | 36 | 31 |
| Mn | 1.32 | 1.32 | 1.32 | 3.82 | 7.9 | 13.7 | 38.3 | 26.6 |
| Mo | BDL | BDL | BDL | 0.056 | 0.075 | 0.083 | 0.52 | 0.19 |
| Na | 29 | 29 | 29 | 27 | 33 | 52 | 110 | 74 |
| Ni | BDL | BDL | BDL | BDL | BDL | 0.05 | BDL | 0.05 |
| Pb | BDL | BDL | BDL | BDL | BDL | 0.10 | BDL | BDL |
| Si | 16 | 15 | 15 | 14 | 16 | 27 | 21 | 46 |
| Sr | 0.330 | 0.330 | 0.33 | 0.341 | 0.631 | 0.385 | 0.654 | 0.448 |
| Ti | BDL | BDL | BDL | 0.005 | 0.005 | BDL | 0.007 | BDL |
| Zn | 1.19 | 1.30 | 1.31 | 0.192 | 0.48 | 10.6 | 0.205 | 29.8 |

1 Meter

# SILVER BOW CREEK
# TRANSECT IB
# 6/26/95

| | IB- SW0 | IB- SWI | IB- SWII | IB- SWIII | IB- SWIV |
|---|---|---|---|---|---|
| pH | 7.6 | 7.5 | 7.7 | 7.5 | 7.5 |
| D.O. | 6.3 | 5.8 | 5.9 | 3.9 | 6.3 |
| Cond. | 0.328 | 0.324 | 0.317 | 0.315 | 0.321 |
| Alk. | 1.1E+02 | 1.2E+02 | 80 | 1.2E+02 | 1.0E+02 |
| Temp. | | | | | |
| Cl | 10 | 10 | 10 | 10 | 10 |
| NO3-N | 0.94 | 0.94 | 0.97 | 0.97 | 0.97 |
| SO4 | 54.6 | 54.5 | 54.4 | 54.7 | 54.0 |
| Al | BDL | BDL | BDL | 0.08 | 0.07 |
| As | BDL | BDL | BDL | BDL | 0.17 |
| Ca | 38 | 38 | 38 | 38 | 45 |
| Cd | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL |
| Cu | 0.085 | 0.081 | 0.09 | 0.104 | BDL |
| Fe | 0.20 | 0.25 | 0.26 | 0.29 | 6.2 |
| Mg | 8.1 | 8.1 | 8.2 | 8.2 | 7.5 |
| Mn | 0.491 | 0.487 | 0.495 | 0.524 | 1.34 |
| Mo | BDL | BDL | BDL | BDL | BDL |
| Na | 17 | 17 | 18 | 10 | 16 |
| Ni | BDL | BDL | BDL | BDL | BDL |
| Pb | BDL | BDL | BDL | BDL | BDL |
| Si | 14 | 14 | 14 | 13 | 13 |
| Sr | 0.214 | 0.214 | 0.216 | 0.22 | 0.212 |
| Tl | BDL | BDL | BDL | BDL | BDL |
| Zn | 0.323 | 0.334 | 0.357 | 0.399 | 0.348 |

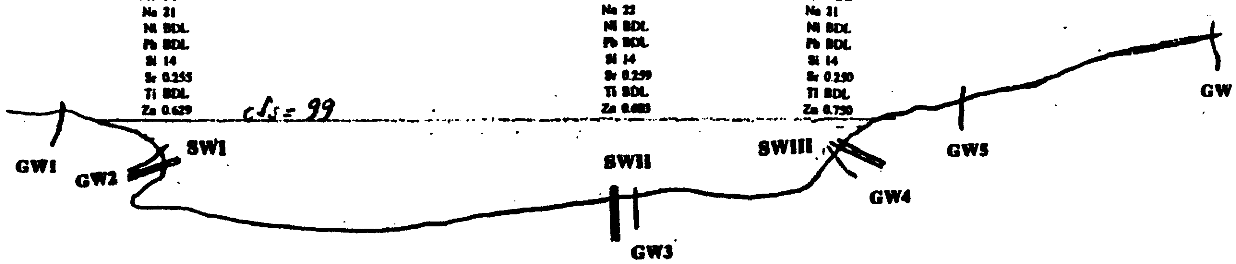



| | IB- GW1/2 | IB- GW1 | IB- GW2 | IB- GW3 | IB- GW4 | IB- GW5 | IB- GW6 |
|---|---|---|---|---|---|---|---|
| pH | 6.4 | 6.8 | 6.8 | 6.3 | 6.2 | 3.8 | 2.8 |
| D.O. | 0.0 | 0.5 | 5.2 | 1.9 | 1.3 | 1.6 | 1.9 |
| Cond. | 0.380 | 1.20 | 0.351 | 0.340 | 1.68 | 1.61 | 2.01 |
| Alk. | 1.5E+02 | 7.6E+02 | 1.8E+02 | 1.2E+02 | 94 | 0 | 0 |
| Temp. | | | | | | | |
| Cl | 8.1 | 30 | 10 | 9.4 | 12 | 20 | 23 |
| NO3-N | BDL | BDL | 0.85 | 0.61 | 0.65 | BDL | BDL |
| SO4 | 80.4 | 15.3 | 55.4 | 59.2 | 2.4E+02 | 1.1E+03 | 1.3E+03 |
| Al | BDL | 0.39 | BDL | BDL | BDL | 20 | 23 |
| As | 0.19 | 1.6 | 0.17 | BDL | 0.07 | 0.08 | BDL |
| Ca | 45 | 110 | 38 | 37 | 56 | 120 | 93 |
| Cd | BDL | BDL | BDL | BDL | BDL | 0.0828 | 0.129 |
| Co | BDL | BDL | BDL | BDL | BDL | 0.064 | 0.067 |
| Cu | 0.012 | 0.175 | 0.023 | 0.066 | 0.002 | 2.70 | 11.4 |
| Fe | 6.3 | 71 | 6.4 | 0.19 | 62 | 1.8E+02 | 2.3E+02 |
| Mg | 7.9 | 21 | 7.8 | 8.0 | 14 | 33 | 27 |
| Mn | 1.33 | 20 | 1.89 | 0.546 | 7.33 | 23.7 | 22.8 |
| Mo | 0.020 | 0.151 | 0.02 | BDL | 0.190 | 0.256 | 0.323 |
| Na | 16 | 31 | 18 | 18 | 37 | 70 | 74 |
| Ni | BDL | BDL | BDL | BDL | BDL | 0.07 | 0.06 |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 15 | 21 | 14 | 14 | 16 | 38 | 48 |
| Sr | 0.210 | 0.610 | 0.231 | 0.21 | 0.307 | 0.487 | 0.293 |
| Tl | BDL | 0.016 | BDL | BDL | BDL | BDL | 0.006 |
| Zn | 0.069 | 0.304 | 0.290 | 0.442 | 0.197 | 17.3 | 24.2 |

1 Meter

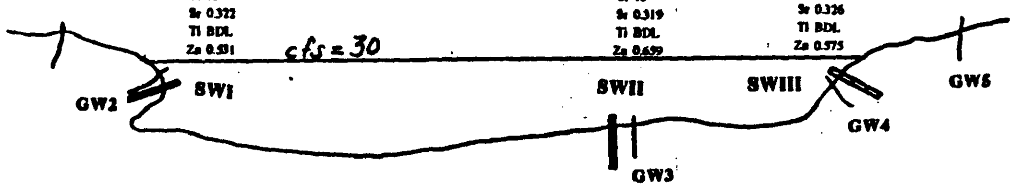
# SILVER BOW CREEK
# TRANSECT IB
# 7/19/95

| IB- | SW1 | SWII | SWIII | GW1 | GW2 | GW3 | GW4 | GW5 | GW6 |
|---|---|---|---|---|---|---|---|---|---|
| pH | 7.6 | 7.6 | 7.4 | 6.5 | 6.7 | 6.6 | 6.3 | 4.3 | 3.3 |
| D.O. | 5.9 | 6.0 | 5.9 | 0.8 | 2.4 | 2.3 | 1.6 | 1.6 | 2.6 |
| Cond. | 0.404 | 0.414 | 0.394 | 1.13 | 0.424 | 0.405 | 0.807 | 1.38 | 2.19 |
| Alk. | 1.1E+02 | 1.4E+02 | 1.3E+02 | | | 1.2E+02 | 2.5E+02 | 0 | 0 |
| Temp. | 18.3 | 18.2 | 18.2 | 16.7 | 14.8 | 14.5 | 14.8 | 14.0 | 18.9 |
| Cl | 12 | 12 | 11 | 16 | 14 | 12 | 15 | 19 | 25 |
| NO3-N | 1.10 | 1.09 | 1.07 | BDL | 0.51 | 0.63 | 0.75 | BDL | BDL |
| SO4 | 73.8 | 73.4 | 73.4 | 21.9 | 72.6 | 80.5 | 2.8E+02 | 1.8E+03 | 2.3E+03 |
| Al | BDL | 0.076 | BDL | 0.72 | BDL | 0.09 | BDL | 12 | 16 |
| As | BDL | BDL | BDL | 1.9 | 0.10 | BDL | BDL | 0.08 | 0.08 |
| Ca | 46 | 46 | 45 | 140 | 43 | 43 | 61 | 105 | 99 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.060 | 0.138 |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.046 | 0.068 |
| Cu | 0.123 | 0.148 | 0.134 | 0.331 | 0.021 | 0.091 | 0.013 | 0.935 | 4.58 |
| Fe | 0.22 | 0.43 | 0.29 | 1.6E+02 | 11 | 1.2 | 64 | 1.5E+02 | 3.2E+02 |
| Mg | 10 | 10 | 9.7 | 24 | 8.5 | 8.8 | 14 | 28 | 28 |
| Mn | 0.794 | 0.818 | 0.836 | 23.5 | 2.32 | 0.774 | 7.73 | 20.7 | 24.3 |
| Mo | BDL | BDL | BDL | 0.26 | 0.022 | BDL | 0.094 | 0.21 | 0.45 |
| Na | 21 | 22 | 21 | 40 | 21 | 21 | 36 | 73 | 80 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.045 | 0.06 |
| Pb | BDL | BDL | BDL | 0.12 | BDL | BDL | BDL | BDL | BDL |
| Si | 14 | 14 | 14 | 22 | 14 | 13 | 17 | 35 | 55 |
| Sr | 0.255 | 0.259 | 0.250 | 0.962 | 0.258 | 0.232 | 0.311 | 0.438 | 0.330 |
| Tl | BDL | BDL | BDL | 0.039 | BDL | BDL | BDL | BDL | BDL |
| Zn | 0.629 | 0.683 | 0.750 | 0.368 | 0.270 | 0.511 | 0.490 | 12.7 | 23.8 |



# SILVER BOW CREEK TRANSECT IB 8/27/95

| ID- | SWI | SWII | SWIII | GW2 | GW3 | GW4 | GW5 |
|---|---|---|---|---|---|---|---|
| pH | 8.0 | 7.8 | 7.9 | 6.8 | 6.7 | 6.4 | 5.4 |
| D.O. | 7.2 | 6.9 | 7.9 | 1.3 | 2.2 | 2.3 | 3.4 |
| Cond. | 0.505 | 0.493 | 0.498 | 0.492 | 0.457 | 0.802 | 1.95 |
| Alk. | 1.2E+02 | 1.2E+02 | 1.1E+02 | 1.4E+02 | 9.6E+01 | 1.9E+02 | 3.6E+01 |
| Temp. | 18.2 | 18.3 | 18.2 | 14.0 | 14.2 | 14.1 | 16.3 |
| Cl | 28 | 17 | 17 | 19 | 18 | 18 | 29 |
| NO3-N | 1.86 | 1.81 | 1.88 | 0.76 | 1.21 | 0.86 | BDL |
| PO4-P | BDL | BDL | BDL | BDL | BDL | BDL | 0.6 |
| SO4 | 102 | 100 | 104 | 63.2 | 96.2 | 176 | 1.3E+03 |
| Al | BDL | BDL | BDL | BDL | BDL | BDL | 2.0 |
| As | BDL | BDL | BDL | 0.14 | BDL | BDL | 0.10 |
| Ca | 58 | 57 | 57 | 51 | 51 | 62 | 134 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | 0.018 |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | 0.05 |
| Cu | 0.147 | 0.148 | 0.162 | 0.058 | 0.049 | 0.024 | BDL |
| Fe | 0.09 | 0.10 | 0.08 | 6.4 | 0.40 | 51 | 3.2E+02 |
| Mg | 13 | 13 | 13 | 12 | 11 | 16 | 37 |
| Mn | 1.14 | 1.15 | 1.16 | 2.80 | 0.90 | 6.71 | 27.0 |
| Mo | BDL | BDL | BDL | 0.016 | BDL | 0.076 | 0.44 |
| Na | 27 | 26 | 27 | 26 | 25 | 36 | 83 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | 0.05 |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 13 | 13 | 13 | 13 | 13 | 16 | 36 |
| Sr | 0.322 | 0.319 | 0.326 | 0.287 | 0.273 | 0.322 | 0.484 |
| Tl | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Zn | 0.531 | 0.659 | 0.575 | 0.160 | 0.296 | 0.288 | 10.3 |




1 Meter

# SILVER BOW CREEK TRANSECT IC 6/28/95

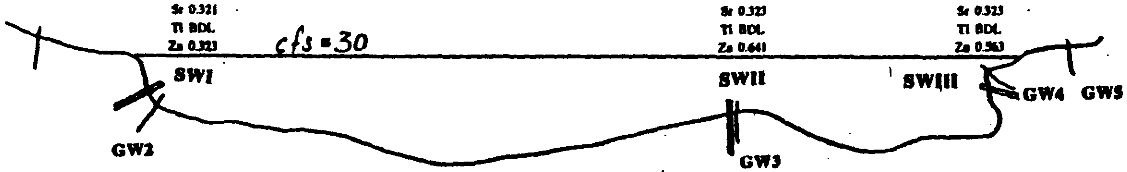
| | IC- SW0 | IC- SWI | IC- SWII | IC- SWIII | IC- SWIV |
|---|---|---|---|---|---|
| pH | 7.6 | 7.7 | 7.6 | 7.6 | 7.4 |
| D.O. | 7.8 | 6.1 | 6.0 | 7.6 | 5.4 |
| Cond. | 0.326 | 0.321 | 0.322 | 0.324 | 0.320 |
| Alk. | 1.1E+02 | 1.7E+02 | 1.0E+02 | 8.0E+01 | 1.9E+02 |
| Temp. | | | | | |
| Cl | 10 | 10 | 10 | 10 | 10 |
| NO3-N | 0.92 | 0.89 | 0.88 | 0.86 | 0.84 |
| SO4 | 31.8 | 31.6 | 31.7 | 31.6 | 31.4 |
| Al | BDL | BDL | BDL | BDL | BDL |
| As | BDL | BDL | BDL | BDL | BDL |
| Ca | 38 | 38 | 38 | 38 | 38 |
| Cd | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL |
| Cu | 0.089 | 0.089 | 0.112 | 0.111 | 0.107 |
| Fe | 0.28 | 0.28 | 0.33 | 0.36 | 0.33 |
| Mg | 8.0 | 8.1 | 8.1 | 8.1 | 8.0 |
| Mn | 0.657 | 0.504 | 0.555 | 0.556 | 0.549 |
| Mo | BDL | BDL | BDL | BDL | BDL |
| Na | 17 | 17 | 17 | 17 | 17 |
| Ni | BDL | BDL | BDL | BDL | BDL |
| Pb | BDL | BDL | BDL | BDL | BDL |
| Si | 13 | 14 | 14 | 14 | 13 |
| Sr | 0.208 | 0.210 | 0.210 | 0.211 | 0.208 |
| Tl | BDL | BDL | BDL | BDL | BDL |
| Zn | 0.434 | 0.442 | 0.529 | 0.500 | 0.509 |


| | IC- GW1/2 | IC- GW1 | IC- GW2 | IC- GW3 | IC- GW4 | IC- GW5 | IC- GW6 |
|---|---|---|---|---|---|---|---|
| pH | | 6.8 | 6.8 | 7.1 | 6.5 | 6.1 | 2.7 |
| D.O. | | 1.9 | 2.1 | 3.3 | 2.6 | 2.4 | 4.5 |
| Cond. | | | 0.434 | 0.312 | 0.296 | 0.301 | 2.15 |
| Alk. | | | 2.0E+02 | 1.2E+02 | 1.2E+02 | 52 | 0 |
| Temp. | | | | | | | |
| Cl | | 22 | 9.9 | 13 | 16 | 10 | |
| NO3-N | | BDL | BDL | 0.64 | 0.16 | 0.63 | |
| SO4 | | 1.88 | 24.9 | 48.3 | 53.3 | 64.3 | |
| Al | 29 | 0.19 | BDL | BDL | BDL | 0.26 | 33 |
| As | BDL | 0.15 | 0.12 | BDL | BDL | BDL | BDL |
| Ca | 160 | 120 | 43 | 37 | 35 | 31 | 180 |
| Cd | 0.102 | BDL | BDL | BDL | BDL | BDL | 0.118 |
| Co | 0.076 | BDL | BDL | BDL | BDL | BDL | 0.089 |
| Cu | 18.2 | 0.0413 | BDL | 0.086 | 0.095 | 0.143 | 20.4 |
| Fe | 26 | 1.8E+02 | 27 | 5.2 | 7.8 | 1.6 | 29 |
| Mg | 26 | 22 | 8.4 | 7.7 | 7.3 | 7.1 | 29 |
| Mn | 29.7 | 13.1 | 4.09 | 1.42 | 0.834 | 0.428 | 35.0 |
| Mo | 0.047 | 0.253 | 0.045 | 0.014 | 0.057 | BDL | 0.049 |
| Na | 41 | 40 | 18 | 17 | 18 | 18 | 43 |
| Ni | 0.064 | 0.05 | BDL | BDL | BDL | BDL | 0.073 |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 51 | 24 | 18 | 15 | 13 | 11 | 55 |
| Sr | 0.308 | 1.49 | 0.259 | 0.199 | 0.184 | 0.144 | 0.347 |
| Tl | 0.014 | 0.012 | BDL | BDL | BDL | 0.006 | 0.017 |
| Zn | 26.4 | 0.139 | 0.048 | 0.578 | 0.110 | 0.226 | 29.3 |

1 Meter

# SILVER BOW CREEK
# TRANSECT IC
# 8/27/95

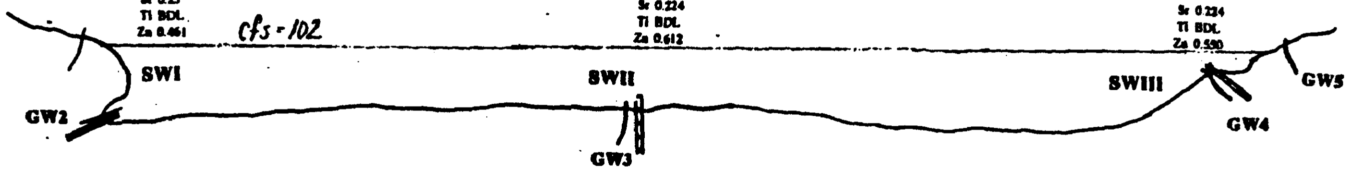
| | IC- SWI | IC- SWII | IC- SWIII | IC- GW2 | IC- GW3 | IC- GW4 | IC- GW5 |
|---|---|---|---|---|---|---|---|
| pH | 8.0 | 8.0 | 7.8 | 6.7 | 6.8 | 6.6 | 4.5 |
| D.O. | | | | | | | |
| Cond. | 0.496 | 0.501 | 0.505 | 0.761 | 0.515 | 0.564 | 1.01 |
| Alk. | 1.0E+02 | 1.1E+02 | 1.4E+02 | 3.4E+02 | 1.4E+02 | 1.4E+02 | 0 |
| Temp. | 18.4 | 18.3 | 18.2 | 14.2 | 14.0 | 14.4 | 16.0 |
| Cl | 18 | 17 | 17 | 16 | 17 | 17 | 17 |
| NO3-N | 1.93 | 1.92 | 1.91 | 0.14 | 0.08 | 0.14 | 0.68 |
| SO4 | 101 | 102 | 105 | 31.9 | 62.1 | 143 | 6.5E+02 |
| Al | BDL | BDL | BDL | BDL | BDL | BDL | 9.78 |
| As | BDL | BDL | BDL | 0.20 | 0.10 | BDL | BDL |
| Ca | 56 | 57 | 57 | 68 | 52 | 64 | 73 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | 0.073 |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | 0.050 |
| Cu | 0.060 | 0.162 | 0.127 | BDL | 0.052 | 0.053 | 8.30 |
| Fe | 0.18 | 0.16 | 0.11 | 55 | 10 | 9.4 | 70 |
| Mg | 13 | 13 | 13 | 13 | 12 | 14 | 20 |
| Mn | 1.16 | 1.13 | 1.2 | 7.50 | 3.79 | 3.24 | 16.0 |
| Mo | BDL | BDL | BDL | 0.082 | 0.021 | 0.019 | 0.098 |
| Na | 27 | 26 | 26 | 27 | 26 | 28 | 35 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | 0.046 |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 13 | 13 | 13 | 19 | 15 | 16 | 38 |
| Sr | 0.321 | 0.323 | 0.323 | 0.473 | 0.296 | 0.357 | 0.32 |
| Tl | BDL | BDL | BDL | BDL | BDL | 0.0051 | BDL |
| Zn | 0.323 | 0.641 | 0.563 | 0.063 | 0.164 | 0.560 | 18.7 |



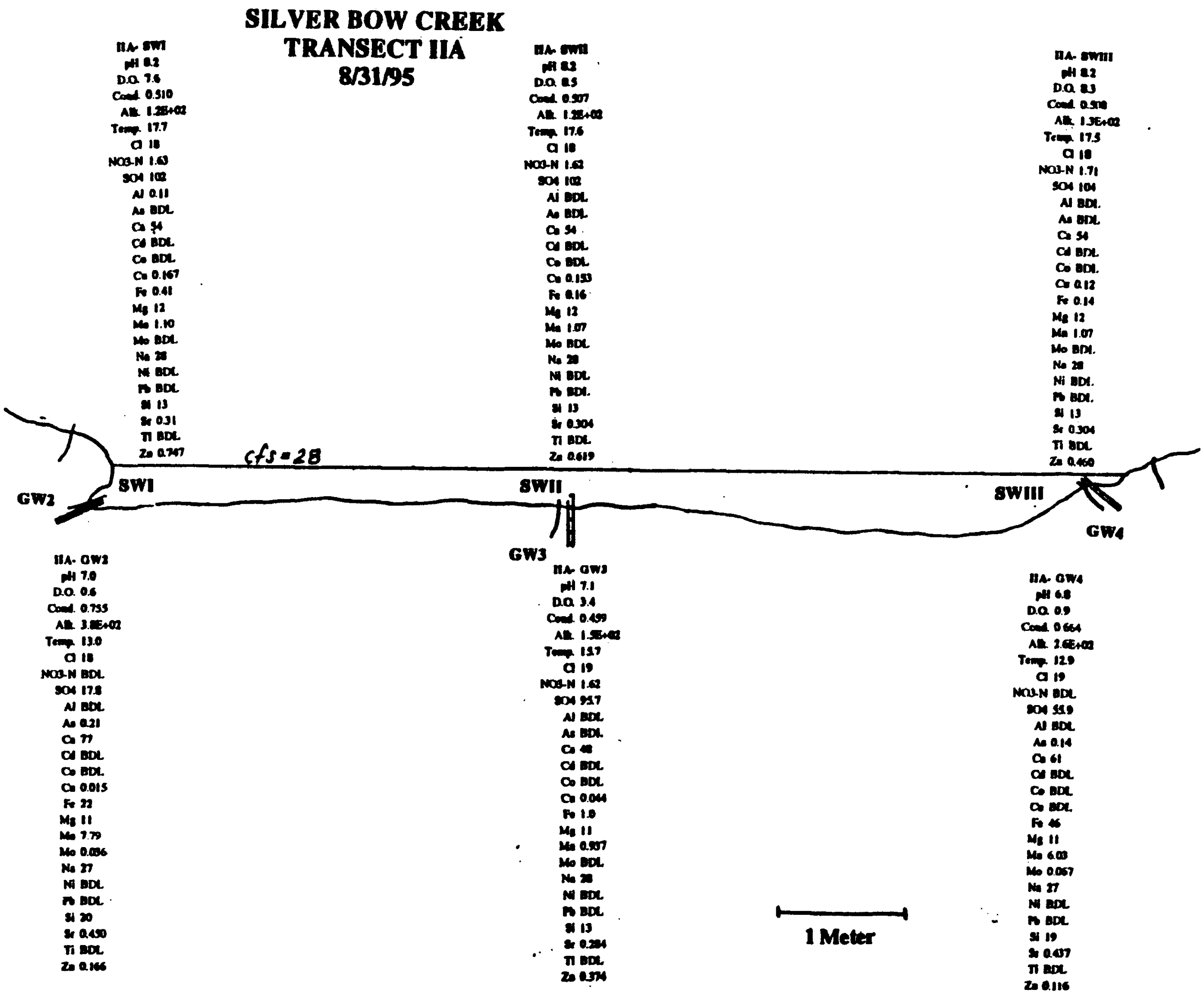

1 Meter

# SILVER BOW CREEK
## TRANSECT IIA
### 7/6/95

| | IIA- SWI | IIA- SWII | IIA- SWIII | IIA- GW2 | IIA- GW3 | IIA- GW4 | IIA- GW5 |
|---|---|---|---|---|---|---|---|
| pH | 7.6 | 7.6 | 7.5 | 6.5 | 6.9 | 6.7 | 6.8 |
| D.O. | 3.9 | 6.3 | 6.2 | 2.0 | 2.9 | 1.3 | 1.3 |
| Cond. | 0.351 | 0.350 | 0.360 | | 0.335 | 0.603 | 2.27 |
| Alk. | 1.2E+02 | 1.4E+02 | 1.3E+02 | | 1.3E+02 | 3.4E+02 | 1.7E+03 |
| Temp. | | | | | | | |
| Cl | 10 | 10 | 10 | 17 | 10 | 17 | 26 |
| NO3-N | 0.74 | 0.69 | 0.90 | 0.09 | 0.08 | BDL | BDL |
| SO4 | 63.2 | 59.4 | 60.8 | 7.61 | 52.2 | 25.8 | 188 |
| Al | BDL | BDL | BDL | 0.07 | BDL | 0.13 | 0.64 |
| As | BDL | BDL | BDL | 2.7 | BDL | 0.18 | 2.6 |
| Ca | 43 | 42 | 42 | 92 | 39 | 64 | 3.3E+02 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | 0.048 |
| Cu | 0.091 | 0.11 | 0.099 | 0.025 | 0.084 | 0.079 | 0.954 |
| Fe | 0.26 | 0.23 | 0.24 | 91 | 2.0 | 31 | 2.1E+02 |
| Mg | 9.0 | 8.4 | 8.7 | 17 | 8.6 | 12 | 54 |
| Mn | 0.673 | 0.656 | 0.695 | 16.4 | 0.960 | 5.52 | 45.5 |
| Mo | BDL | BDL | BDL | 0.20 | 0.01 | 0.05 | 0.335 |
| Na | 19 | 19 | 19 | 32 | 19 | 25 | 65 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | 0.023 |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | 0.14 |
| Si | 13 | 12 | 12 | 17 | 15 | 17 | 17 |
| Sr | 0.23 | 0.224 | 0.224 | 0.585 | 0.227 | 0.419 | 1.12 |
| Tl | BDL | BDL | BDL | BDL | BDL | BDL | 0.023 |
| Zn | 0.461 | 0.612 | 0.590 | 0.380 | 0.297 | 0.221 | 2.04 |



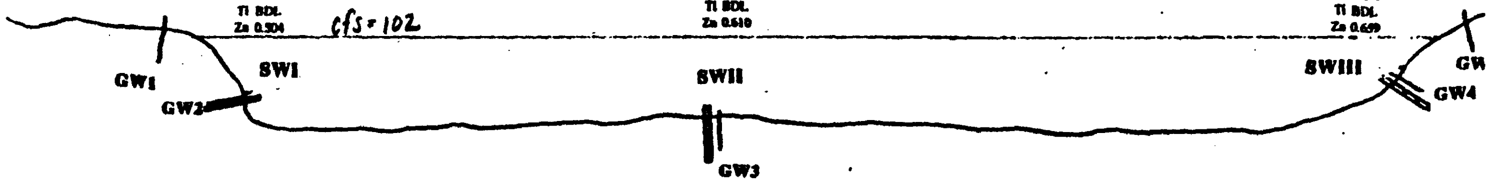

1 Meter


SILVER BOW CREEK
TRANSECT IIA
8/31/95
IIA- SWI
pH 8.2
D.O. 7.6
Cond. 0.510
Alk. 1.2E+02
Temp. 17.7
Cl 18
NO3-N 1.63
SO4 102
Al 0.11
As BDL
Ca 54
Cd BDL
Co BDL
Cu 0.167
Fe 0.41
Mg 12
Mn 1.10
Mo BDL
Na 28
Ni BDL
Pb BDL
Si 13
Sr 0.31
Tl BDL
Zn 0.747
IIA- SWII
pH 8.2
D.O. 8.5
Cond. 0.507
Alk. 1.2E+02
Temp. 17.6
Cl 18
NO3-N 1.62
SO4 102
Al BDL
As BDL
Ca 54
Cd BDL
Co BDL
Cu 0.153
Fe 0.16
Mg 12
Mn 1.07
Mo BDL
Na 28
Ni BDL
Pb BDL
Si 13
Sr 0.304
Ti BDL
Zn 0.619
IIA- SWIII
pH 8.2
D.O. 8.3
Cond. 0.508
Alk. 1.3E+02
Temp. 17.5
Cl 18
NO3-N 1.71
SO4 104
Al BDL
As BDL
Ca 54
Cd BDL
Co BDL
Cu 0.12
Fe 0.14
Mg 12
Mn 1.07
Mo BDL
Na 28
Ni BDL
Pb BDL
Si 13
Sr 0.304
Ti BDL
Zn 0.460
cfs = 28
SWI
SWII
SWIII
GW2
GW3
GW4
IIA- GW2
pH 7.0
D.O. 0.6
Cond. 0.755
Alk. 3.8E+02
Temp. 13.0
Cl 18
NO3-N BDL
SO4 17.8
Al BDL
As 0.21
Ca 77
Cd BDL
Co BDL
Cu 0.015
Fe 22
Mg 11
Mn 7.79
Mo 0.036
Na 27
Ni BDL
Pb BDL
Si 20
Sr 0.450
Ti BDL
Zn 0.166
IIA- GW3
pH 7.1
D.O. 3.4
Cond. 0.499
Alk. 1.5E+02
Temp. 15.7
Cl 19
NO3-N 1.62
SO4 95.7
Al BDL
As BDL
Ca 48
Cd BDL
Co BDL
Cu 0.044
Fe 1.8
Mg 11
Mn 0.937
Mo BDL
Na 28
Ni BDL
Pb BDL
Si 13
Sr 0.284
Tl BDL
Zn 0.374
IIA- GW4
pH 6.8
D.O. 0.9
Cond. 0.664
Alk. 2.6E+02
Temp. 12.9
Cl 19
NO3-N BDL
SO4 55.9
Al BDL
As 0.14
Ca 61
Cd BDL
Co BDL
Cu BDL
Fe 46
Mg 11
Mn 6.03
Mo 0.067
Na 27
Ni BDL
Pb BDL
Si 19
Sr 0.437
Tl BDL
Zn 0.116
1 Meter

# SILVER BOW CREEK
## TRANSECT IIB
## 7/6/95

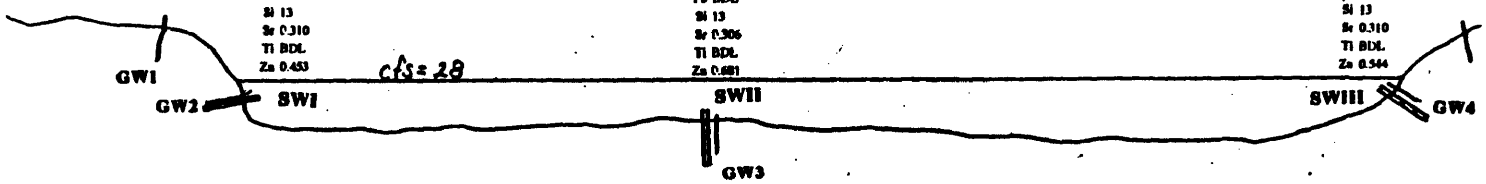
| | IIB- SWI | IIB- SWII | IIB- SWIII | IIB- GW1 | IIB- GW2 | IIB- GW3 | IIB- GW4 | IIB- GW5 |
|---|---|---|---|---|---|---|---|---|
| pH | 7.6 | 7.5 | 7.4 | 6.6 | 6.6 | 7.0 | 6.5 | 6.1 |
| D.O. | 6.9 | 6.0 | 5.9 | 1.9 | 1.3 | 3.4 | 1.1 | 0.7 |
| Cond. | 0.366 | 0.355 | 0.367 | 0.356 | 0.355 | 0.343 | 0.667 | 1.495 |
| Alk. | 1.3E+02 | 1.3E+02 | 1.6E+02 | 1.4E+02 | 1.5E+02 | 1.5E+02 | 2.7E+02 | 8.4E+02 |
| Temp. | | | | | | | | |
| Cl | 13 | 12 | 12 | 23 | 16 | 12 | 16 | 21 |
| NO3-N | 1.20 | 1.15 | 1.15 | 0.46 | 0.60 | 1.01 | BDL | BDL |
| SO4 | 62.5 | 62.9 | 66.7 | 63.8 | 56.4 | 58.1 | 9.25 | 51.5 |
| Al | BDL | BDL | BDL | BDL | 0.11 | BDL | BDL | 0.16 |
| As | BDL | BDL | BDL | BDL | 0.16 | BDL | 0.16 | 0.90 |
| Ca | 43 | 43 | 44 | 43 | 40 | 41 | 100 | 118 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cu | 0.091 | 0.109 | 0.129 | 0.139 | 0.046 | 0.086 | BDL | 0.012 |
| Fe | 0.21 | 0.23 | 0.29 | 0.70 | 6.2 | 0.18 | 63 | 2.1E+02 |
| Mg | 9.2 | 9.1 | 9.1 | 8.4 | 8.4 | 8.3 | 19 | 13 |
| Mn | 0.710 | 0.683 | 0.799 | 0.966 | 2.16 | 0.475 | 9.32 | 20.0 |
| Mo | BDL | BDL | BDL | BDL | 0.018 | BDL | 0.095 | 0.304 |
| Na | 20 | 19 | 20 | 19 | 20 | 19 | 36 | 40 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 13 | 13 | 13 | 13 | 13 | 12 | 21 | 25 |
| Sr | 0.232 | 0.220 | 0.235 | 0.223 | 0.235 | 0.220 | 0.535 | 0.507 |
| Tl | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.009 |
| Zn | 0.504 | 0.610 | 0.659 | 0.971 | 0.214 | 0.523 | 0.072 | 0.069 |

cfs = 102



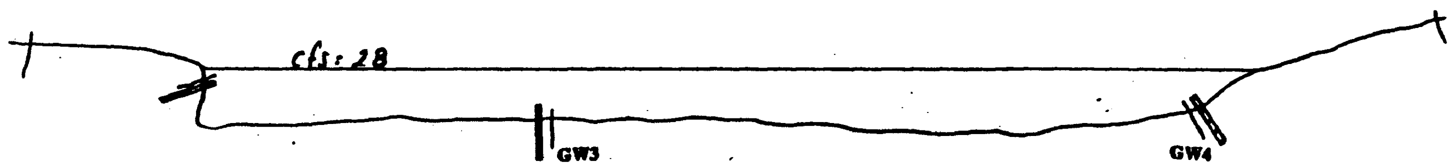

1 Meter

# SILVER BOW CREEK
## TRANSECT IIB
## 9/4/95




| | IIB- SWI | IIB- SWII | IIB- SWIII | IIB- GW1 | IIB- GW2 | IIB- GW3 | IIB- GW4 |
|---|---|---|---|---|---|---|---|
| pH | 8.1 | 8.1 | 8.3 | 7.3 | 6.7 | 7.5 | 6.7 |
| D.O. | | | | | | | |
| Cond. | 0.506 | 0.514 | 0.534 | 0.515 | 0.452 | 0.498 | 0.666 |
| Alk. | 1.1E+02 | 1.0E+02 | 1.2E+02 | 1.2E+02 | 1.6E+02 | 1.1E+02 | 3.8E+02 |
| Temp. | 16.3 | 16.2 | 16.2 | 15.0 | 14.3 | 13.9 | 13.8 |
| Cl | 16 | 16 | 16 | 17 | 17 | 16 | 16 |
| NO3-N | 1.94 | 1.92 | 1.89 | 1.38 | 1.27 | 2.06 | BDL |
| SO4 | 101 | 101 | 102 | 87.1 | 83.3 | 100 | 16.4 |
| Al | BDL | BDL | BDL | BDL | 0.09 | BDL | BDL |
| As | BDL | BDL | BDL | BDL | 0.724 | BDL | BDL |
| Ca | 54 | 54 | 54 | 55 | 55 | 53 | 69 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cu | 0.152 | 0.131 | 0.120 | 0.117 | 0.089 | 0.114 | BDL |
| Fe | 0.07 | 0.15 | 0.16 | 0.17 | 15 | 0.15 | 38 |
| Mg | 12 | 12 | 12 | 12 | 12 | 12 | 14 |
| Mn | 1.04 | 1.07 | 1.06 | 1.06 | 3.95 | 0.714 | 5.89 |
| Mo | BDL | BDL | BDL | BDL | 0.080 | BDL | 0.055 |
| Na | 28 | 28 | 28 | 29 | 28 | 28 | 33 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 13 | 13 | 13 | 13 | 12 | 13 | 16 |
| Sr | 0.310 | 0.306 | 0.310 | 0.314 | 0.363 | 0.300 | 0.489 |
| Tl | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Zn | 0.453 | 0.681 | 0.544 | 1.08 | 0.471 | 0.967 | 0.243 |

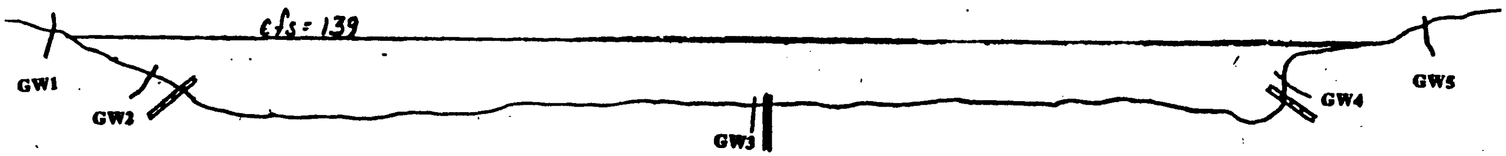
# SILVER BOW CREEK
# TRANSECT IIC
# 9/4/95




IIC- GW3
pH 6.8
D.O.
Cond. 0.501
Alk.
Temp.
Cl 16
NO3-N 2.02
SO4 109
Al 0.18
As BDL
Ca 54
Cd BDL
Co BDL
Cu 0.221
Fe 0.57
Mg 11.9
Mn 0.944
Mo BDL
Na 28
Ni BDL
Pb BDL
Si 13
Sr 0.310
Tl 0.004
Zn 1.24

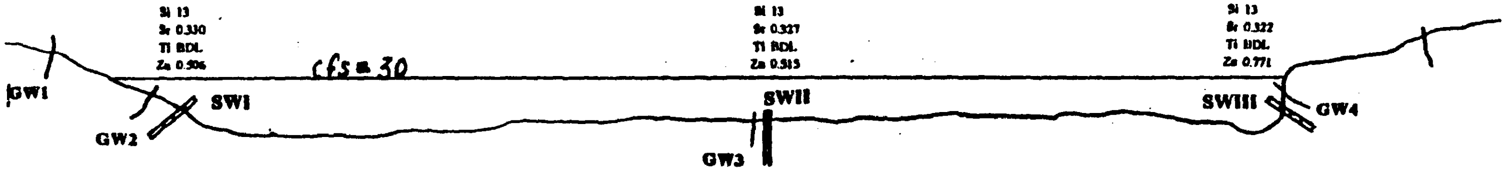
IIC- GW4
pH 7.3
D.O.
Cond. 0.532
Alk.
Temp.
Cl 16
NO3-N BDL
SO4 27.3
Al BDL
As BDL
Ca 53
Cd BDL
Co BDL
Cu 0.013
Fe 3.6
Mg 11.7
Mn 3.16
Mo BDL
Na 29
Ni BDL
Pb BDL
Si 14
Sr 0.303
Tl BDL
Zn 0.064

# SILVER BOW CREEK
## TRANSECT IIIA
## 7/10/95




| | IIIA- GW1 | IIIA- GW2 | IIIA- GW3 | IIIA- GW4 | IIIA- GW5 |
|---|---|---|---|---|---|
| pH | 6.1 | 6.2 | 6.6 | 6.9 | 6.4 |
| D.O. | 1.6 | 2.0 | 3.9 | 2.5 | 2.2 |
| Cond. | 2.22 | 1.559 | 0.528 | 1.215 | 1.472 |
| Alk. | 1.6E+02 | 8.0E+01 | 1.0E+02 | 6.2E+02 | 3.2E+02 |
| Temp. | | | | | |
| Cl | 76 | 59 | 16 | 30 | 23 |
| NO3-N | BDL | 0.11 | 0.63 | BDL | BDL |
| SO4 | 1.1E+03 | 7.9E+02 | 2.60E+02 | 62.7 | 5.6E+02 |
| Al | 0.21 | 0.14 | BDL | 0.33 | BDL |
| As | 0.15 | 0.09 | BDL | 0.26 | 0.42 |
| Ca | 245 | 172 | 46 | 154 | 156 |
| Cd | BDL | BDL | BDL | BDL | BDL |
| Co | 0.011 | 0.055 | BDL | BDL | 0.022 |
| Cu | BDL | BDL | 0.047 | 0.138 | BDL |
| Fe | 35 | 59 | 6.8 | 1.2E+02 | 3.2E+02 |
| Mg | 59 | 37 | 10 | 36 | 46 |
| Mn | 5.04 | 10.4 | 1.74 | 15.0 | 23.3 |
| Mo | 0.054 | 0.089 | 0.017 | 0.174 | 0.498 |
| Na | 210 | 112 | 24 | 82 | 85 |
| Ni | BDL | 0.025 | BDL | BDL | BDL |
| Pb | BDL | BDL | BDL | BDL | BDL |
| Si | 20 | 20 | 14 | 24 | 22 |
| Sr | 2.18 | 1.66 | 0.323 | 1.38 | 0.700 |
| Tl | BDL | BDL | BDL | BDL | BDL |
| Zn | 2.58 | 14.7 | 2.87 | 0.228 | 0.394 |

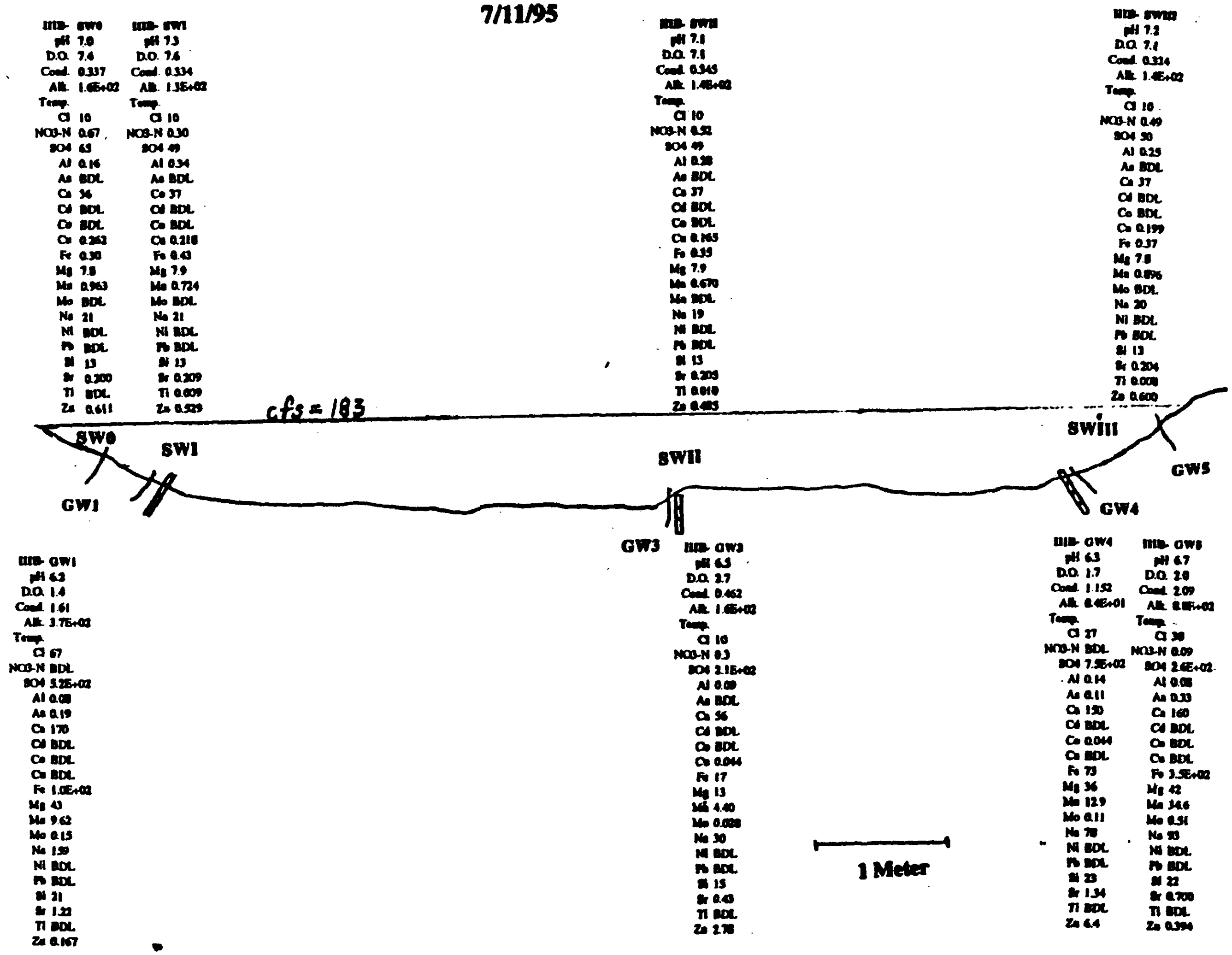
# SILVER BOW CREEK
## TRANSECT IIIA
## 8/28/95



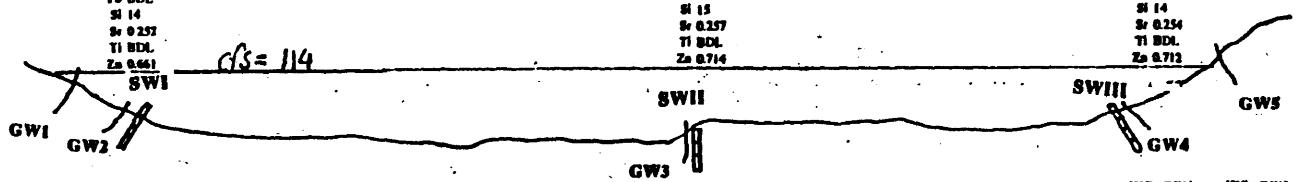

| | IIIA- SWI | IIIA- SWII | IIIA- SWIII | IIIA- GW1 | IIIA- GW2 | IIIA- GW3 | IIIA- GW4 |
|---|---|---|---|---|---|---|---|
| pH | 8.1 | 8.2 | 8.1 | 6.8 | 6.3 | 6.6 | 6.8 |
| D.O. | 8.2 | 7.1 | 8.0 | 3.3 | 1.7 | 4.8 | 1.3 |
| Cond. | 0.509 | 0.511 | 0.501 | 2.23 | 1.581 | 0.637 | 1.237 |
| Alk. | 1.2E+02 | 1.1E+02 | 1.2E+02 | 1.9E+02 | 9.6E+01 | 8.4E+01 | 4.6E+02 |
| Temp. | 17.9 | 17.8 | 17.9 | 12.9 | 12.7 | 14.4 | 13.7 |
| Cl | 18 | 18 | 18 | 69 | 38 | 19 | 26 |
| NO3-N | 1.93 | 1.92 | 1.85 | BDL | BDL | 1.23 | 0.21 |
| SO4 | 105 | 102 | 102 | 1.0E+03 | 6.9E+02 | 177 | 155 |
| Al | BDL | BDL | BDL | BDL | 0.09 | BDL | BDL |
| As | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Ca | 58 | 58 | 57 | 238 | 166 | 63 | 118 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | 0.053 | BDL | BDL |
| Cu | 0.129 | 0.129 | 0.153 | BDL | BDL | 0.057 | 0.067 |
| Fe | 0.087 | 0.085 | 0.14 | 17 | 60 | 9.7 | 16 |
| Mg | 13 | 13 | 13 | 61 | 38 | 15 | 36 |
| Mn | 1.13 | 1.13 | 1.18 | 4.83 | 10.0 | 2.47 | 11.1 |
| Mo | BDL | BDL | BDL | 0.025 | 0.089 | 0.017 | 0.038 |
| Na | 28 | 27 | 27 | 195 | 103 | 34 | 73 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 13 | 13 | 13 | 18 | 20 | 14 | 18 |
| Sr | 0.330 | 0.327 | 0.322 | 2.2 | 1.63 | 0.472 | 1.34 |
| Tl | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Zn | 0.506 | 0.515 | 0.771 | 0.339 | 12.7 | 1.50 | 0.267 |

1 Meter

# SILVER BOW CREEK
# TRANSECT IIIB
# 7/11/95



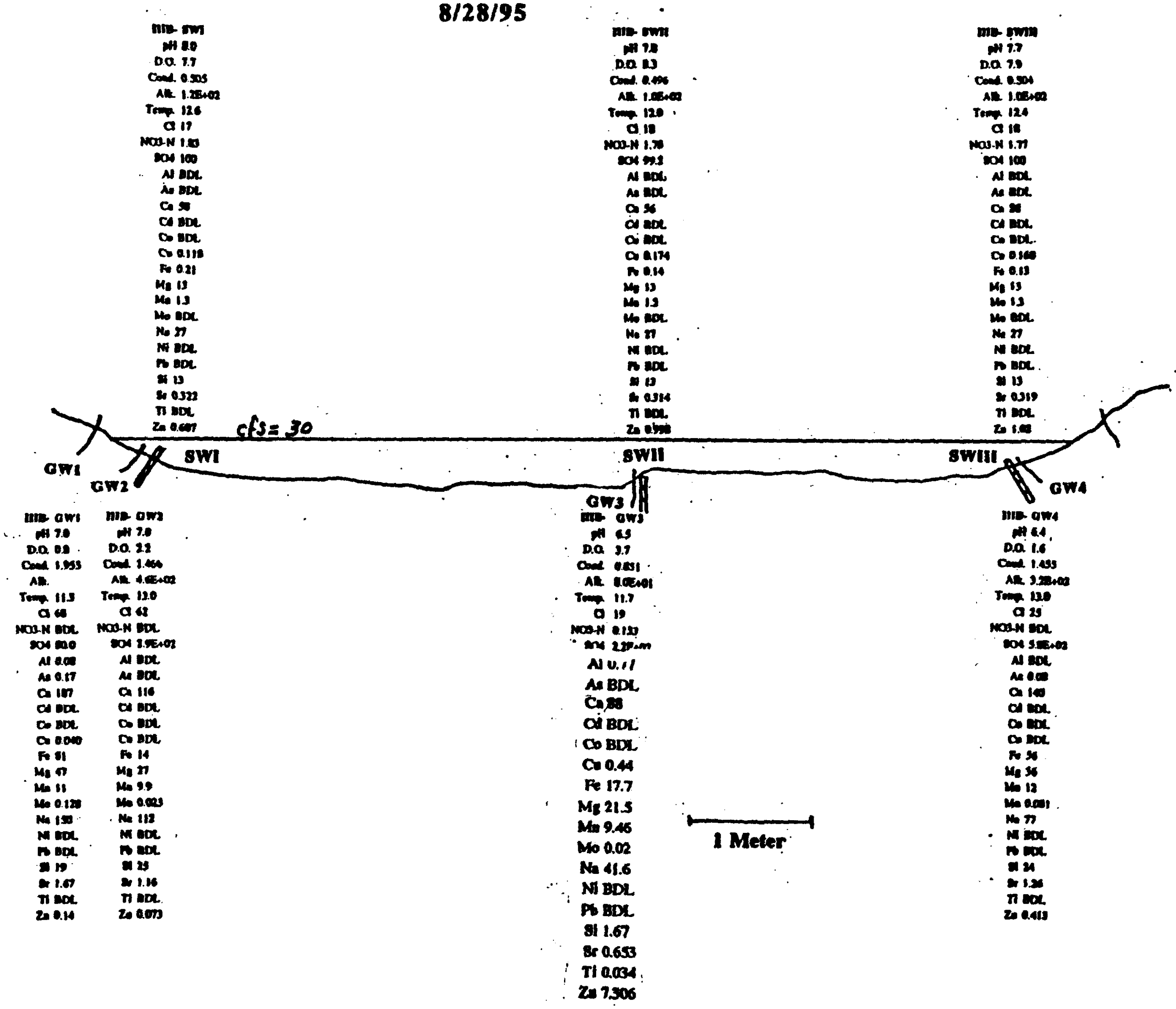
# SILVER BOW CREEK
## TRANSECT IIIB
## 7/17/95




| | IIIB- SWI | IIIB- SWII | IIIB- SWIII | IIIB- GW1 | IIIB- GW2 | IIIB- GW3 | IIIB- GW4 | IIIB- GW5 |
|---|---|---|---|---|---|---|---|---|
| pH | 7.5 | 7.5 | 7.5 | 6.9 | | 6.7 | 6.3 | 6.7 |
| D.O. | 5.3 | 6.2 | 6.3 | 1.8 | | 3.1 | 0.9 | 0.4 |
| Cond. | | | | | | | | |
| Alk. | 1.9E+02 | 2.0E+02 | 1.0E+02 | 4.1E+02 | | 1.4E+02 | 1.5E+02 | 1.2E+03 |
| Temp. | 15.3 | 15.2 | 15.3 | 13.9 | 13.5 | 13.7 | 13.7 | 14.2 |
| Cl | 11 | 11 | 11 | 1.0E+02 | 40 | 12 | 25 | 25 |
| NO3-N | 1.00 | 1.01 | 1.01 | BDL | BDL | 1.02 | BDL | BDL |
| SO4 | 69.4 | 68.0 | 67.8 | 5.4E+02 | 2.94E+02 | 83.8 | 7.4E+02 | 1.4E+02 |
| Al | BDL | BDL | BDL | 0.12 | BDL | 0.07 | 0.16 | 0.17 |
| As | BDL | BDL | BDL | 0.23 | BDL | BDL | 0.12 | 0.30 |
| Ca | 45 | 46 | 45 | 174 | 97 | 46 | 153 | 153 |
| Cd | BDL | BDL | BDL | BDL | BDL | 0.002 BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | 0.044 | BDL |
| Cu | 0.131 | 0.133 | 0.125 | BDL | 0.023 | 0.051 | BDL | 0.039 |
| Fe | 0.31 | 0.23 | 0.26 | 1.1E+02 | 3.6 | 0.90 | 79 | 3.4E+02 |
| Mg | 9.5 | 9.9 | 9.8 | 43 | 23 | 10 | 36 | 40 |
| Mn | 0.839 | 0.788 | 0.789 | 9.37 | 2.64 | 1.60 | 13.1 | 31.5 |
| Mo | BDL | BDL | BDL | 0.17 | BDL | BDL | 0.11 | 0.49 |
| Na | 20 | 20 | 20 | 157 | 79 | 22 | 81 | 93 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | 0.02 | BDL |
| Pb | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 14 | 15 | 14 | 22 | 11 | 14 | 24 | 22 |
| Sr | 0.252 | 0.257 | 0.254 | 1.27 | 0.838 | 0.289 | 1.39 | 0.793 |
| Tl | BDL | BDL | BDL | 0.010 | BDL | BDL | BDL | BDL |
| Zn | 0.661 | 0.714 | 0.712 | 0.193 | 0.411 | 0.818 | 6.35 | 0.198 |

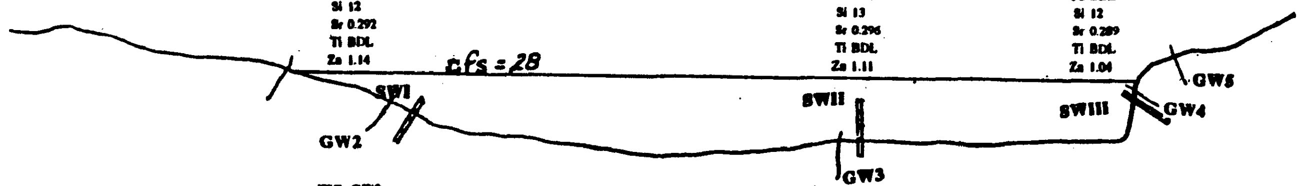
1 Meter

# SILVER BOW CREEK
# TRANSECT IIIB
# 8/28/95



# SILVER BOW CREEK
## TRANSECT IIIC
## 8/31/95

| | IIIC- SWI | IIIC- SWII | IIIC- SWIII | IIIC- GW2 | IIIC- GW3 | IIIC- GW4 | IIIC- GW5 |
|---|---|---|---|---|---|---|---|
| pH | 7.6 | 7.7 | 7.8 | 6.7 | 6.4 | 6.9 | 6.7 |
| D.O. | 8.5 | 8.9 | 8.7 | 1.3 | 3.0 | 2.1 | 1.1 |
| Cond. | 0.502 | 0.502 | 0.503 | 1.746 | 0.973 | 0.673 | 0.829 |
| Alk. | 1.2E+02 | 1.2E+02 | 1.2E+02 | 6.8E+02 | 6.4E+01 | 2.3E+02 | 3.2E+02 |
| Temp. | 14.2 | 14.2 | 14.4 | 12.4 | 11.8 | 12.7 | 13.0 |
| Cl | 18 | 18 | 17 | 47 | 22 | 19 | 16 |
| NO3-N | 1.63 | 1.62 | 1.49 | BDL | 0.63 | 0.73 | BDL |
| SO4 | 97.1 | 97.2 | 102 | 2.3E+02 | 4.3E+02 | 79.1 | 104 |
| Al | BDL | BDL | BDL | 0.07 | 0.12 | 0.08 | BDL |
| As | BDL | BDL | BDL | 0.46 | BDL | 0.24 | 0.39 |
| Ca | 52 | 53 | 52 | 154 | 104 | 65 | 64 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | 0.005 | 0.036 | BDL | BDL |
| Cu | 0.175 | 0.178 | 0.166 | 0.011 | 0.200 | 0.043 | 0.012 |
| Fe | 0.19 | 0.18 | 0.15 | 90 | 17 | 23 | 38 |
| Mg | 11 | 12 | 11 | 40 | 24 | 15 | 12 |
| Mn | 1.12 | 1.13 | 1.10 | 20.1 | 6.7 | 10.2 | 18.8 |
| Mo | BDL | BDL | BDL | 0.135 | 0.025 | 0.046 | 0.063 |
| Na | 28 | 28 | 27 | 130 | 56 | 32 | 33 |
| Ni | BDL | BDL | BDL | BDL | 0.02 | BDL | BDL |
| Pb | BDL | BDL | BDL | 0.021 | BDL | BDL | BDL |
| Si | 12 | 13 | 12 | 26 | 15 | 15 | 21 |
| Sr | 0.292 | 0.296 | 0.289 | 1.22 | 0.849 | 0.418 | 0.38 |
| Ti | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Zn | 1.14 | 1.11 | 1.04 | 0.093 | 13.7 | 0.487 | 1.8 |




1 Meter

**Mixing ratios for transects at Site 1**

| Transect | Date | l/s in SW | Cl in SW | Cl-GW | Mg-in SW | Mg-GW | Na-in SW | Na-GW | Ca-in SW | Ca-GW | Sample Date | Subsurface water ID | (VALUES ARE % GW) Cl mix rat. | Mg mix rat. | Na mix rat. | Ca mix rat. | Average % GW from Ca and Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IA | 6/20/95 | 6100 | 7 | 28 | 7.64 | 36 | 16.5 | 110 | 35.3 | 150 | 6/20/95 | IA-GW 1/2 | 2.4 | -1.15 | 5.88 | 5.32 | 2.09 |
| IA | 7/19/95 | 2800 | 11 | 28 | 9.64 | 36 | 21.1 | 110 | 45.8 | 150 | 6/20/95 | IA GW 1 | | 23.48 | 8.13 | 38.36 | 30.92 ▾ |
| IA | 8/24/95 | 1050 | 16 | 28 | 12.4 | 36 | 26 | 110 | 55.5 | 150 | 6/20/95 | IA GW 2 | 2.4 | -0.49 | -0.11 | -0.78 | -0.64 |
| IA | 9/27/95 | 1250 | 16 | 28 | 13 | 36 | 29 | 110 | 57 | 150 | 6/20/95 | IA-GW 3 | 14 | 15.02 | 11.87 | 13.43 | 14.22 |
| | | | | | | | | | | | 6/20/95 | IA-GW 4 | | 52.40 | 50.59 | 43.07 | 47.73 |
| IB | 6/26/95 | 4840 | 9 | 29 | 8.1 | 37 | 17.4 | 83 | 38.2 | 140 | 6/20/95 | IA GW 5 | 13 | 25.25 | 19.79 | 23.80 | 24.52 |
| IB | 7/19/95 | 2800 | 11 | 29 | 9.85 | 37 | 20.8 | 83 | 45.6 | 140 | 6/20/95 | IA GW 6 | 67 | 75.32 | 62.57 | 62.51 | 68.91 |
| IB | 8/27/95 | 850 | 17 | 29 | 13 | 37 | 26.6 | 83 | 57.6 | 140 | | | | | | | |
| | | | | | | | | | | | 7/19/95 | IA-GW 1 | -8.8 | 7.81 | 9.00 | 21.40 | 14.61 |
| IC | 6/28/95 | 4840 | 9 | 28 | 8.1 | 29 | 17.4 | 43 | 38.2 | 180 | 7/19/95 | IA GW 2 | -11.8 | 18.82 | 9.79 | 38.96 | 28.89 |
| IC | 8/27/95 | 850 | 17.3 | 28 | 12.9 | 29 | 26.3 | 43 | 56.9 | 180 | 7/19/95 | IA GW 3 | 47.1 | 60.17 | 43.87 | 56.81 | 58.49 |
| | | | | | | | | | | | 7/19/95 | IA GW 4 | 82.4 | 39.30 | 67.27 | 55.85 | 47.58 |
| | | | | | | | | | | | 7/19/95 | IA GW 5 | 17.6 | 51.06 | 49.49 | 37.91 | 44.49 |
| | | | | | | | | | | | 7/19/95 | IA GW 6 | 100.0 | 103.79 | 88.75 | 90.40 | 97.10 |
| | | | | | | | | | | | 8/24/96 | IA-GW 1 | 8.3 | 3.39 | 2.14 | 1.80 | 0.80 |
| | | | | | | | | | | | 8/24/96 | IA-GW 2 | -8.3 | 14.41 | 7.26 | 34.18 | 24.29 |
| | | | | | | | | | | | 8/24/96 | IA GW 3 | 29.2 | 74.15 | 47.26 | 58.73 | 66.44 |
| | | | | | | | | | | | 8/24/96 | IA-GW 4 | 30.8 | 14.83 | 30.71 | -7.94 | 3.45 |
| | | | | | | | | | | | 8/24/96 | IA-GW 5 | 50.0 | 78.81 | 54.76 | 55.56 | 67.18 |
| | | | | | | | | | | | 9/27/95 | IA-GW 1 | 3.3 | -4.35 | -2.47 | 1.08 | -1.64 |
| | | | | | | | | | | | 9/27/95 | IA-GW 2 | -6.7 | 4.35 | 4.94 | 30.11 | 17.23 |
| | | | | | | | | | | | 9/27/95 | IA GW 3 | 19.2 | 34.78 | 28.40 | 25.81 | 30.29 |
| | | | | | | | | | | | 9/27/95 | IA-GW 4 | 100.0 | 100.00 | 100.00 | 100.00 | 100.00 |
| | | | | | | | | | | | 9/27/95 | IA GW 5 | 53.3 | 78.26 | 55.56 | 56.99 | 67.63 |
| | | | | | | | | | | | 6/26/95 | IB-GW 1/2 | 4.5 | 0.69 | -1.52 | 7.07 | 3.19 |
| | | | | | | | | | | | 6/26/95 | IB-GW 1 | 105.0 | 44.64 | 20.88 | 69.55 | 57.09 |
| | | | | | | | | | | | 6/26/95 | IB-GW 2 | 5.0 | -1.04 | 0.91 | -0.59 | -0.81 |
| | | | | | | | | | | | 6/26/95 | IB-GW 3 | 2.0 | 0.35 | 0.91 | -0.79 | 0.57 |
| | | | | | | | | | | | 6/26/95 | IB GW 4 | 14.0 | 19.38 | 29.12 | 17.88 | 18.63 |
| | | | | | | | | | | | 6/26/95 | IB GW 5 | 55.0 | 86.16 | 80.18 | 80.35 | 83.26 |
| | | | | | | | | | | | 6/26/95 | IB-GW 6 | 70.0 | 63.67 | 86.43 | 54.03 | 58.85 |
| | | | | | | | | | | | 7/19/95 | IB-GW 1 | 26.1 | 51.75 | 30.71 | 98.94 | 75.35 |
| | | | | | | | | | | | 7/19/95 | IB-GW 2 | 17.8 | -4.97 | 0.96 | -2.75 | -3.86 |
| | | | | | | | | | | | 7/19/95 | IB-GW 3 | 6.8 | -3.87 | 0.48 | -2.75 | 3.31 |
| | | | | | | | | | | | 7/19/95 | IB GW 4 | 20.6 | 16.39 | 24.76 | 16.31 | 16.35 |
| | | | | | | | | | | | 7/19/95 | IB-GW 5 | 44.4 | 66.85 | 83.12 | 62.92 | 64.89 |
| | | | | | | | | | | | 7/19/95 | IB-GW 6 | 77.8 | 66.85 | 95.18 | 56.57 | 61.71 |
| | | | | | | | | | | | 8/27/95 | IB-GW 2 | 16.7 | -4.17 | -1.06 | 8.01 | 6.09 |
| | | | | | | | | | | | 8/27/95 | IB-GW 3 | 8.3 | -8.33 | -2.84 | 8.01 | 8.17 |
| | | | | | | | | | | | 8/27/95 | IB GW 4 | 8.3 | 12.50 | 16.67 | 5.34 | 8.92 |
| | | | | | | | | | | | 8/27/95 | IB GW 5 | 100.0 | 100.00 | 100.00 | 80.58 | 90.29 |
| | | | | | | | | | | | 6/28/95 | IC GW 1/2 | | 83.25 | 90.23 | 87.31 | 85.28 |
| | | | | | | | | | | | 6/28/95 | IC GW 1 | 66.3 | 64.11 | 92.19 | 60.51 | 62.31 |
| | | | | | | | | | | | 6/28/95 | IC-GW 2 | 1.6 | 3.35 | 4.69 | 4.65 | 4.00 |
| | | | | | | | | | | | 6/28/95 | IC-GW 3 | 22.6 | -2.11 | -2.34 | -0.56 | -1.33 |
| | | | | | | | | | | | 6/28/95 | IC-GW 4 | 36.8 | 3.83 | 0.39 | -2.47 | 3.15 |
| | | | | | | | | | | | 6/28/95 | IC-GW 5 | 7.9 | 4.88 | 1.17 | -5.29 | 5.08 |
| | | | | | | | | | | | 6/28/95 | IC-GW 6 | | 100.00 | 100.39 | 100.00 | 100.00 |
| | | | | | | | | | | | 8/27/95 | IC-GW 2 | -12.1 | 0.62 | 4.19 | 9.02 | 4.82 |
| | | | | | | | | | | | 8/27/95 | IC-GW 3 | 2.8 | -5.59 | -1.80 | -3.98 | -4.79 |
| | | | | | | | | | | | 8/27/95 | IC-GW 4 | -2.8 | 6.83 | 10.18 | 5.77 | 6.30 |
| | | | | | | | | | | | 8/27/95 | IC GW 5 | -2.8 | 44.10 | 52.10 | 13.08 | 28.59 |

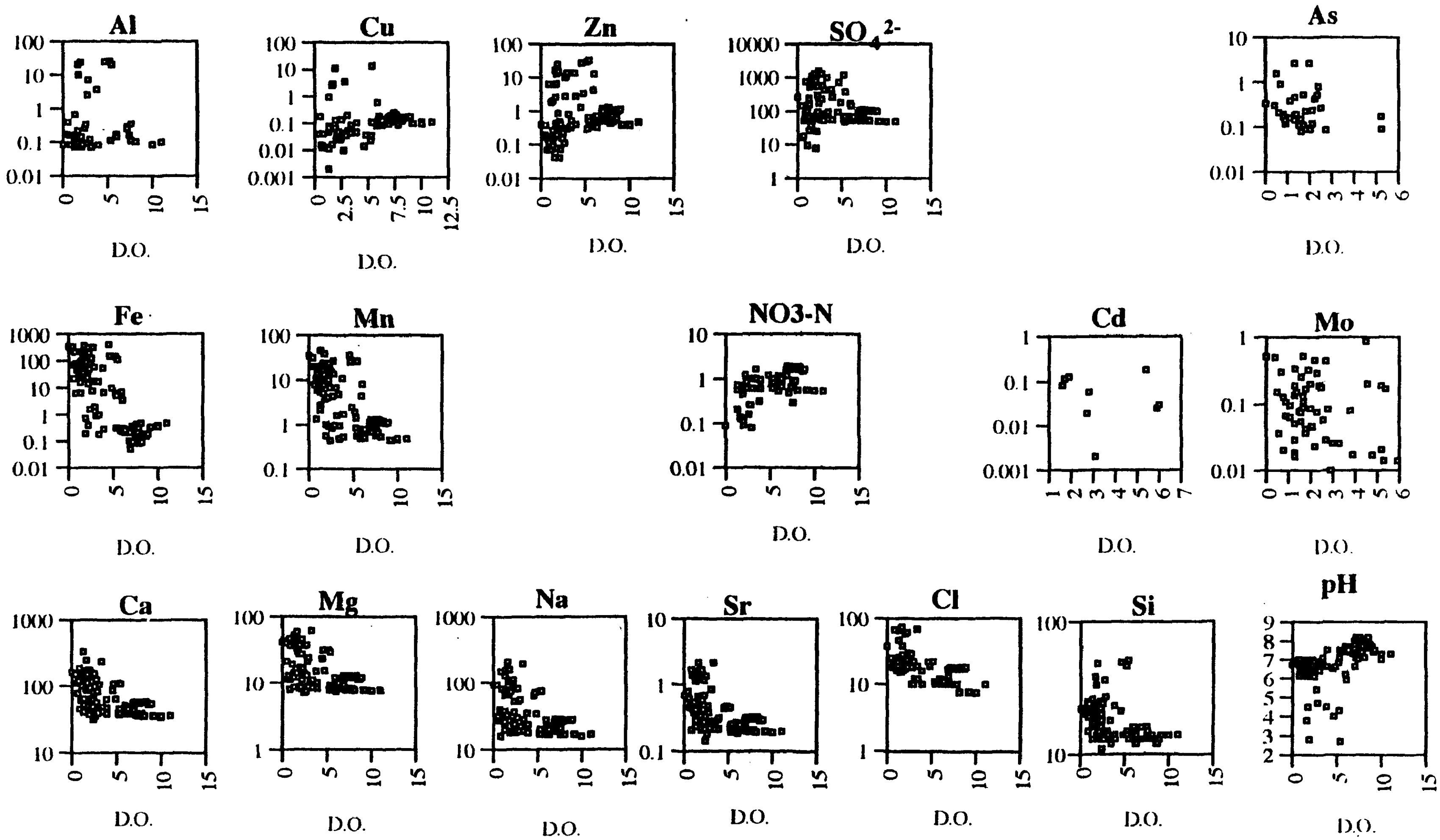
## Mixing ratios for transects at Site II

| Transect | Date | L/s in SW | Cl - in SW | Cl - in IIA GW5 | Mg in SW | Mg - in IIA-GW5 | Na- in SW | Na- in IIA-GW5 | Ca - in SW | Ca - in IIA-GW5 | Sample Date | Subsurface water ID | Cl mix. rat. | Mg mix. rat. | Na mix. rat. | Ca mix. rat. | Average % GW from Ca, Mg, Na |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IIA | 7/6/95 | 2890 | 10.3 | 26 | 8.7 | 54 | 19 | 65 | 41.9 | 330 | 7/6/95 | IIA-GW2 | 43.3 | 17.4 | 27.4 | 17.4 | 20.8 |
| IIA | 8/31/95 | 790 | 17.5 | | 11.9 | | 28.3 | | 54 | | 7/6/95 | IIA-GW3 | 0.0 | -0.2 | 0.4 | -1.1 | -0.6 |
| | | | | | | | | | | | 7/6/95 | IIA GW4 | 40.8 | 7.1 | 13.5 | 7.5 | 9.4 |
| IIB | 7/6/95 | 2890 | 12 | | 9.1 | | 19.6 | | 43.3 | | 7/6/95 | IIA-GW5 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| IIB | 9/4/95 | 790 | 15.9 | | 11.9 | | 28 | | 53.8 | | | | | | | | |
| | | | | | | | | | | | 8/31/95 | IIA GW2 | 0.0 | -3.3 | 4.1 | 8.2 | 0.3 |
| IIC | 9/4/95 | 790 | 15.9 | | 11.9 | | 28 | | 53.8 | | 8/31/95 | IIA GW3 | 14.1 | -2.9 | 2.2 | -2.0 | -2.4 |
| | | | | | | | | | | | 8/31/95 | IIA-GW4 | 12.9 | -1.4 | 3.5 | 2.6 | -0.8 |
| | | | | | | | | | | | 7/6/95 | IIB GW1 | 80.0 | 1.3 | 1.1 | 0.2 | 0.9 |
| | | | | | | | | | | | 7/6/95 | IIB GW2 | 25.7 | 1.6 | 0.9 | 1.1 | 0.6 |
| | | | | | | | | | | | 7/6/95 | IIB-GW3 | -3.6 | 1.8 | -0.4 | 0.9 | -1.0 |
| | | | | | | | | | | | 7/6/95 | IIB GW4 | 30.0 | 22.0 | 36.3 | 19.8 | 26.1 |
| | | | | | | | | | | | 7/6/95 | IIB GW5 | 64.3 | 8.7 | 44.9 | 26.1 | 26.6 |
| | | | | | | | | | | | 9/4/95 | IIB GW1 | 9.9 | 0.2 | 2.7 | 0.4 | 1.1 |
| | | | | | | | | | | | 9/4/95 | IIB GW2 | 5.9 | 0.2 | 0.0 | 0.4 | 0.2 |
| | | | | | | | | | | | 9/4/95 | IIB-GW3 | 2.0 | 0.2 | 0.0 | -0.3 | 0.0 |
| | | | | | | | | | | | 9/4/95 | IIB GW4 | 2.0 | 5.0 | 13.5 | 5.5 | 8.0 |
| | | | | | | | | | | | 9/4/95 | IIC GW2 | -3.0 | 5.7 | 12.2 | 8.0 | 8.6 |
| | | | | | | | | | | | 9/4/95 | IIC-GW3 | 0.0 | 0.0 | 1.1 | 0.2 | 0.4 |
| | | | | | | | | | | | 9/4/95 | IIC-GW4 | 4.0 | -0.5 | 2.7 | -0.3 | 0.6 |

## Mixing ratios for transects at Site III

| Transect | Date | L/s in SW | Cl - in SW | Cl - in GW | Mg in SW | Mg- in GW | Na- in SW | Na- in GW | Ca- in SW | Ca- in GW | Sample Date | Subsurface water ID | Cl mix. rat. | Mg mix. ratio | Na mix. rat. | Ca mix. ratio | Average % GW from Ca and Mg ratios |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 76 | | 61 | | 210 | | 245 | | | | | | | |
| IIIA | 8/28/95 | 850 | 17.7 | | 13.1 | | 27.4 | | 57.7 | | 8/28/95 | IIIA GW1 | 87.8 | 95.8 | 90.7 | 96.3 | 96.0 |
| | | | | | | | | | | | 8/28/95 | IIIA-GW2 | 34.5 | 50.9 | 41.4 | 57.8 | 54.4 |
| IIIB | 7/11/95 | 5180 | 9 | | 7.8 | | 20.6 | | 36.5 | | 8/28/95 | IIIA-GW3 | 2.4 | 2.9 | 3.8 | 2.7 | 2.8 |
| IIIB | 7/17/95 | 3230 | 10 | | 9.7 | | 20 | | 45 | | 8/28/95 | IIIA-GW4 | 13.7 | 48.2 | 24.9 | 32.2 | 40.2 |
| IIIB | 8/28/95 | 850 | 17.6 | | 12.9 | | 27 | | 57.3 | | | | | | | | |
| | | | | | | | | | | | 7/11/95 | IIIB GW1 | 86.6 | 66.0 | 73.1 | 64.0 | 65.0 |
| IIIC | 8/31/95 | 790 | 17.5 | | 11.5 | | 27.8 | | 52.6 | | 7/11/95 | IIIB GW3 | 7.5 | 10.5 | 4.8 | 9.4 | 10.0 |
| | | | | | | | | | | | 7/11/95 | IIIB-GW4 | 26.9 | 52.1 | 30.4 | 53.0 | 52.5 |
| | | | | | | | | | | | 7/11/95 | IIIB GW5 | 43.3 | 64.3 | 38.2 | 58.8 | 61.5 |
| | | | | | | | | | | | 7/17/95 | IIIB-GW1 | | 63.2 | 73.2 | 64.5 | 63.8 |
| | | | | | | | | | | | 7/17/95 | IIIB GW2 | 45.5 | 25.9 | 31.2 | 25.9 | 25.9 |
| | | | | | | | | | | | 7/17/95 | IIIB-GW3 | 3.5 | 1.0 | 1.1 | 0.7 | 0.8 |
| | | | | | | | | | | | 7/17/95 | IIIB-GW4 | 23.0 | 51.7 | 31.9 | 53.5 | 52.6 |
| | | | | | | | | | | | 7/17/95 | IIIB-GW5 | 22.7 | 58.5 | 38.5 | 53.5 | 56.0 |
| | | | | | | | | | | | 8/28/95 | IIIB-GW1 | 85.4 | 70.1 | 67.2 | 69.1 | 69.6 |
| | | | | | | | | | | | 8/28/95 | IIIB-GW2 | 75.5 | 28.3 | 46.4 | 31.3 | 29.8 |
| | | | | | | | | | | | 8/28/95 | IIIB-GW3 | 3.6 | 17.9 | 8.0 | 16.4 | 17.1 |
| | | | | | | | | | | | 8/28/95 | IIIB-GW4 | 12.5 | 48.2 | 27.2 | 44.1 | 46.1 |
| | | | | | | | | | | | 8/31/95 | IIIC-GW2 | 49.6 | 58.4 | 56.1 | 52.7 | 55.5 |
| | | | | | | | | | | | 8/31/95 | IIIC-GW3 | 7.5 | 25.3 | 15.5 | 26.7 | 26.0 |
| | | | | | | | | | | | 8/31/95 | IIIC-GW4 | 2.4 | 6.1 | 2.0 | 6.3 | 6.2 |
| | | | | | | | | | | | 8/31/95 | IIIC GW5 | -2.2 | 1.2 | 2.6 | 5.7 | 3.5 |

# Concentrations vs. Dissolved oxygen [mg/L]



**Full listing of hyporheic zone samples with dissolved oxygen, nitrogen-N, and sulfate concentrations lower than (and alkalinity levels higher than) surface water and groundwater samples:**

| Hyporheic zone (H.Z.) Sample | H.Z. Diss. $O_2$ | H.Z. $NO_3$-N | H.Z. $SO_4^{2-}$ | H.Z. Alk. | *Surface water Diss. $O_2$* | *Surface water $NO_3$-N* | *Surface water $SO_4^{2-}$* | *Surface water Alk.* |
|---|---|---|---|---|---|---|---|---|
| *Site I* | | | | | | | | |
| IB-GW1 (6/26/95) | **0.5** | **BDL** | **15.3** | **7.6E+02** | *6* | *0.9- 1.0* | *54-55* | *1.0E+02* |
| IC-GW1 (6/28/95) | **1.9** | **BDL** | **1.88** | **NA** | *6-7* | *0.9* | *51-52* | *1.5E+02* |
| IC-GW2 (6/28/95) | **2.1** | **BDL** | **24.9** | **2.0E+02** | *6-7* | *0.9* | *51-52* | *1.5E+02* |
| IA-GW1 (7/19/95) | **1.3** | **0.1** | **37.8** | **3.4E+02** | *6* | *1.1* | *73* | *1.7E+02* |
| IA-GW2 (7/19/95) | **1.2** | **BDL** | **28.9** | **5.7E+02** | *6* | *1.1* | *73* | *1.7E+02* |
| IB-GW1 (7/19/95) | **0.8** | **BDL** | **21.9** | **NA** | *6* | *1.1* | *73* | *1.7E+02* |
| IA-GW1 (8/24/95) | **1.8** | **BDL** | **69.2** | **1.8E+02** | *7-8* | *1.6-1.7* | *90-96* | *1.3E+02* |
| IA-GW2 (8/24/95) | **1.5** | **BDL** | **36.4** | **3.7E+02** | *7-8* | *1.6-1.7* | *90-96* | *1.3E+02* |
| IB-GW2 (8/27/95) | **1.3** | **0.76** | **63.2** | **1.4E+02** | *7-8* | *1.9* | *100-104* | *1.2E+02* |
| IC-GW2 (8/27/95) | **NA** | **0.14** | **31.9** | **3.4E+02** | *NA* | *1.9* | *101-103* | *1.2E+02* |
| IC-GW3 (8/27/95) | **NA** | **0.08** | **62.1** | **1.4E+02** | *NA* | *1.9* | *101-103* | *1.2E+02* |
| IA-GW1 (9/27/95) | **1.8** | **BDL** | **68.1** | **2.1E+02** | *7* | *1.9* | *108* | *1.3E+02* |
| IA-GW2 (9/27/95) | **1.6** | **0.14** | **51.4** | **3.4E+02** | *7* | *1.9* | *108* | *1.3E+02* |
| *Site II* | | | | | | | | |
| IIA-GW2 (7/6/95) | **2.0** | **0.09** | **7.61** | **NA** | *6* | *0.7-0.9* | *60-63* | *1.3E+02* |
| IIA-GW4 (7/6/95) | **1.3** | **BDL** | **25.8** | **3.4E+02** | *6* | *0.7-0.9* | *60-63* | *1.3E+02* |
| IIB-GW2 (7/6/95) | **1.3** | **0.60** | **56.4** | **1.5E+02** | *6-7* | *1.2* | *62-67* | *1.4E+02* |
| IIB-GW4 (7/6/95) | **1.1** | **BDL** | **9.25** | **2.7E+02** | *6-7* | *1.2* | *62-67* | *1.4E+02* |
| IIA-GW2 (8/31/95) | **0.6** | **BDL** | **17.8** | **3.8E+02** | *8* | *1.6-1.7* | *102-104* | *1.2E+02* |
| IIA-GW4 (8/31/95) | **0.9** | **BDL** | **55.9** | **2.6E+02** | *8* | *1.6-1.7* | *102-104* | *1.2E+02* |
| IIB-GW1 (9/4/95) | **NA** | **1.38** | **87.1** | **1.2E+02** | *NA* | *1.9* | *101* | *1.1E+02* |
| IIB-GW2 (9/4/95) | **NA** | **1.27** | **83.3** | **1.6E+02** | *NA* | *1.9* | *101* | *1.1E+02* |
| IIB-GW4 (9/4/95) | **NA** | **BDL** | **16.4** | **3.8E+02** | *NA* | *1.9* | *101* | *1.1E+02* |
| IIC-GW4 (9/4/95) | **NA** | **BDL** | **27.3** | **NA** | *NA* | *1.9* | *101* | *1.1E+02* |
| *Site III* | | | | | | | | |
| IIIC-GW4(8/31/95) | **2.1** | **0.73** | **79.1** | **2.3E+02** | *8-9* | *1.5-1.6* | *97-102* | *1.2E+02* |

### *Transect-scale trends in surface water chemistry:*

A simple and quick measurement of groundwater infiltration into the surface water was measured directly with the specific conductance meter. When the meter was placed directly against (but not into) the stream bank, significantly higher specific conductance was measured where water data indicated that ground water was infiltrating.

| Transect | Spec. Cond. (mS/cm) in SW center | Spec. Cond. (mS/cm) in SW, against creek bank | Spec. Cond. (mS/cm) in gound water <1m from creek |
|---|---|---|---|
| IA (2/26/95) | 0.220 | 0.290 | 0.950 |
| IA (5/15/95) | 0.200 | 0.220 | 1.20 |
| IB (5/15/95) | 0.210 | 0.290 | 1.50 |
| IC (5/15/95) | 0.210 | 0.220 | 0.370 |
| IB (8/27/95) | 0.498 | 0.625 | 1.95 |
| IIIA (8/28/95) | 0.510 | 0.640 (E bank) | 2.23 |
| IIIA (8/28/95) | 0.510 | 0.599 (W bank) | 1.24 |

*Table 6: Examples of specific conductance measurements of water along the creek banks, as compared to those of the surface water in the central portion of the creek channel and to nearby groundwater.*

This was found primarily on the east bank of Site I, where piezometeric data indicate groundwater is flowing into the creek from the east side. When the specific conductance meter was placed in the surface water, right up against the east bank, higher measurements were recorded. The most striking example was measured on 8/27/95, when the specific conductance in the central portion of the stream channel measured at 0.498 mS/cm, whereas along the east bank it was measured 0.625 mS/cm. The suspected source for this elevated level, the groundwater within the east bank, was measured to have a specific conductance of 1.95 mS/cm. The 95% confidence interval for the mean error associated with specific conductance measurements was calculated to be 3.4%, and thus these differences observed in the surface water are significant. Such measurements indicate that it is possible to directly detect the high-conductivity groundwater infiltrating the creek, at least along those portions of the creek where the differences between the surface water and ground water specific conductance values are large. Although the measurements are not useful in indicating the type and concentrations of the specific ions are moving into the surface water system, they are useful in detecting locations of ground water movement into the creek.

**ICAPES data from bead digests run on 1/24/96 and 1/25/96**

| Sample Name | Analysis Date | Analysis Time | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BLANK | 1/24/96 | 8:45 | 0.003 | -0.021 | 0.001 | 0.0011 | 0.0004 | 0.0005 | 0.0023 | 0.003 | 0.01 | 0 | -0.0011 | 0.009 | -0.004 | 0.02 | 0.014 | 0.034 | 0.0003 | -0.0002 | 0.0012 |
| 8-STR.BLANK1 | 1/24/96 | 8:48 | 0.023 | -0.011 | 0 | 0.0006 | 0.0046 | 0.0086 | 0.0027 | 0.013 | 0.03 | 5E-04 | 0.0034 | -0.013 | 0.005 | 0.08 | -0.005 | 0.029 | 0.0002 | 0 | 0.0071 |
| 8-STR.BLANK2 | 1/24/96 | 8:50 | 0.013 | 0.018 | 0 | 0.0006 | 0.0016 | 0.0077 | 0.0012 | 0.01 | 0.02 | 0 | -0.0005 | -0.009 | -0.001 | 0.08 | -0.005 | 0.028 | 0 | -0.0004 | 0.0051 |
| 8-BEADBLNK1:1.0022g | 1/24/96 | 8:54 | 4.05 | -0.016 | 0.211 | 0.0001 | 0.002 | 0.0067 | 0.0019 | 0.024 | 0.157 | 0.003 | 0.0006 | 0.031 | 0.001 | 0.11 | 0.005 | 0.417 | 0.0012 | 0.0065 | 0.0049 |
| 8-BEADBLNK2:0.9939g | 1/24/96 | 8:57 | 2.27 | -0.03 | 0.249 | 0.0007 | 0.0008 | 0.0147 | 0.0008 | 0.017 | 0.116 | 0.005 | -0.0003 | 0.043 | -0.001 | 0.09 | -0.002 | 0.377 | 0.0015 | 0.0066 | 0.0022 |
| BLANK | 1/24/96 | 9:09 | 0.02 | -0.003 | 0.006 | 0 | 0.001 | 0.0011 | 0.0027 | 0.001 | 0.014 | 0 | -0.0011 | 0.006 | -0.003 | 0.09 | -0.026 | -0.007 | 0.0003 | 0 | 0.0035 |
| USGS T107 | 1/24/96 | 9:13 | 0.25 | 0 | 13 | 0.0183 | 0.0123 | 0.0263 | 0.0329 | 0.061 | 2.27 | 0.052 | 0.0159 | 22.9 | 0.027 | 0.14 | 0.033 | 4.16 | 0.0649 | 0.0025 | 0.0906 |
| USGS T117 | 1/24/96 | 9:17 | 0.106 | -0.006 | 23.3 | 0.0033 | 0.0067 | 0.0234 | 0.0077 | 0.52 | 11 | 0.243 | 0.0154 | 22 | 0.014 | 0.37 | -0.006 | 6.21 | 0.2779 | 0.0027 | 0.2034 |
| 8-BLANK | 1/26/96 | 9:06 | 0.004 | -0.009 | 0 | 0.0001 | -2E-04 | 0.0019 | -0.001 | -0.004 | 0 | 0 | 0.0019 | 0.01 | -0.005 | 0.02 | 0.003 | 0.011 | 0.0002 | 0 | 0.0002 |
| USGS T107 | 1/26/96 | 9:08 | 0.236 | -0.011 | 12.9 | 0.0173 | 0.0142 | 0.0276 | 0.0301 | 0.061 | 2.28 | 0.052 | 0.0156 | 22.7 | 0.029 | 0.05 | 0.017 | 4.14 | 0.0645 | 0.0022 | 0.0887 |
| USGS T117 | 1/26/96 | 9:12 | 0.092 | 0.01 | 23.2 | 0.0032 | 0.0055 | 0.0274 | 0.0053 | 0.517 | 11 | 0.241 | 0.0132 | 21.9 | 0.006 | 0.27 | -0.006 | 6.24 | 0.278 | 0.0025 | 0.1988 |
| USGS T-91 | 1/26/96 | 9:15 | 0.413 | -0.01 | 27.8 | 0.0397 | 0.0131 | 0.0196 | 0.997 | 0.313 | 11.1 | 2.551 | 0.0014 | 6.23 | 0.018 | 0.08 | 0.009 | 7.37 | 0.123 | 0.0018 | 6.276 |
| USGS AMW-2 | 1/26/96 | 9:18 | 20.5 | -0.028 | 339 | 0.1393 | 0.1458 | 0.3491 | 4.939 | 102 | 116 | 92.03 | 0.1445 | 25.2 | 0.247 | 0.51 | 0.037 | 23 | 1.424 | 0.0148 | 47.61 |
| 8-BLANK | 1/26/96 | 9:28 | 0.006 | -0.012 | 0.006 | -1E-04 | 0.0009 | 0.0357 | -0.002 | -0.003 | 0.007 | 0.002 | 0.0021 | 0.07 | -0.004 | 0.14 | 0.002 | -0.004 | 0.0015 | 0.006 | 0.0009 |
| 8-STR.BLANK1 | 1/26/96 | 9:31 | 0.017 | -0.005 | 0.053 | -2E-04 | 0.0011 | 0.028 | -0.001 | 0.032 | 0.06 | 0.001 | -0.0009 | 0.052 | -0.004 | 0.14 | 0 | 0.071 | 0.0008 | 0.0022 | 0.0038 |
| 8-STR.BLANK2 | 1/26/96 | 9:34 | 0.065 | -0.017 | 0.084 | -1E-04 | 0.0017 | 0.036 | -0.001 | 0.041 | 0.366 | 0.001 | -0.0004 | 0.125 | -0.002 | 0.17 | -0.006 | 0.206 | 0.0014 | 0.0065 | 0.0022 |
| 8-STR.BLANK3 | 1/26/96 | 9:37 | 0.011 | -0.013 | 0.065 | 0.0003 | 0.0009 | 0.0289 | -7E-04 | 0.032 | 0.057 | 5E-04 | 0.0012 | 0.12 | 0.017 | 0.14 | -0.01 | 0.079 | 0.001 | 0.004 | 0.0162 |
| 8-BLANK | 1/26/96 | 9:40 | -0.003 | -0.005 | 0.006 | -6E-04 | 0.0009 | 0.0389 | -7E-04 | -0.004 | 0.01 | 7E-04 | 0.0024 | 0.08 | -0.001 | 0.18 | -0.001 | 0.002 | 0.0017 | 0.0076 | 0.0007 |
| 8-BEADBLANK3 | 1/26/96 | 9:43 | 3 | -0.015 | 0.676 | 0.0008 | 0.0017 | 0.0323 | -0.001 | 0.036 | 0.169 | 0.009 | -0.0011 | 0.175 | -0.006 | 0.17 | 0.002 | 0.777 | 0.0042 | 0.0143 | 0.0028 |
| 8-IC-1 0-8cm | 1/26/96 | 9:46 | 4.1 | 0.095 | 1.81 | 0.0037 | 0.0019 | 0.0366 | 1.107 | 3.51 | 0.52 | 0.395 | 0.0031 | 0.394 | 0.049 | 0.72 | 0.141 | 1.68 | 0.015 | 0.0474 | 1.355 |
| 8-IC-1 8-11 cm | 1/26/96 | 9:50 | 4.23 | 0.116 | 2.28 | 0.0057 | 0.003 | 0.0404 | 0.5275 | 5.91 | 0.841 | 0.958 | 0.007 | 0.728 | 0.146 | 0.99 | 0.214 | 1.47 | 0.0188 | 0.0347 | 1.601 |
| 8-IC-1 11-30 cm | 1/26/96 | 9:53 | 3.65 | 0.022 | 1.61 | 0.0031 | 0.0015 | 0.037 | 0.9004 | 1.53 | 0.83 | 0.706 | 0.0006 | 0.991 | 0.069 | 0.46 | 0.097 | 0.873 | 0.012 | 0.0275 | 1.973 |
| 8-IC-3 0-9.5cm | 1/26/96 | 9:56 | 5.06 | 0.063 | 2 | 0.0057 | 0.0008 | 0.0371 | 1.512 | 3.93 | 0.536 | 0.504 | 0.0066 | 0.667 | 0.103 | 0.75 | 0.188 | 1.87 | 0.0162 | 0.0419 | 1.599 |
| 8-IC-3 9.5-21cm | 1/26/96 | 10:00 | 4.56 | 0.016 | 1.42 | 0.0021 | 0.0008 | 0.0403 | 0.9113 | 2.81 | 0.426 | 0.262 | 0.003 | 0.45 | 0.041 | 0.45 | 0.065 | 1.23 | 0.0101 | 0.0358 | 0.5246 |
| USGS T107 | 1/26/96 | 10:03 | 0.226 | 0.002 | 13.6 | 0.0187 | 0.0157 | 0.0776 | 0.0294 | 0.063 | 2.28 | 0.054 | 0.0132 | 22.3 | 0.034 | 0.28 | 0.039 | 4.34 | 0.0644 | 0.0116 | 0.0969 |
| USGS T117 | 1/26/96 | 10:06 | 0.07 | -0.01 | 23.8 | 0.0027 | 0.0047 | 0.0688 | 0.0035 | 0.513 | 10.7 | 0.243 | 0.0115 | 20.8 | 0.009 | 0.49 | 0 | 6.32 | 0.2654 | 0.0112 | 0.2086 |
| 8-IC-3 21-32cm | 1/26/96 | 10:09 | 11.3 | 0.027 | 1.25 | 0.0044 | 0.0011 | 0.0422 | 1.108 | 13.2 | 0.555 | 0.207 | 0.02 | 0.386 | 0.059 | 0.47 | 0.065 | 3.01 | 0.0095 | 0.0506 | 0.7684 |
| 8-IC-3 32-42cm | 1/26/96 | 10:12 | 5.96 | 0.014 | 1.22 | 0.0025 | 0.0004 | 0.0386 | 0.951 | 5.41 | 0.529 | 0.327 | 0.0052 | 0.543 | 0.065 | 0.37 | 0.063 | 1.46 | 0.0084 | 0.0344 | 0.6865 |
| 8-IC-1 30-42cm | 1/26/96 | 10:15 | 4.63 | 0.468 | 2.65 | 0.0245 | 0.0034 | 0.0556 | 3.598 | 60.4 | 0.752 | 1.29 | 0.0861 | 0.879 | 0.317 | 8.7 | 0.244 | 3.61 | 0.0535 | 0.0358 | 4.367 |
| 8-IC-2 0-14cm | 1/26/96 | 10:18 | 3.13 | 0.055 | 2.45 | 0.0066 | 0.0017 | 0.0432 | 1.424 | 3.85 | 0.575 | 0.609 | 0.0041 | 0.397 | 0.109 | 0.79 | 0.156 | 1.86 | 0.0196 | 0.0456 | 2.093 |
| 8-IC-2 14-18cm | 1/26/96 | 10:21 | 10.8 | 0.124 | 2.68 | 0.0098 | 0.0027 | 0.0429 | 1.773 | 5.43 | 1.03 | 0.71 | 0.0067 | 0.758 | 0.045 | 0.86 | 0.329 | 2.69 | 0.0233 | 0.0617 | 1.618 |
| 8-IC-2 18-32cm | 1/26/96 | 10:24 | 4.74 | 0.85 | 3.35 | 0.023 | 0.0036 | 0.0573 | 2 | 53.8 | 0.966 | 1.567 | 0.0749 | 0.894 | 0.052 | 5.9 | 0.287 | 4.22 | 0.0483 | 0.0391 | 4.512 |
| 8-IC-2 18-32cm (2) | 1/26/96 | 10:28 | 5.86 | 0.758 | 2.8 | 0.0202 | 0.0017 | 0.0522 | 2 | 48.6 | 1.03 | 1.478 | 0.0647 | 0.934 | 0.03 | 5.4 | 0.241 | 3.95 | 0.0432 | 0.0358 | 3.945 |
| 8-IC-2 32-41cm | 1/26/96 | 10:31 | 2.73 | 0 | 1.37 | 0.0042 | 0.0009 | 0.0431 | 0.552 | 1.4 | 0.431 | 0.34 | 0.0028 | 0.57 | 0.199 | 0.49 | 0.047 | 0.762 | 0.0097 | 0.0239 | 0.6602 |
| 8-IB-1 0-8cm | 1/26/96 | 10:38 | 6.97 | 0.034 | 1.76 | 0.0147 | 0.0051 | 0.0476 | 2.842 | 2.61 | 2.95 | 3.352 | 0.0037 | 2.93 | 0.005 | 0.87 | 0.093 | 1.61 | 0.015 | 0.0331 | 5.522 |
| 8-IB-1 0-8cm (2) | 1/26/96 | 10:41 | 3.36 | 0.014 | 1.96 | 0.0153 | 0.0051 | 0.0527 | 2.91 | 3.05 | 2.81 | 3.353 | 0.0041 | 3.05 | 0.007 | 0.98 | 0.105 | 1.38 | 0.0169 | 0.0297 | 5.593 |
| 8-IB-1 0-8cm DUP | 1/26/96 | 10:43 | 37.1 | 0.023 | 1.95 | 0.0137 | 0.0055 | 0.0528 | 2.829 | 2.87 | 3.79 | 3.359 | 0.0053 | 3.01 | 0.008 | 0.9 | 0.086 | 4.39 | 0.0163 | 0.0803 | 5.526 |
| 8-IB-1 8-12cm | 1/26/96 | 10:47 | 5.45 | 0.158 | 1.9 | 0.0093 | 0.0025 | 0.0437 | 1.366 | 10.1 | 0.821 | 1.3 | 0.011 | 0.798 | 0.003 | 2.1 | 0.201 | 1.63 | 0.0236 | 0.0347 | 2.476 |
| 8-BLANK | 1/26/96 | 10:50 | 0.012 | -0.023 | 0.01 | 0.0008 | 0.0006 | 0.0562 | -0.002 | -0.002 | 0.02 | 5E-04 | -0.0024 | 0.13 | -0.003 | 0.3 | -0.004 | 0 | 0.0023 | 0.0094 | 0.0025 |
| 8-IB-1 12-16cm | 1/26/96 | 10:53 | 2.61 | 0.004 | 1.44 | 0.0028 | 0.0015 | 0.038 | 0.291 | 0.757 | 0.396 | 0.252 | -0.0008 | 0.504 | -0.003 | 0.43 | 0.053 | 0.895 | 0.0109 | 0.0249 | 0.7794 |
| 8-BLANK | 1/26/96 | 10:56 | 0.015 | -0.02 | 0.012 | -3E-04 | 0.0009 | 0.0555 | -7E-04 | -0.004 | 0.004 | 2E-04 | -0.001 | 0.112 | -0.001 | 0.32 | 0.006 | -0.002 | 0.0023 | 0.009 | 0.0024 |
| USGS T107 | 1/26/96 | 10:59 | 0.226 | -0.01 | 13.6 | 0.0188 | 0.0138 | 0.0847 | 0.029 | 0.058 | 2.22 | 0.054 | 0.0137 | 22.2 | 0.031 | 0.36 | 0.011 | 4.26 | 0.0641 | 0.0128 | 0.0974 |
| USGS T117 | 1/26/96 | 11:02 | 0.094 | 0.007 | 24 | 0.0032 | 0.0051 | 0.0756 | 0.0042 | 0.521 | 10.6 | 0.248 | 0.012 | 21.3 | 0.01 | 0.56 | -0.002 | 6.39 | 0.2674 | 0.0119 | 0.2131 |
| 8-IB-1 16-21cm | 1/26/96 | 11:05 | 3.31 | -0.032 | 1.01 | 0.0011 | 0 | 0.0405 | 0.1947 | 0.358 | 0.275 | 0.128 | 0.0003 | 0.321 | -0.003 | 0.37 | 0.036 | 0.819 | 0.0076 | 0.0206 | 0.4695 |
| 8-IB-22-32cm | 1/26/96 | 11:08 | 8.85 | 0.008 | 1.51 | 0.0019 | 0.0021 | 0.0427 | 0.4582 | 0.517 | 0.494 | 0.205 | 0.0001 | 0.455 | 0.002 | 0.41 | 0.047 | 1.33 | 0.0099 | 0.034 | 0.6558 |
| 8-IB-1 32-41.5 | 1/26/96 | 11:11 | 5.86 | 0.004 | 1.74 | 0.0022 | 0.0021 | 0.0409 | 0.6104 | 1.44 | 0.606 | 0.364 | 0.0007 | 0.687 | 0.001 | 0.46 | 0.069 | 1.38 | 0.0132 | 0.0372 | 0.6588 |
| 8-IB-1 8-12cm DUP | 1/26/96 | 11:14 | 21.1 | 0.123 | 2.24 | 0.0107 | 0.0017 | 0.0489 | 1.339 | 10.1 | 1.24 | 1.296 | 0.0138 | 0.872 | 0.007 | 2.2 | 0.207 | 3.59 | 0.0254 | 0.0692 | 2.451 |
| 8-IA-3 0-10cm | 1/26/96 | 11:17 | 4.43 | 0.098 | 2.18 | 0.0122 | 0.0027 | 0.0458 | 3.566 | 6.93 | 1.33 | 1.641 | 0.0066 | 1.94 | 0.013 | 1.5 | 0.217 | 2.53 | 0.0225 | 0.0474 | 3.596 |
| 8-IA-3 10-20cm | 1/26/96 | 11:20 | 5.42 | 0.13 | 1.7 | 0.0126 | 0.0021 | 0.0432 | 2.655 | 15.1 | 1.35 | 1.543 | 0.0178 | 2.02 | 0.131 | 0.87 | 0.222 | 3.02 | 0.0144 | 0.032 | 2.692 |
| 8-IA-3 20-31cm | 1/26/96 | 11:23 | 5.7 | 0.001 | 1.76 | 0.0132 | 0.0025 | 0.0458 | 1.483 | 1.13 | 2 | 1.967 | 0.0005 | 2.06 | 0.016 | 0.6 | 0.093 | 1.23 | 0.0127 | 0.0278 | 3.091 |
| 8-IA-3 31-42cm | 1/26/96 | 11:26 | 5.8 | 0.019 | 3.44 | 0.0047 | 0.0025 | 0.044 | 1.077 | 1.12 | 1.32 | 1.082 | 0.0017 | 1.22 | 0.14 | 0.44 | 0.065 | 1.61 | 0.0151 | 0.0376 | 1.773 |
| 8-IA-2 0-12cm | 1/26/96 | 11:30 | 3.7 | 0.074 | 2.47 | 0.0084 | 0.0025 | 0.0455 | 3.386 | 7.07 | 1.08 | 1.333 | 0.0092 | 1.45 | 0.045 | 1.5 | 0.203 | 2.31 | 0.0241 | 0.0481 | 2.471 |
| 8-IA-2 0-12cm(2) | 1/26/96 | 11:33 | 5.92 | 0.096 | 2.67 | 0.0091 | 0.0015 | 0.0481 | 3.688 | 8 | 1.27 | 1.461 | 0.0091 | 1.55 | 0.001 | 1.7 | 0.196 | 2.91 | 0.0261 | 0.0557 | 2.778 |
| 8-IA-2 12-15cm | 1/26/96 | 11:36 | 12.1 | 0.232 | 2.12 | 0.0162 | -2E-04 | 0.0448 | 6.275 | 28.8 | 0.601 | 0.674 | 0.0396 | 0.833 | -0.003 | 2.4 | 0.239 | 8.26 | 0.0216 | 0.0286 | 3.171 |
| 8-IA-2 15-23cm | 1/26/96 | 11:39 | 20.8 | 0.085 | 1.94 | 0.0088 | 0.0013 | 0.0516 | 3.66 | 42.1 | 0.732 | 0.76 | 0.0627 | 0.962 | 0 | 1.3 | 0.601 | 11.8 | 0.0171 | 0.0324 | 2.601 |
| 8-BLANK | 1/26/96 | 11:44 | 0.007 | -0.032 | 0.012 | 0.0014 | -2E-04 | 0.0484 | -0.002 | -0.003 | 0.012 | -2E-04 | -0.0022 | 0.107 | 0.001 | 0.31 | -0.035 | -0.005 | 0.0021 | 0.0087 | 0.0027 |
| 8-IA-2 23-33.5cm | 1/26/96 | 11:47 | 10.6 | 0.043 | 4.74 | 0.006 | 0.0011 | 0.0482 | 2.198 | 28.3 | 0.786 | 0.709 | 0.0417 | 1.19 | -0.006 | 0.71 | 0.338 | 4.87 | 0.025 | 0.0354 | 1.345 |
| 8-IA-2 0-12cm(2) DUP | 1/26/96 | 11:50 | 12.7 | 0.093 | 2.89 | 0.0092 | 0.0019 | 0.0556 | 3.645 | 8.2 | 1.48 | 1.454 | 0.0078 | 1.58 | -0.005 | 1.7 | 0.187 | 4.47 | 0.0272 | 0.0796 | 2.751 |
| 8-IA-2 23-33.5cm (2) | 1/26/96 | 11:53 | 10.2 | 0.039 | 4.16 | 0.005 | 0.0006 | 0.05 | 2.189 | 27.7 | 0.652 | 0.591 | 0.044 | 0.983 | -0.003 | 0.73 | 0.301 | 4.84 | 0.0219 | 0.0304 | 1.212 |
| 8-IA-2 33.5-42cm | 1/26/96 | 11:56 | 9.59 | 0.044 | 1.81 | 0.0045 | 0.0008 | 0.0624 | 2.151 | 38.1 | 0.76 | 0.683 | 0.0591 | 1.12 | -0.003 | 0.63 | 0.327 | 3.13 | 0.0143 | 0.0329 | 1.227 |
| USGS T117 | 1/26/96 | 11:59 | 0.082 | 0.007 | 25.6 | 0.0039 | 0.0047 | 0.0935 | 0.0035 | 0.558 | 11.2 | 0.263 | 0.0109 | 22.6 | 0.008 | 0.65 | -0.016 | 6.82 | 0.279 | 0.0155 | 0.23 |
| USGS T107 | 1/26/96 | 12:02 | 0.219 | -0.009 | 13.5 | 0.0183 | 0.0118 | 0.0832 | 0.0287 | 0.066 | 2.2 | 0.053 | 0.012 | 22.4 | 0.036 | 0.38 | 0.012 | 4.26 | 0.0637 | 0.013 | 0.0972 |
| 8-IIA-3 0-8.5cm | 1/26/96 | 12:05 | 20.7 | 0.053 | 2.19 | 0.0029 | 0.0009 | 0.0448 | 1.32 | 4.62 | 0.812 | 0.289 | 0.005 | 0.33 | -0.006 | 0.95 | 0.138 | 4.01 | 0.0189 | 0.0734 | 1.123 |
| 8-IIA-3 8.5-13.5cm | 1/26/96 | 12:08 | 7.15 | 0.432 | 3.94 | 0.0074 | 0.0008 | 0.056 | 0.9751 | 54.5 | 0.45 | 0.364 | 0.0763 | 0.301 | 0.001 | 4.7 | 0.172 | 4.15 | 0.0552 | 0.0358 | 1.045 |
| 8-IIA-3 13.5-21.5cm | 1/26/96 | 12:11 | 7.78 | 0.031 | 1.47 | 0.0013 | 0.0002 | 0.0426 | 0.2464 | 2.74 | 0.348 | 0.089 | 0.0034 | 0.28 | -0.007 | 0.89 | 0.065 | 1.26 | 0.0134 | 0.0316 | 0.2547 |
| 8-IIA-3 13.5-21.5(2) | 1/26/96 | 12:14 | 7.19 | 0.019 | 1.72 | 0.0012 | 0.0002 | 0.042 | 0.217 | 2.26 | 0.35 | 0.084 | 0.0003 | 0.346 | 0 | 0.77 | 0.039 | 1.38 | 0.0141 | 0.0315 | 0.2668 |
| 8-IIA-3 21.5-29.5cm | 1/26/96 | 12:17 | 6.15 | 0.006 | 1.3 | 0.0004 | 0.0017 | 0.0379 | 0.1884 | 0.769 | 0.306 | 0.059 | -0.0012 | 0.307 | -0.002 | 0.43 | 0.046 | 1.11 | 0.0096 | 0.0278 | 0.3845 |
| 8-IIA-3 30-41cm | 1/26/96 | 12:20 | 4.87 | 0.008 | 1.34 | 0.0004 | -0.001 | 0.043 | 0.2673 | 0.743 | 0.261 | 0.065 | 0.0001 | 0.291 | 0.001 | 0.48 | 0.05 | 1.13 | 0.0101 | 0.0293 | 0.3044 |
| 8-IIB-1 0-8cm | 1/26/96 | 12:23 | 3.18 | 0.035 | 2.02 | 0.0035 | 0.0011 | 0.0409 | 0.9687 | 3.12 | 0.381 | 0.325 | 0.0016 | 0.314 | 0.038 | 0.82 | 0.132 | 1.68 | 0.0165 | 0.0383 | 1.026 |
| USGS T107 | 1/26/96 | 12:26 | 0.223 | -0.001 | 14.1 | 0.0189 | 0.0127 | 0.0926 | 0.0312 | 0.066 | 2.29 | 0.056 | 0.0178 | 23.5 | 0.031 | 0.42 | 0.009 | 4.48 | 0.0663 | 0.0145 | 0.1038 |
| 8-IIB-3 0-7cm | 1/26/96 | 12:29 | 4.35 | 0.058 | 2.1 | 0.0024 | 0.0013 | 0.045 | 0.7931 | 2.82 | 0.539 | 0.299 | 0.0002 | 0.689 | 0.007 | 0.86 | 0.107 | 1.97 | 0.0159 | 0.0381 | 0.8523 |
| 8-IIB-3 7-15cm | 1/26/96 | 12:32 | 4.63 | 0.169 | 2.41 | 0.0044 | 0.0006 | 0.0438 | 0.8211 | 4.17 | 0.448 | 0.202 | 0.0041 | 0.525 | 0.002 | 0.82 | 0.247 | 2.02 | 0.0205 | 0.0546 | 2.829 |
| 8-IIB-3 15-25cm | 1/26/96 | 12:35 | 3.25 | 0.038 | 1.57 | 0.0012 | -6E-04 | 0.0432 | 0.2882 | 1.4 | 0.294 | 0.077 | 0.0023 | 0.422 | 0.001 | 0.58 | 0.077 | 1.21 | 0.0116 | 0.034 | 0.5612 |
| 8-IIB-3 25-41cm | 1/26/96 | 12:37 | 8.25 | 0.004 | 2.24 | 0.0019 | -0.002 | 0.045 | 0.2478 | 1.4 | 0.472 | 0.092 | -0.0036 | 0.469 | -0.005 | 0.46 | 0.082 | 1.81 | 0.0144 | 0.047 | 0.2702 |
| 8-IIB-3 25-41cm (2) | 1/26/96 | 12:40 | 2.57 | 0.025 | 1.48 | 0.0011 | 0.0017 | 0.0395 | 0.2223 | 1.14 | 0.231 | 0.077 | 0.0005 | 0.333 | -0.002 | 0.41 | 0.07 | 1.09 | 0.0103 | 0.0293 | 0.2377 |
| 8-IIC-1 0-11cm | 1/26/96 | 12:43 | 8.01 | 0.044 | 2.44 | 0.0034 | 0.0004 | 0.038 | 0.946 | 3.1 | 0.521 | 0.347 | 0.0013 | 0.478 | -0.002 | 0.81 | 0.137 | 2.53 | 0.0185 | 0.0485 | 1.043 |
| 8-IIC-1 0-11cm (2) | 1/26/96 | 12:45 | 5.08 | 0.047 | 2.55 | 0.0031 | -6E-04 | 0.0439 | 1.008 | 3.18 | 0.473 | 0.377 | 0.0048 | 0.482 | -0.002 | 0.84 | 0.14 | 2.06 | 0.0194 | 0.0448 | 1.168 |
| 8-IIC-1 0-11cm DUP | 1/26/96 | 12:48 | 17.2 | 0.07 | 2.57 | 0.0038 | 0.0013 | 0.0406 | 0.9503 | 3.24 | 0.782 | 0.353 | 0.0061 | 0.515 | -0.003 | 0.83 | 0.127 | 3.84 | 0.0192 | 0.0723 | 1.055 |
| 8-IIC-1 11-20cm | 1/26/96 | 12:50 | 5.92 | 0.2 | 2.44 | 0.0039 | 0.0011 | 0.038 | 1.169 | 12.7 | 0.504 | 0.454 | 0.0185 | 0.384 | -0.005 | 1.3 | 0.433 | 3.03 | 0.0212 | 0.0752 | 0.8982 |
| 8-IIC-1 20-30cm | 1/26/96 | 12:55 | 7.13 | 0.175 | 2.5 | 0.0019 | 0.0008 | 0.0413 | 0.3286 | 20 | 0.388 | 0.256 | 0.0264 | 0.354 | -0.004 | 2.5 | 0.122 | 2.49 | 0.0265 | 0.0423 | 0.7616 |
| 8-IIC-1 20-30cm (2) | 1/26/96 | 12:58 | 14.1 | 0.186 | 3.02 | 0.0023 | 0.0013 | 0.0363 | 0.3473 | 18.8 | 0.636 | 0.264 | 0.024 | 0.433 | 0.001 | 2.6 | 0.12 | 3.1 | 0.0297 | 0.0575 | 0.6752 |
| 8-IIC-1 30-42cm | 1/26/96 | 13:01 | 3.6 | 0.002 | 1.61 | 0.0002 | -0.001 | 0.036 | 0.1714 | 0.71 | 0.286 | 0.082 | -0.0037 | 0.397 | -0.002 | 0.38 | 0.022 | 1.26 | 0.0109 | 0.0289 | 0.8221 |
| 8-IIC-1 30-42cm DUP | 1/26/96 | 13:03 | 3.35 | 0.001 | 1.6 | 0.0015 | 0.0011 | 0.0363 | 0.1685 | 0.694 | 0.291 | 0.082 | -0.0013 | 0.411 | 0.001 | 0.42 | 0.027 | 1.24 | 0.0108 | 0.0289 | 0.8166 |
| USGS T107 | 1/26/96 | 13:06 | 0.234 | -0.011 | 14.8 | 0.021 | 0.0142 | 0.095 | 0.0319 | 0.07 | 2.39 | 0.059 | 0.0159 | 24.4 | 0.036 | 0.45 | 0.019 | 4.68 | 0.069 | 0.0154 | 0.1089 |
| 8-BLANK | 1/26/96 | 13:10 | 0.016 | -0.024 | 0.052 | -5E-04 | -0.001 | 0.0487 | -0.003 | 0.002 | 0.057 | 0.001 | -0.0031 | 0.414 | -0.008 | 0.41 | -0.032 | -0.006 | 0.0023 | 0.0087 | 0.0042 |
| 8-BLANK | 1/26/96 | 13:17 | -0.018 | -0.009 | 0 | -1E-04 | 0.0025 | 0.049 | -0.003 | -0.006 | -0.002 | -2E-04 | 0.0026 | 0.108 | 0 | 0.19 | 0.017 | -0.002 | 0.0021 | 0.0116 | -0.001 |
| USGS T107 | 1/26/96 | 13:20 | 0.21 | 0.015 | 13.7 | 0.0173 | 0.0174 | 0.0793 | 0.029 | 0.066 | 2.3 | 0.053 | 0.0197 | 20.9 | 0.034 | 0.24 | 0.055 | 4.26 | 0.064 | 0.0137 | 0.098 |
| USGS T91 | 1/26/96 | 13:25 | 0.384 | 0 | 29.4 | 0.0425 | 0.0157 | 0.0766 | 0.9616 | 0.32 | 11.1 | 2.586 | 0.005 | 5.73 | 0.023 | 0.25 | 0.039 | 7.58 | 0.1184 | 0.013 | 6.921 |
| BLANK | 1/26/96 | 13:53 | 0.006 | 0.016 | 0.002 | 0.0012 | -4E-04 | -0.0018 | 0.0022 | 0.002 | -0.015 | 0 | 0.0041 | -0.006 | 0.006 | 0.05 | 0.016 | 0.032 | 0 | 0.0015 | 2E-04 |

| Sample Name | Date | Time | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| USGS T107 | 1/26/96 | 13:56 | 0.225 | -0.008 | 12.9 | 0.0177 | 0.0129 | 0.0179 | 0.0326 | 0.067 | 2.28 | 0.052 | 0.0182 | 22.9 | 0.03 | 0.02 | 0.041 | 4.18 | 0.0644 | 0.0007 | 0.0898 |
| USGS T117 | 1/26/96 | 13:59 | 0.081 | -0.001 | 23.5 | 0.0038 | 0.0037 | 0.0225 | 0.0078 | 0.513 | 11.1 | 0.244 | 0.0166 | 21.9 | 0.009 | 0.26 | 0.001 | 6.32 | 0.2788 | 0.0022 | 0.2025 |
| USGS T91 | 1/26/96 | 14:02 | 0.408 | -0.031 | 28.5 | 0.0401 | 0.0112 | 0.0193 | 1.005 | 0.317 | 11.1 | 2.587 | 0.0041 | 6.19 | 0.025 | 0.1 | 0.029 | 7.52 | 0.1237 | 0.0015 | 6.422 |
| 8-BLANK | 1/26/96 | 14:05 | -0.001 | -0.01 | 0.004 | 0.0003 | 0.0006 | -0.0048 | 0.0004 | -0.002 | 0.001 | 0 | 0.002 | -0.017 | 0.005 | -0.01 | -0.007 | 0.002 | -1E-04 | -0.0022 | 0.0012 |
| USGS T-91 | 1/26/96 | 14:08 | 0.399 | -0.027 | 28.4 | 0.0414 | 0.0105 | 0.02 | 0.9996 | 0.31 | 11 | 2.572 | 0.0073 | 6.2 | 0.022 | 0.12 | 0.019 | 7.48 | 0.1231 | 0.0015 | 6.4 |
| 8-IIIB-3 30-41cm | 1/26/96 | 14:13 | 4.43 | 0.019 | 1.97 | 0.0007 | 0.0007 | -0.0095 | 0.3302 | 1.11 | 0.333 | 0.071 | 0.0039 | 0.336 | 0.002 | 0.21 | 0.117 | 1.54 | 0.0155 | 0.0274 | 0.4533 |
| 8-IIIB-3 21-30cm | 1/26/96 | 14:16 | 5.5 | 0.004 | 2.15 | 0.0019 | -9E-04 | -0.0065 | 0.6094 | 1.13 | 0.35 | 0.053 | 0.0053 | 0.337 | 0.002 | 0.28 | 0.118 | 1.82 | 0.0157 | 0.0345 | 0.6875 |
| 8-IIIB-3 9-21cm | 1/26/96 | 14:19 | 3.88 | 0 | 2.08 | 0.0025 | 0.0004 | -0.005 | 0.3828 | 1.11 | 0.272 | 0.071 | 0.0033 | 0.407 | 0.004 | 0.3 | 0.091 | 1.54 | 0.0154 | 0.0255 | 0.921 |
| 8-IIIB-3 0-4cm | 1/26/96 | 14:21 | 5.46 | 0.283 | 3.65 | 0.008 | -0.001 | -0.0038 | 1.739 | 23.9 | 0.433 | 0.28 | 0.0368 | 0.5 | 0.006 | 2.9 | 0.222 | 3.37 | 0.0485 | 0.0345 | 1.644 |
| 8-IIIB-2 0-8cm | 1/26/96 | 14:25 | 6.7 | 0.533 | 4.54 | 0.0071 | 0.0004 | 0.0244 | 2.818 | 141 | 0.369 | 0.166 | 0.2101 | 0.55 | 0.061 | 3.5 | 0.083 | 12.8 | 0.0604 | 0.0304 | 3.701 |
| 8-IIIB-2 8-18cm | 1/26/96 | 14:28 | 5.09 | -0.013 | 2.29 | 0.0001 | -0.002 | -0.0073 | 0.1385 | 0.971 | 0.318 | 0.033 | 0.0037 | 0.358 | 0.055 | 0.1 | 0.028 | 1.79 | 0.0121 | 0.0296 | 0.2256 |
| 8-IIIB-2 18-29cm | 1/26/96 | 14:31 | 3.3 | 0 | 1.69 | 0.0008 | -9E-04 | -0.0083 | 0.1499 | 0.694 | 0.236 | 0.029 | 0.004 | 0.342 | 0.179 | 0.06 | 0.018 | 1.06 | 0.0094 | 0.0176 | 0.2154 |
| 8-IIIB-2 18-29cm(2) | 1/26/96 | 14:33 | 4.29 | -0.02 | 1.96 | 0.0004 | -7E-04 | -0.0031 | 0.0574 | 0.612 | 0.275 | 0.032 | 0.0032 | 0.308 | 0.046 | 0.09 | 0.029 | 1.52 | 0.0107 | 0.0236 | 0.1605 |
| 8-IIIB-3 4-9cm | 1/26/96 | 14:36 | 4.86 | -0.008 | 2.3 | 0.0022 | -0.002 | -0.0044 | 0.6053 | 1.41 | 0.334 | 0.077 | 0.0039 | 0.471 | -0.004 | 0.3 | 0.112 | 1.8 | 0.018 | 0.0334 | 0.8537 |
| USGS T107 | 1/26/96 | 14:39 | 0.229 | 0.01 | 14.1 | 0.0201 | 0.0137 | 0.0428 | 0.0333 | 0.072 | 2.45 | 0.057 | 0.0205 | 24.7 | 0.035 | 0.15 | 0.035 | 4.54 | 0.0695 | 0.0049 | 0.0989 |
| USGS T107 | 1/26/96 | 14:42 | 0.23 | -0.011 | 13.7 | 0.0194 | 0.0129 | 0.0422 | 0.0344 | 0.072 | 2.36 | 0.055 | 0.018 | 23.6 | 0.033 | 0.1 | 0.036 | 4.37 | 0.0672 | 0.0041 | 0.0948 |
| USGS T107 | 1/26/96 | 14:43 | 0.219 | 0.005 | 13.7 | 0.0188 | 0.0133 | 0.0395 | 0.0337 | 0.07 | 2.34 | 0.055 | 0.0209 | 23.6 | 0.032 | 0.09 | 0.025 | 4.34 | 0.067 | 0.0037 | 0.0952 |
| 8-IIIC-1 0-8cm | 1/26/96 | 14:46 | 6.1 | 0.026 | 3.16 | 0.0042 | -4E-04 | -0.003 | 0.7179 | 2.57 | 0.664 | 0.319 | 0.0066 | 1.44 | 0.002 | 0.38 | 0.094 | 2.57 | 0.0216 | 0.039 | 0.9871 |
| 8-BLANK | 1/26/96 | 14:49 | -0.015 | -0.025 | 0.004 | 0.0014 | -7E-04 | 0.0035 | 0 | -0.001 | -0.015 | 0 | 0.0027 | 0.02 | 0.001 | 0.06 | 0.009 | 0.003 | 0.0002 | -0.0004 | 0 |
| 8-IIIC-1 8-11cm | 1/26/96 | 14:52 | 4.89 | 0.375 | 3.93 | 0.0029 | -4E-04 | 0.0079 | 0.9178 | 39.7 | 0.418 | 0.493 | 0.0614 | 0.595 | 0.002 | 3.6 | 0.161 | 4.25 | 0.0544 | 0.033 | 2.016 |
| 8-IIIC-1 11-28cm | 1/26/96 | 14:55 | 4.5 | -0.004 | 2.25 | 0.0011 | -9E-04 | -0.0098 | 0.1807 | 0.68 | 0.326 | 0.078 | 0.0051 | 0.925 | 0.007 | 0.22 | 0.066 | 1.63 | 0.0139 | 0.0234 | 0.6266 |
| 8-IIIC-1 11-28cm (2) | 1/26/96 | 14:58 | 3.7 | -0.02 | 2.03 | 0.0025 | -0.001 | -0.0089 | 0.1684 | 0.57 | 0.286 | 0.072 | 0.0013 | 0.93 | 0.001 | 0.21 | 0.064 | 1.37 | 0.0124 | 0.0191 | 0.4939 |
| 8-IIIC-1 28-42cm | 1/26/96 | 15:01 | 3.45 | -0.009 | 2.09 | 0.0022 | -7E-04 | -0.005 | 0.1462 | 0.452 | 0.294 | 0.095 | 0.0029 | 1.31 | 0.001 | 0.17 | 0.041 | 1.35 | 0.0127 | 0.021 | 0.3694 |
| 8-IIIC-3 0-11cm | 1/26/96 | 15:04 | 6.3 | 0.048 | 3.45 | 0.004 | -7E-04 | -0.0066 | 1.188 | 4.62 | 0.519 | 0.312. | 0.0074 | 0.476 | 0.003 | 0.63 | 0.111 | 2.86 | 0.0238 | 0.0469 | 1.117 |
| 8-IIIC-3 11-17cm | 1/26/96 | 15:08 | 4.33 | 0.095 | 2.34 | 0.003 | -0.002 | -0.0049 | 0.6212 | 6.95 | 0.296 | 0.107 | 0.0122 | 0.413 | 0.002 | 0.53 | 0.134 | 2.27 | 0.0163 | 0.0289 | 0.6445 |
| 8-IIIC-3 17-31cm | 1/26/96 | 15:11 | 4.4 | -0.014 | 2.02 | 0.0009 | -7E-04 | -0.0068 | 0.2118 | 0.674 | 0.265 | 0.058 | 0.003 | 0.33 | 0.036 | 0.18 | 0.063 | 1.67 | 0.0122 | 0.0276 | 0.7046 |
| 8-IIIC-3 31-42cm | 1/26/96 | 15:14 | 6 | -0.022 | 2.26 | 0.001 | -0.002 | -0.0126 | 0.1274 | 0.52 | 0.345 | 0.048 | 0.003 | 0.413 | 0.026 | 0.14 | 0.056 | 1.83 | 0.0137 | 0.0296 | 0.5837 |
| 8-BLANK | 1/26/96 | 15:16 | -0.013 | -0.014 | 0.007 | 0.001 | -0.002 | 0.0105 | 0 | 0.001 | -0.013 | 0 | 0.002 | 0.035 | 0.001 | 0.12 | -0.003 | 0.003 | 0.0006 | 0.0007 | 0.0015 |
| USGS T107 | 1/26/96 | 15:19 | 0.231 | -0.008 | 14 | 0.019 | 0.0118 | 0.0422 | 0.0344 | 0.071 | 2.42 | 0.056 | 0.0182 | 24.3 | 0.039 | 0.14 | 0.024 | 4.48 | 0.0687 | 0.0045 | 0.0979 |
| 8-IIIA-3 0-7.5cm | 1/26/96 | 15:22 | 3.76 | 0.038 | 2.38 | 0.0052 | -4E-04 | -0.0059 | 1.121 | 3.22 | 0.436 | 0.304 | 0.0084 | 0.309 | 0.003 | 0.63 | 0.121 | 2.03 | 0.0175 | 0.0339 | 1.042 |
| 8-IIIA-3 7.5-11cm | 1/26/96 | 15:25 | 4.09 | 0.005 | 2.38 | 0.0042 | -0.002 | -0.0023 | 0.8208 | 2.16 | 0.353 | 0.173 | 0.0069 | 0.548 | 0.721 | 0.42 | 0.083 | 1.91 | 0.0151 | 0.0285 | 0.9478 |
| 8-IIIA-1 0-5.5cm | 1/26/96 | 15:28 | 4.78 | 0.063 | 2.92 | 0.006 | -0.002 | -0.001 | 1.534 | 6.88 | 0.474 | 0.456 | 0.0135 | 0.445 | 0.005 | 0.67 | 0.151 | 2.84 | 0.0233 | 0.0427 | 1.812 |
| 8-IIIA-1 5.5-8.5cm | 1/26/96 | 15:31 | 5.45 | 0.412 | 3.62 | 0.0047 | -4E-04 | 0.0092 | 1.026 | 65.3 | 0.354 | 0.21 | 0.0996 | 0.389 | 0.001 | 1.3 | 0.2 | 6.19 | 0.0416 | 0.0345 | 2.424 |
| 8-IIIA-1 0-5.5cm DUP | 1/26/96 | 15:34 | 6.12 | 0.052 | 3.06 | 0.0069 | -2E-04 | 0.0016 | 1.534 | 6.99 | 0.517 | 0.461 | 0.0141 | 0.472 | 0.005 | 0.7 | 0.155 | 3.12 | 0.024 | 0.0476 | 1.828 |
| 8-IIIA-1 8-14cm | 1/26/96 | 15:37 | 6.71 | 0.001 | 2.25 | 0.0008 | -0.001 | -0.0062 | 0.1973 | 0.729 | 0.326 | 0.042 | 0.0025 | 0.462 | 0.006 | 0.13 | 0.059 | 1.94 | 0.0143 | 0.0264 | 0.4793 |
| 8-IIIA-1 14-25cm | 1/26/96 | 15:40 | 4.4 | -0.018 | 2.02 | 0.0018 | -0.002 | -0.0071 | 0.1899 | 0.702 | 0.274 | 0.039 | 0.0033 | 0.393 | 0.001 | 0.14 | 0.067 | 1.71 | 0.0132 | 0.0236 | 0.4772 |
| 8-IIIA-1 25-42cm | 1/26/96 | 15:43 | 4.68 | -0.019 | 2.13 | 0.002 | -0.001 | -0.0033 | 0.1377 | 0.631 | 0.273 | 0.042 | 0 | 0.41 | 0.004 | 0.15 | 0.057 | 1.73 | 0.0136 | 0.0242 | 0.427 |
| 8-IIIB-3 30-41cm DUP | 1/26/96 | 15:45 | 42.3 | -0.007 | 2.69 | 0.0022 | -0.002 | -0.0041 | 0.3524 | 1.39 | 1.36 | 0.096 | 0.003 | 0.502 | 0.003 | 0.26 | 0.108 | 4.27 | 0.0202 | 0.0812 | 0.4824 |
| 8-IIIB-2 0-8cm DUP | 1/26/96 | 15:51 | 15 | 0.53 | 5.08 | 0.0065 | 0.0007 | 0.0337 | 2.807 | 142 | 0.62 | 0.176 | 0.213 | 0.64 | 0.066 | 3.6 | 0.118 | 13.6 | 0.063 | 0.0444 | 3.761 |
| 8-BLANK | 1/26/96 | 15:55 | -0.003 | -0.019 | 0.008 | 0.0008 | 0.0011 | 0.0096 | 0.0004 | 0.018 | -0.005 | 5E-04 | 0.0023 | 0.021 | 0.002 | 0.11 | -0.001 | 0.005 | 0.0004 | 0.0007 | 0.0017 |
| 8-STR.BLANK1 | 1/26/96 | 15:58 | 0.024 | -0.017 | 0.053 | 0.0006 | -0.001 | -0.0056 | 0.0019 | 0.024 | 0.046 | 0 | 0.0023 | -0.018 | -0.001 | 0.08 | 0.008 | 0.061 | -5E-04 | -0.0037 | 0.0063 |
| 8-STR.BLANK2 | 1/26/96 | 16:00 | 0.072 | -0.017 | 0.078 | 0.0006 | -0.001 | -0.0052 | 0.0011 | 0.047 | 0.34 | 0 | 0.0039 | 0.04 | -0.001 | 0.07 | 0.003 | 0.194 | -2E-04 | -0.0015 | 0.0022 |
| 8-STR.BLANK3 | 1/26/96 | 16:04 | 0.017 | -0.008 | 0.06 | 0.0013 | -0.002 | -0.0077 | 0.0019 | 0.038 | 0.049 | 8E-04 | 0.0007 | 0.029 | 0.019 | 0.09 | 0 | 0.067 | -6E-04 | -0.0041 | 0.0163 |
| 8-USGST107 | 1/26/96 | 16:06 | 0.243 | -0.002 | 14.6 | 0.0204 | 0.0142 | 0.0576 | 0.0352 | 0.077 | 2.47 | 0.059 | 0.0202 | 24.9 | 0.035 | 0.21 | 0.036 | 4.62 | 0.0705 | 0.0075 | 0.1044 |
| 8-USGST107 | 1/26/96 | 16:08 | 0.236 | 0.013 | 14 | 0.0188 | 0.0139 | 0.0478 | 0.0337 | 0.073 | 2.4 | 0.056 | 0.0189 | 23.9 | 0.038 | 0.17 | 0.014 | 4.43 | 0.0682 | 0.006 | 0.1001 |
| USGS T117 | 1/26/96 | 16:11 | 0.077 | 0.003 | 24.9 | 0.0029 | 0.0037 | 0.04 | 0.0078 | 0.542 | 11.5 | 0.257 | 0.0151 | 22.8 | 0.01 | 0.4 | 0.004 | 6.65 | 0.2886 | 0.0056 | 0.2172 |
| USGS T91 | 1/26/96 | 16:14 | 0.406 | -0.036 | 30.1 | 0.0431 | 0.0114 | 0.0354 | 1.037 | 0.329 | 11.4 | 2.722 | 0.0046 | 6.45 | 0.03 | 0.22 | 0.009 | 7.87 | 0.128 | 0.0045 | 6.871 |

**ICAPES data of bead digests analysis of 2/6/96**

| Sample Name | Analysis Date | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-STR.BLANK A | 2/6/96 | 0.046 | -0.028 | 0.054 | 7E-04 | -0.002 | 0.0074 | 0.0007 | 0.083 | 0.02 | 0.0017 | -0.002 | -0.037 | 0.018 | 0.13 | -0.042 | 0.035 | -6E-04 | -0.0044 | 0.0043 |
| 8-STR.BLANK B | 2/6/96 | -0.068 | 0.024 | 0.037 | 3E-04 | 0 | 0.0264 | -0.001 | 0.033 | -0.006 | 0.0007 | -0.002 | 0.054 | 0.004 | 0.15 | -0.006 | 0.024 | 0.0014 | 0.0039 | 0.0028 |
| RINSE HCL | 2/6/96 | 0.07 | -0.017 | 0.043 | 8E-04 | -4E-04 | 0.0176 | -7E-04 | 0.037 | 0.095 | 0.0012 | -0.002 | 0.008 | -0.002 | 0.2 | -0.018 | 0.073 | 0.0004 | 0.0007 | 0.2679 |
| RINSE HCL | 2/6/96 | 0.079 | -0.027 | 0.044 | 2E-04 | 0 | 0.0151 | -0.001 | 0.038 | 0.106 | 0.0012 | 0.001 | 0.008 | -0.002 | 0.24 | -0.027 | 0.074 | 0.0004 | 0.0007 | 0.2693 |
| RINSE HCL | 2/6/96 | 0.038 | -0.005 | 0.071 | 0 | -0.002 | 0.0173 | -0.001 | 0.012 | 0.006 | 0.0002 | -0.002 | 0.002 | -0.001 | 0.24 | -0.019 | 0.019 | 0.0001 | -0.0011 | 0.0039 |
| RINSE HCL | 2/6/96 | 0.043 | -0.027 | 0.07 | 0.002 | -6E-04 | 0.0152 | -0.001 | 0.012 | 0.017 | 0.0007 | -0.002 | 0.003 | 0.002 | 0.2 | -0.028 | 0.016 | 0.0001 | -0.0015 | 0.0039 |
| 8-STR.BLANK A | 2/6/96 | 0.043 | -0.031 | 0.064 | 9E-04 | -8E-04 | 0.0153 | -0.001 | 0.095 | 0.022 | 0.0027 | -0.002 | -0.015 | 0.013 | 0.18 | -0.041 | 0.035 | -1E-04 | -0.0026 | 0.0059 |
| 50% HCL | 2/6/96 | 0.041 | -0.016 | 0.073 | 0.001 | 0.0006 | 0.0179 | -7E-04 | 0.015 | 0.023 | 0.0007 | -5E-04 | 0.017 | 0.001 | 0.26 | -0.023 | 0.02 | 0.0002 | -0.0004 | 0.0043 |
| NEW 50%HCL | 2/6/96 | 0.025 | -0.008 | 0.013 | 0.001 | -0.002 | 0.0016 | 0.0007 | 0.025 | 0.026 | 0.001 | -0.004 | -0.038 | -0.006 | 0.18 | -0.043 | 0.007 | -5E-04 | -0.0037 | 0.0583 |
| NEW 50%HCL | 2/6/96 | 0.028 | -0.01 | 0.013 | 3E-04 | -0.001 | 0.0101 | -0.001 | 0.035 | 0.036 | 0.0007 | -0.004 | -0.023 | -0.005 | 0.25 | -0.04 | 0.012 | -3E-04 | -0.0026 | 0.06 |
| NEW 50%HCL | 2/6/96 | 0.008 | -0.017 | 0.019 | 1E-04 | -6E-04 | 0.0043 | -0.002 | 0.017 | 0.04 | -0.0002 | -0.001 | -0.031 | -0.003 | 0.13 | -0.037 | 0.011 | -3E-04 | -0.0026 | 0.0569 |
| 8-STR.BLANK X | 2/6/96 | 0.005 | 0.002 | 0.059 | -5E-04 | -0.001 | 0.006 | -0.004 | 0.034 | 0.015 | 0.0002 | -0.004 | 0.008 | -0.005 | 0.14 | -0.039 | 0.03 | 0.0002 | -0.0015 | 0.0035 |
| 8-STR.BLANK X | 2/6/96 | 0.006 | 0.003 | 0.059 | 0 | -0.001 | 0.0063 | -0.003 | 0.036 | 0.029 | 0.0007 | -8E-04 | 0.003 | -0.004 | 0.16 | -0.053 | 0.027 | 0.0002 | -0.0015 | 0.0035 |
| 8-STR.BLANK Y | 2/6/96 | 0.008 | -0.002 | 0.061 | 0 | -0.002 | 0.0124 | -0.003 | 0.037 | 0.015 | 0.001 | -0.003 | 0.009 | -0.005 | 0.2 | -0.065 | 0.025 | 0.0003 | -0.0007 | 0.0031 |
| 8-STR.BLANK Z | 2/6/96 | 0.005 | -0.012 | 0.059 | 3E-04 | -0.003 | 0.0077 | -0.004 | 0.032 | 0.018 | 0.0002 | -0.003 | 0.01 | -0.008 | 0.14 | -0.044 | 0.019 | 0.0001 | -0.0015 | 0.0022 |
| 8-BEADBLANK4 | 2/6/96 | 11.6 | -0.002 | 0.97 | 0 | -0.003 | 0.0124 | -4E-04 | 0.133 | 0.477 | 0.0163 | -0.002 | 0.198 | 0.007 | 0.16 | -0.05 | 1.37 | 0.0049 | 0.0206 | 0.007 |
| 8-BEADBLANK5 | 2/6/96 | 9 | 0 | 0.911 | 2E-04 | -0.002 | 0.0109 | -0.003 | 0.08 | 0.324 | 0.016 | -0.003 | 0.173 | -0.005 | 0.16 | -0.038 | 1.11 | 0.0047 | 0.0198 | 0.005 |
| 8-BEADBLANK6 | 2/6/96 | 20.3 | -0.025 | 1.62 | 2E-04 | -0.002 | 0.0116 | 0 | 0.138 | 0.709 | 0.0244 | -0.001 | 0.313 | -0.001 | 0.17 | -0.03 | 2.13 | 0.0086 | 0.0411 | 0.0075 |
| 8-BEADBLANK7 | 2/6/96 | 5.77 | 0.003 | 1.11 | -5E-04 | -0.002 | 0.0132 | -0.002 | 0.14 | 0.25 | 0.0133 | -0.005 | 0.215 | 0.011 | 0.16 | -0.054 | 1.11 | 0.0057 | 0.0158 | 0.0076 |
| 50%HCL | 2/6/96 | 0 | -0.004 | 0.022 | -6E-04 | -0.005 | 0.0071 | -0.003 | 0.056 | 0.04 | 0.0002 | -0.003 | -0.012 | -0.009 | 0.12 | -0.048 | 0.016 | 0 | -0.0015 | 0.0569 |
| 50%HCL | 2/6/96 | -0.008 | -0.007 | 0.022 | 1E-04 | -0.003 | 0.0057 | -0.003 | 0.062 | 0.031 | 0 | -0.004 | -0.013 | -0.008 | 0.12 | -0.037 | 0.013 | -1E-04 | -0.0022 | 0.0573 |
| 8-IA-1 0-13cm | 2/6/96 | 6.53 | 0.046 | 2.2 | 0.004 | -0.002 | 0.0186 | 0.9043 | 2.02 | 0.726 | 0.5973 | -0.001 | 0.703 | 0.008 | 0.52 | 0.061 | 1.71 | 0.0151 | 0.0341 | 1.195 |
| 8-IA-1 0-13cm(21 | 2/6/96 | 6.39 | 0.045 | 1.65 | 0.004 | -0.001 | 0.015 | 0.9246 | 2 | 0.575 | 0.5022 | -9E-04 | 0.511 | 0.004 | 0.54 | 0.053 | 1.65 | 0.012 | 0.0268 | 1.233 |
| 8-IA-1 13-21cm | 2/6/96 | 3.18 | 0.201 | 1.46 | 0.007 | -0.003 | 0.0168 | 2.152 | 15.6 | 0.484 | 0.4532 | 0.0204 | 0.483 | 0.006 | 2 | 0.28 | 1.82 | 0.0165 | 0.0305 | 1.324 |
| 8-IA-1 21-31cm | 2/6/96 | 3.68 | 0.04 | 1.54 | 0.004 | -0.002 | 0.0215 | 1.325 | 3.06 | 0.782 | 0.737 | 0.001 | 0.947 | 0.002 | 0.89 | 0.093 | 1.11 | 0.0135 | 0.0264 | 1.472 |
| 8-IA-1 31-41cm | 2/6/96 | 2.55 | 0.022 | 1.19 | 0.003 | -0.001 | 0.017 | 0.8738 | 1.53 | 0.665 | 0.5971 | 0.0009 | 0.892 | 0.005 | 0.34 | 0.018 | 0.842 | 0.01 | 0.0224 | 0.9862 |
| 8-IB-2 0-7.5cm | 2/6/96 | 3.75 | 0.106 | 2.28 | 0.005 | -0.003 | 0.0168 | 2.427 | 5.82 | 0.656 | 0.7476 | 0.0065 | 0.57 | -0.001 | 0.98 | 0.142 | 2.35 | 0.0214 | 0.0397 | 2.425 |
| 8-IB-2 7.5-12cm | 2/6/96 | 4.22 | 0.111 | 2.7 | 0.006 | -0.001 | 0.0161 | 2.568 | 6.52 | 0.705 | 0.7673 | 0.0081 | 0.596 | 0.009 | 1.2 | 0.187 | 2.48 | 0.0242 | 0.0487 | 2.14 |
| 8-IB-2 12-16cm | 2/6/96 | 3.69 | 0.003 | 1.9 | 0.002 | -0.002 | 0.0163 | 0.8785 | 1.34 | 0.648 | 0.6623 | -0.002 | 0.843 | 0.008 | 0.39 | -0.007 | 1.31 | 0.0129 | 0.0246 | 1.138 |
| USGS T107 | 2/6/96 | 0.252 | 0.003 | 14.8 | 0.019 | 0.0111 | 0.0661 | 0.0323 | 0.064 | 2.46 | 0.0581 | 0.018 | 26 | 0.032 | 0.34 | 0 | 4.7 | 0.07 | 0.0092 | 0.1053 |
| USGS T107 | 2/6/96 | 0.238 | 0.026 | 14.2 | 0.019 | 0.0113 | 0.058 | 0.0316 | 0.062 | 2.37 | 0.0552 | 0.0131 | 25.2 | 0.033 | 0.29 | -0.017 | 4.52 | 0.0678 | 0.0073 | 0.101 |
| USGS T117 | 2/6/96 | 0.08 | -0.005 | 25.2 | 0.003 | 0.0008 | 0.0541 | 0.0051 | 0.529 | 11.2 | 0.2596 | 0.0088 | 23.7 | 0.007 | 0.53 | -0.045 | 6.69 | 0.2847 | 0.0077 | 0.222 |
| USGS T117 | 2/6/96 | 0.094 | -0.002 | 25.1 | 0.003 | 0.0019 | 0.0561 | 0.0051 | 0.53 | 11.1 | 0.2584 | 0.0082 | 23.5 | 0.006 | 0.53 | -0.04 | 6.66 | 0.2831 | 0.0077 | 0.2204 |
| FLUSHING HCL | 2/6/96 | 0.06 | 0.002 | 0.055 | 4E-04 | -0.002 | 0.0182 | -0.002 | 0.038 | 0.1 | 0.0012 | -0.002 | 0.023 | -0.003 | 0.23 | -0.05 | 0.075 | 0.0008 | 0.0018 | 0.2665 |
| 50%(EST.)HCL | 2/6/96 | 0.03 | -0.01 | 0.077 | 5E-04 | -0.002 | 0.0088 | -7E-04 | 0.01 | 0.022 | 0.0007 | -0.004 | -0.004 | -0.005 | 0.19 | -0.051 | 0.024 | 0.0001 | -0.0018 | 0.0039 |
| BLANK-STD1 | 2/6/96 | 0.009 | -0.01 | 0.025 | 5E-04 | -0.002 | 0.0242 | -7E-04 | 0.001 | 0.026 | 0.0002 | -0.003 | 0.061 | -0.007 | 0.25 | -0.058 | 0 | 0.0011 | 0.0029 | 0.0039 |
| 8-IB-2 16-21.5cm | 2/6/96 | 3.61 | -0.007 | 1.82 | 0.002 | -8E-04 | 0.0123 | 0.6719 | 0.656 | 0.6 | 0.6392 | -0.003 | 0.787 | 0.006 | 0.33 | -0.029 | 1.21 | 0.0109 | 0.0246 | 0.9586 |
| 8-IB-2 22-32cm | 2/6/96 | 4.73 | 0.007 | 2.07 | 0.002 | -2E-04 | 0.0076 | 0.3953 | 0.467 | 0.573 | 0.3993 | -0.002 | 0.732 | 0.008 | 0.24 | -0.047 | 1.45 | 0.0118 | 0.0294 | 0.7007 |
| 8-IB-2 32-42cm | 2/6/96 | 6.22 | 0.002 | 2.19 | 0.002 | -0.001 | 0.0151 | 0.5772 | 1.3 | 0.696 | 0.3741 | 0.0011 | 0.786 | 0.004 | 0.34 | -0.011 | 1.56 | 0.0144 | 0.0296 | 0.6686 |
| 8-IB-3 0-8cm | 2/6/96 | 5.99 | 0.038 | 2.2 | 0.006 | -0.001 | 0.0208 | 1.589 | 3.83 | 1.31 | 1.462 | 0.0016 | 1.64 | 0.01 | 0.75 | 0.033 | 2.04 | 0.0152 | 0.0312 | 2.478 |
| 8-IB-3 8-11cm | 2/6/96 | 4.24 | 0.052 | 1.97 | 0.007 | 0.0011 | 0.0159 | 1.33 | 6.7 | 1.5 | 1.644 | 0.0059 | 2.12 | 0.011 | 0.58 | 0.072 | 1.72 | 0.0129 | 0.0231 | 2.808 |
| 8-IB-3 11-21cm | 2/6/96 | 4.03 | -0.006 | 2.02 | 0.014 | 0.0011 | 0.0225 | 1.174 | 1.05 | 1.88 | 2.017 | -1E-04 | 2.45 | 0.011 | 0.48 | -0.006 | 1.18 | 0.0119 | 0.0206 | 3.233 |
| 8-IB-3 21-31cm | 2/6/96 | 3.72 | 0.009 | 1.52 | 0.007 | -8E-04 | 0.0217 | 1.022 | 0.95 | 1.19 | 1.238 | -0.001 | 1.78 | 0.008 | 0.41 | -0.021 | 1.16 | 0.01 | 0.0195 | 1.93 |
| 8-IB-3 21-31cm DUP | 2/6/96 | 3.65 | -0.001 | 1.44 | 0.005 | -8E-04 | 0.0195 | 1.015 | 0.939 | 1.18 | 1.221 | 0.0003 | 1.78 | 0.008 | 0.38 | -0.023 | 1.11 | 0.0095 | 0.0184 | 1.906 |
| 8-IB-3 11-21cm DUP | 2/6/96 | 51 | -0.001 | 2.32 | 0.009 | -0.001 | 0.0209 | 1.179 | 1.24 | 2.98 | 2.024 | -0.002 | 2.53 | 0.012 | 0.5 | 0.034 | 3.54 | 0.0136 | 0.0745 | 3.203 |
| 8-IB-3 31-41cm | 2/6/96 | 5.03 | 0.007 | 1.45 | 0.006 | -0.002 | 0.0173 | 0.7979 | 0.986 | 1.02 | 0.9862 | -0.001 | 1.07 | 0.006 | 0.43 | 0.001 | 1.2 | 0.0095 | 0.0217 | 1.552 |
| 8-IB-3 31-41cm DUP | 2/6/96 | 4.85 | -0.009 | 1.49 | 0.007 | -8E-04 | 0.018 | 0.7957 | 0.981 | 0.994 | 0.9759 | -0.003 | 1.09 | 0.009 | 0.45 | -0.002 | 1.22 | 0.0097 | 0.0217 | 1.537 |
| 8-IIB-2 0-7cm | 2/6/96 | 5.23 | 0.036 | 2.34 | 0.002 | -0.002 | 0.0138 | 1.041 | 3.09 | 0.428 | 0.348 | 0.0022 | 0.312 | -0.001 | 0.88 | 0.047 | 1.98 | 0.0177 | 0.0354 | 0.9546 |
| 8-IIB-2 7-12cm | 2/6/96 | 3.49 | 0.058 | 2.16 | 0.003 | -8E-04 | 0.0627 | 1.101 | 4.17 | 0.373 | 0.3653 | 0.0063 | 0.354 | 0.137 | 0.93 | 0.07 | 1.77 | 0.0172 | 0.0327 | 0.9012 |
| BLANK-STD1 | 2/6/96 | 0.013 | -0.015 | 0.028 | -1E-04 | -0.001 | 0.0241 | -0.003 | 0.003 | 0.02 | 0.0005 | -0.004 | 0.074 | -0.006 | 0.26 | -0.049 | -0.002 | 0.0012 | 0.0029 | 0.0049 |
| 8-IIB-2 12-19.5cm | 2/6/96 | 4.16 | 0.037 | 2.4 | 0.001 | -0.001 | 0.1533 | 0.7743 | 4.22 | 0.398 | 0.2685 | 0.0055 | 0.494 | 0.273 | 0.74 | 0.042 | 1.95 | 0.0164 | 0.036 | 0.7093 |
| 8-IIB-2 20-30cm | 2/6/96 | 4.62 | 0.017 | 2.01 | 0.001 | -4E-04 | 0.2281 | 0.4255 | 3.13 | 0.365 | 0.185 | 0.0044 | 0.441 | 0.271 | 0.56 | 0.015 | 1.68 | 0.0129 | 0.0292 | 0.4571 |
| 8-IIB-2 20-30cm DU | 2/6/96 | 3.87 | 0.019 | 2 | 0.002 | 0 | 0.2244 | 0.4265 | 3.13 | 0.352 | 0.184 | 0.0058 | 0.441 | 0.268 | 0.51 | 0.01 | 1.61 | 0.0128 | 0.0279 | 0.4567 |
| 8-IIB-2 30-40.5cm | 2/6/96 | 4.73 | -0.013 | 2.04 | 1E-04 | -0.003 | 0.0135 | 0.1848 | 0.63 | 0.328 | 0.067 | -0.002 | 0.378 | 0.001 | 0.32 | -0.021 | 1.6 | 0.0122 | 0.0263 | 0.2521 |
| USGS T107 | 2/6/96 | 0.243 | 0.001 | 14.7 | 0.021 | 0.0119 | 0.0769 | 0.0327 | 0.061 | 2.41 | 0.0579 | 0.0153 | 25.9 | 0.034 | 0.42 | 0.008 | 4.69 | 0.0696 | 0.0099 | 0.1059 |
| USGS T117 | 2/6/96 | 0.094 | 0.005 | 25.4 | 0.003 | 0.0036 | 0.0664 | 0.0033 | 0.531 | 11.1 | 0.2626 | 0.0104 | 23.8 | 0.004 | 0.57 | -0.044 | 6.76 | 0.2837 | 0.0092 | 0.2265 |
| 8-IIA-1 0-10.5cm | 2/6/96 | 3.31 | 0.05 | 1.86 | 0.003 | -0.003 | 0.0159 | 0.8375 | 2.08 | 0.319 | 0.2589 | 0.0004 | 0.299 | 0.017 | 0.6 | 0.062 | 1.49 | 0.0137 | 0.0275 | 0.7167 |
| 8-IIA-1 10.5-15.5cm | 2/6/96 | 2.85 | 0.037 | 1.65 | 0.001 | -0.003 | 0.0192 | 0.5834 | 1.85 | 0.287 | 0.1766 | -0.002 | 0.3 | -0.007 | 0.59 | 0.095 | 1.31 | 0.0136 | 0.0261 | 0.4248 |
| 8-IIA-1 15.5-22cm | 2/6/96 | 3.29 | 0.033 | 1.87 | 6E-04 | -0.002 | 0.012 | 0.6222 | 1.26 | 0.306 | 0.1224 | -6E-04 | 0.393 | 0.001 | 0.48 | 0.083 | 1.41 | 0.0144 | 0.0297 | 0.3585 |
| 8-IIA-1 22.5-33cm | 2/6/96 | 3.83 | 0.025 | 1.83 | 0.002 | -0.003 | 0.0123 | 0.5957 | 1.1 | 0.315 | 0.1232 | 0.0011 | 0.353 | -0.005 | 0.5 | 0.117 | 1.41 | 0.0149 | 0.0327 | 0.8926 |
| 8-IIA-1 33-42cm | 2/6/96 | 2.72 | 0.031 | 1.61 | 0.001 | -0.002 | 0.0152 | 0.224 | 0.686 | 0.251 | 0.0818 | -0.003 | 0.345 | -0.007 | 0.46 | 0.016 | 1.05 | 0.0111 | 0.0209 | 0.4334 |
| BLANK-STD1 | 2/6/96 | 0.009 | -0.003 | 0.025 | 5E-04 | -0.004 | 0.0261 | -0.003 | 0.001 | 0.015 | -0.0002 | -0.003 | 0.071 | -0.004 | 0.29 | -0.045 | -0.007 | 0.0012 | 0.0033 | 0.0037 |
| 8-IIA-2 0-10.5cm | 2/6/96 | 3.57 | 0.052 | 2.42 | 0.003 | -0.002 | 0.0181 | 0.9467 | 3.31 | 0.431 | 0.3633 | 0.0022 | 0.314 | 0.006 | 0.99 | 0.058 | 1.89 | 0.0179 | 0.0338 | 0.8218 |
| 8-IIA-2 11-13.5cm | 2/6/96 | 3.22 | 0.015 | 1.97 | 8E-04 | -0.003 | 0.0209 | 0.469 | 1.97 | 0.365 | 0.1559 | -4E-04 | 0.305 | 0.002 | 0.68 | 0.02 | 1.46 | 0.0134 | 0.0275 | 0.5081 |
| 8-IIA-2 13.5-21.5cm | 2/6/96 | 5.29 | -0.001 | 1.98 | 5E-04 | -0.003 | 0.0162 | 0.3489 | 1.48 | 0.676 | 0.1271 | -0.004 | 0.344 | 0.006 | 0.53 | -0.007 | 1.78 | 0.0129 | 0.0301 | 0.3773 |
| 8-IIA-2 13.5-21.5(2) | 2/6/96 | 3.99 | 0.011 | 2.01 | 6E-04 | -0.003 | 0.015 | 0.3804 | 1.59 | 0.313 | 0.1328 | -1E-04 | 0.318 | 0.009 | 0.58 | 0.001 | 1.56 | 0.0132 | 0.0297 | 0.4179 |
| 8-IIA-2 22-32cm | 2/6/96 | 4.03 | 0.003 | 1.82 | 7E-04 | -0.002 | 0.0188 | 0.171 | 0.736 | 0.311 | 0.0727 | -0.002 | 0.36 | 0.005 | 0.42 | -0.02 | 1.36 | 0.0111 | 0.0239 | 0.221 |
| 8-IIA-2 22-32cm DU | 2/6/96 | 4.32 | -0.005 | 1.88 | 5E-04 | -0.003 | 0.0169 | 0.1721 | 0.739 | 0.313 | 0.0724 | -0.002 | 0.361 | 0.006 | 0.43 | -0.025 | 1.41 | 0.0114 | 0.024 | 0.2214 |
| 8-IIA-2 22-32cm (2) | 2/6/96 | 5.29 | -0.006 | 2.16 | -2E-04 | -0.003 | 0.0136 | 0.1666 | 0.749 | 0.344 | 0.0746 | -0.002 | 0.404 | 0.007 | 0.39 | -0.028 | 1.65 | 0.0127 | 0.0272 | 0.2107 |
| 8-IIA-2 32-42cm | 2/6/96 | 4.27 | 0.017 | 1.86 | -1E-04 | -0.002 | 0.0181 | 0.1521 | 0.865 | 0.278 | 0.0675 | 0.004 | 0.318 | 0.008 | 0.39 | -0.028 | 1.48 | 0.0113 | 0.0253 | 0.1905 |
| BLANK-STD1 | 2/6/96 | 0.022 | -0.015 | 0.028 | 1E-04 | -0.003 | 0.0304 | -0.001 | 0.002 | 0.037 | 0.0007 | -0.002 | 0.078 | -0.006 | 0.33 | -0.036 | -0.003 | 0.0013 | 0.0039 | 0.0057 |
| 8-STR.BLANK Y DU | 2/6/96 | 0.025 | -0.006 | 0.061 | 0 | -0.004 | 0.0066 | -0.003 | 0.006 | 0.026 | 0.001 | -0.005 | 0.004 | -0.007 | 0.25 | -0.056 | 0.017 | 0.0001 | -0.002 | 0.0031 |
| 8-STR.BLANK Z | 2/6/96 | 0.027 | 0.001 | 0.063 | -2E-04 | -0.002 | 0.0128 | -0.001 | 0.01 | 0.024 | 0.001 | -0.005 | 0.025 | -0.004 | 0.29 | -0.046 | 0.019 | 0.0003 | -0.0009 | 0.0047 |
| 8-STR.BLANK B | 2/6/96 | 0.023 | -0.015 | 0.073 | 3E-04 | -0.002 | 0.0291 | -0.003 | 0.103 | 0.037 | 0.0017 | -0.006 | 0.032 | 0.016 | 0.3 | -0.049 | 0.031 | 0.0004 | -0.0004 | 0.0065 |
| 8-BEADBLANK6 DI | 2/6/96 | 16.8 | 0.009 | 2.96 | -5E-04 | -0.002 | 0.0154 | -0.002 | 0.118 | 0.636 | 0.0323 | -0.004 | 0.503 | -0.004 | 0.28 | -0.044 | 2.91 | 0.0155 | 0.043 | 0.0086 |
| 8-BEADBLANK7 DI | 2/6/96 | 16.3 | 0.005 | 2.07 | -5E-04 | -0.003 | 0.0211 | -0.002 | 0.153 | 0.504 | 0.0239 | -0.006 | 0.371 | 0.009 | 0.27 | -0.049 | 2.25 | 0.0107 | 0.0301 | 0.0083 |
| 8-BEADBLANK4 | 2/6/96 | 16.8 | -0.004 | 2.15 | -0.001 | -0.002 | 0.0214 | -0.002 | 0.139 | 0.598 | 0.0259 | -0.005 | 0.383 | 0.004 | 0.31 | -0.043 | 2.54 | 0.0111 | 0.033 | 0.0076 |
| USGS T107 | 2/6/96 | 0.262 | 0.01 | 14.3 | 0.02 | 0.0119 | 0.0659 | 0.0312 | 0.062 | 2.36 | 0.0564 | 0.0144 | 25.6 | 0.037 | 0.43 | -0.015 | 4.59 | 0.068 | 0.0088 | 0.1035 |
| USGS T117 | 2/6/96 | 0.098 | -0.008 | 25.3 | 0.003 | 0.0023 | 0.0657 | 0.0047 | 0.528 | 11 | 0.2611 | 0.0113 | 23.7 | 0.008 | 0.7 | -0.042 | 6.71 | 0.2818 | 0.0092 | 0.2263 |
| USGS T117 | 2/6/96 | 0.095 | 0.009 | 24.1 | 0.003 | 0.0002 | 0.054 | 0.0025 | 0.506 | 10.5 | 0.2505 | 0.0088 | 22.9 | 0.005 | 0.63 | -0.055 | 6.42 | 0.2715 | 0.0073 | 0.2153 |
| USGS T107 | 2/6/96 | 0.253 | -0.014 | 13.3 | 0.018 | 0.0088 | 0.0557 | 0.0305 | 0.058 | 2.17 | 0.0539 | 0.0139 | 23.8 | 0.029 | 0.37 | -0.033 | 4.25 | 0.0639 | 0.0066 | 0.0966 |
| BLANK | 2/6/96 | 0.039 | -0.006 | 0.018 | 9E-04 | -0.002 | 0.023 | -0.001 | 0.002 | 0.035 | 0.0005 | -0.003 | 0.047 | 0.01 | 0.36 | -0.05 | 0.001 | 0.0009 | 0.002 | 0.0051 |

# Appendix

**ICAPES data of bead digest analysis of 2/15/96**

| Sample Name | Analysis Date | Analysis Time | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mu | Na | Ni | P | Pb | Si | Sr | Tl | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STD1-Blank | 2/15/96 | 9:51 | 0.066 | -0.01 | 0.002 | 0.001 | 0.002 | 0.189 | 0.001 | 9E-05 | -2E-04 | 7E-04 | -3E-04 | 0.052 | 0.0052 | 0.083 | 0.045 | 0.003 | 0.015 | 0.015 | 0.00185 |
| STD3 | 2/15/96 | 9:55 | 2.088 | | | | | | | 1.557 | | | 1.655 | 11.04 | 1.7486 | | | | | 2.861 | |
| STD4 | 2/15/96 | 9:58 | | 0.975 | | | | 8.133 | | | | | | | | 0.664 | | 11.89 | | | |
| STD2 | 2/15/96 | 10:01 | | | 18.77 | 2.05 | 2.585 | | 1.493 | | 4.0214 | 2.044 | | | | | 7.285 | | 19.26 | | 2.25 |
| STD8 | 2/15/96 | 10:04 | | | | | | | | | | | | | | | | | | | |
| STD 1 | 2/15/96 | 10:06 | 0.014 | -0.01 | 0.006 | 0.002 | 0.003 | 0.006 | 0.002 | 0.001 | 0.011 | 9E-04 | 6E-04 | 0.002 | 0.007 | 0.11 | 0.014 | 0.01 | 7E-04 | -2E-04 | 0.0015 |
| USGS T107 | 2/15/96 | 10:09 | 0.254 | 0.037 | 12.9 | 0.018 | 0.013 | 0.033 | 0.032 | 0.056 | 2.26 | 0.052 | 0.016 | 23 | 0.038 | 0.15 | 0.038 | 4.23 | 0.063 | 0.002 | 0.0898 |
| USGS T117 | 2/15/96 | 10:12 | 0.102 | 0.025 | 23.1 | 0.004 | 0.007 | 0.03 | 0.006 | 0.507 | 11 | 0.239 | 0.013 | 21.9 | 0.015 | 0.35 | 0.008 | 6.33 | 0.272 | 0.003 | 0.2001 |
| 8-STR.BLANKL | 2/15/96 | 10:16 | 0.023 | 0.017 | 0.024 | 8E-04 | 0.001 | 0.006 | 6E-04 | 0.004 | 0.013 | 9E-04 | 0.002 | -0.02 | 0.008 | 0.14 | 0.009 | 0.052 | -0 | -0.002 | 0.0013 |
| 8-STR.BLANKM | 2/15/96 | 10:19 | 0.021 | -0 | 0.016 | 0.001 | 0.002 | 0.015 | -3E-04 | 0.002 | 0.018 | 9E-04 | 0.003 | -0.03 | 0.006 | 0.17 | 0.021 | 0.044 | 0 | -8E-04 | 0.0004 |
| 8-STR.BLANKN | 2/15/96 | 10:22 | 0.018 | 0.006 | 0.006 | 0.002 | 0.003 | 0.013 | -6E-04 | 0.003 | 0.002 | 9E-04 | 0.001 | -0.02 | 0.001 | 0.15 | 0.023 | 0.038 | -0 | -0.001 | 0.0023 |
| 9-BEADBLANK8 | 2/15/96 | 10:25 | 1.06 | -0 | 0.242 | 7E-04 | 4E-04 | 0.011 | 0 | 0.01 | 0.05 | 0.003 | 0.001 | 0.024 | 0.008 | 0.14 | 0.006 | 0.478 | 0.001 | 0.002 | 0.0002 |
| 8-BEADBLANK9 | 2/15/96 | 10:27 | 1.06 | -0 | 0.282 | 3E-04 | 9E-04 | 0.016 | -6E-04 | 0.01 | 0.06 | 0.004 | 0 | 0.038 | 0.006 | 0.16 | 0.011 | 0.596 | 0.001 | 0.003 | 0.0014 |
| 8-BEADBLANK10 | 2/15/96 | 10:30 | 4.94 | -0 | 0.778 | 0.001 | 0.001 | 0.017 | -6E-04 | 0.027 | 0.246 | 0.011 | 0.001 | 0.117 | 0.002 | 0.16 | 0.008 | 0.929 | 0.004 | 0.016 | 0.0024 |
| 8-IIC-3 8.5-10cm | 2/15/96 | 10:35 | 0.937 | 0.018 | 0.527 | 6E-04 | 0.001 | 0.016 | 0.218 | 0.729 | 0.095 | 0.082 | 8E-04 | 0.084 | 0.007 | 0.28 | 0.05 | 0.457 | 0.004 | 0.006 | 0.2064 |
| 8-IIC-3 0-8.5cm | 2/15/96 | 10:38 | 22.2 | 0.083 | 2.59 | 0.007 | 0.002 | 0.024 | 1.621 | 5 | 1.13 | 0.614 | 0.008 | 0.317 | 0.003 | 1 | 0.198 | 5.47 | 0.023 | 0.072 | 1.875 |
| 8-IIC-3 20-30cm | 2/15/96 | 10:41 | 0.934 | 0.063 | 0.525 | 0.002 | 0.003 | 0.015 | 0.113 | 1.43 | 0.087 | 0.037 | 0.002 | 0.074 | 0.006 | 0.36 | 0.028 | 0.446 | 0.004 | 0.006 | 0.1625 |
| 8-IIC-3 30-34cm | 2/15/96 | 10:44 | 1.09 | 0.029 | 0.691 | 0.002 | 4E-04 | 0.015 | 0.083 | 2.08 | 0.103 | 0.04 | 0.002 | 0.088 | 0.004 | 0.69 | 0.05 | 0.529 | 0.007 | 0.007 | 0.2901 |
| 8-IIIA-3 15-21.5cm | 2/15/96 | 10:47 | 3.57 | 0.015 | 1.07 | 0.003 | 0.002 | 0.027 | 0.33 | 0.944 | 0.236 | 0.042 | 6E-04 | 0.282 | 0.005 | 0.45 | 0.069 | 0.833 | 0.009 | 0.02 | 0.9985 |
| STD.1-BLANK | 2/15/96 | 10:50 | 0.025 | -0.01 | 0.001 | 0.001 | 4E-04 | 0.021 | 6E-04 | 0 | 0.002 | 7E-04 | -6E-04 | 0.028 | 0.002 | 0.23 | 0.011 | 0.01 | 7E-04 | 0.002 | 0.0023 |
| 8-IIC-3 30-34cm DUP | 2/15/96 | 10:52 | 2.28 | 0.023 | 0.739 | 0.001 | 9E-04 | 0.012 | 0.082 | 2.04 | 0.132 | 0.04 | 0.005 | 0.09 | 0.002 | 0.69 | 0.063 | 0.62 | 0.007 | 0.008 | 0.2797 |
| 8-IIC-3 30-34cm DUP | 2/15/96 | 10:54 | 2.13 | 0.026 | 0.757 | 0.002 | 0.002 | 0.017 | 0.082 | 2.08 | 0.122 | 0.04 | 0.001 | 0.095 | 0.005 | 0.75 | 0.068 | 0.63 | 0.007 | 0.009 | 0.289 |
| USGS T107 | 2/15/96 | 10:57 | 0.276 | 0.019 | 151 | 0.021 | 0.016 | 0.059 | 0.083 | 0.067 | 2.52 | 0.059 | 0.018 | 249 | 0.043 | 0.31 | 0.04 | 4.89 | 0.07 | 0.007 | 0.1076 |
| USGS T107 | 2/15/96 | 10:59 | 0.276 | 0.003 | 142 | 0.021 | 0.017 | 0.05 | 0.033 | 0.062 | 2.41 | 0.056 | 0.019 | 243 | 0.045 | 0.29 | 0.049 | 4.62 | 0.067 | 0.005 | 0.1006 |
| 8-STR.BLANKL DUP | 2/15/96 | 11:02 | 0.003 | -0.01 | 0.014 | 8E-04 | 8E-04 | 0.013 | -6E-04 | 0.002 | 0.009 | 2E-04 | 0.002 | -0.03 | 0.005 | 0.22 | 0.008 | 0.03 | -0 | -0.001 | 0.0015 |
| USGS T107 | 2/15/96 | 11:05 | 0.276 | 0.023 | 147 | 0.021 | 0.015 | 0.055 | 0.033 | 0.065 | 2.46 | 0.058 | 0.017 | 247 | 0.041 | 0.28 | 0.034 | 4.75 | 0.069 | 0.006 | 0.104 |
| USGS T117 | 2/15/96 | 11:10 | 0.124 | 0.005 | 251 | 0.005 | 0.007 | 0.045 | 0.007 | 0.543 | 11.4 | 0.259 | 0.015 | 23.4 | 0.016 | 0.56 | 0.028 | 6.78 | 0.286 | 0.005 | 0.2179 |
| 8-IIC-3 30-34cm DUP | 2/15/96 | 11:16 | 6.65 | 0.011 | 0.923 | 0.003 | 0.001 | 0.009 | 0.084 | 2.08 | 0.266 | 0.044 | 0.003 | 0.111 | 0.005 | 0.73 | 0.045 | 1.02 | 0.008 | 0.014 | 0.2801 |
| 8-IIC-3 20-30cm DUP | 2/15/96 | 11:19 | 2.17 | 0.05 | 0.607 | 0.003 | 6E-04 | 0.014 | 0.115 | 1.44 | 0.118 | 0.039 | 0.001 | 0.091 | 0.001 | 0.44 | 0.048 | 0.562 | 0.005 | 0.007 | 0.1624 |
| Std 1 blank | 2/15/96 | 11:39 | 0.144 | -0.03 | 0.005 | 0.005 | 0.007 | 0.067 | 0.003 | 0.053 | 0.017 | 0.003 | 0.002 | 0.094 | 0.017 | 0.53 | 0.037 | 0.238 | 0.002 | 0.012 | 0.0106 |
| COMP 1-4 | 2/15/96 | 11:44 | 2.73 | 2.99 | 31.6 | 3.06 | 3.058 | 3.001 | 2.667 | 2.96 | 27.1 | 2.983 | 2.97 | 25.6 | 2.99 | 3.6 | 3.09 | 29.3 | 2.607 | 2.796 | 3.138 |
| COMP 1-4 | 2/15/96 | 12:10 | 2.68 | 2.96 | 31 | 3.012 | 3 | 2.949 | 2.658 | 2.92 | 26.6 | 2.942 | 2.932 | 25.6 | 2.98 | 3.7 | 2.98 | 28.9 | 2.596 | 2.762 | 3.09 |
| COMP 1-4 | 2/15/96 | 12:21 | 2.68 | 2.99 | 31.4 | 3.039 | 3.027 | 2.978 | 2.646 | 2.92 | 26.6 | 2.962 | 2.956 | 25.2 | 3.02 | 3.7 | 3.02 | 29 | 2.584 | 2.761 | 3.12 |
| COMP 1-4 | 2/15/96 | 12:35 | 2.67 | 2.97 | 31.2 | 3.018 | 3.01 | 2.96 | 2.647 | 2.9 | 26.4 | 2.947 | 2.939 | 25.7 | 3.01 | 3.7 | 3.01 | 28.8 | 2.584 | 2.747 | 3.097 |
| COMP 1-4 | 2/15/96 | 12:41 | 2.69 | 2.99 | 31.2 | 3.017 | 3.004 | 2.955 | 2.661 | 2.91 | 26.5 | 2.947 | 2.932 | 25.9 | 3.01 | 3.7 | 2.99 | 28.8 | 2.595 | 2.751 | 3.093 |
| COMP 1-4 | 2/15/96 | 12:48 | 2.66 | 2.97 | 31.2 | 3.016 | 3.002 | 2.95 | 2.632 | 2.9 | 26.3 | 2.938 | 2.938 | 25.5 | 3.01 | 3.6 | 2.98 | 28.6 | 2.568 | 2.731 | 3.091 |
| COMP 1-4 | 2/15/96 | 13:00 | 2.66 | 3.02 | 31 | 3.004 | 2.987 | 2.938 | 2.637 | 2.88 | 26.2 | 2.93 | 2.921 | 25.5 | 3.02 | 3.7 | 2.97 | 28.6 | 2.571 | 2.725 | 3.081 |
| COMP 1-4 | 2/15/96 | 13:08 | 2.65 | 2.98 | 31 | 2.999 | 2.978 | 2.93 | 2.646 | 2.88 | 26.2 | 2.926 | 2.919 | 25.8 | 3 | 3.7 | 2.95 | 28.6 | 2.58 | 2.727 | 3.072 |
| COMP 1-4 | 2/15/96 | 13:19 | 2.64 | 2.98 | 31.3 | 3.026 | 3.002 | 2.954 | 2.631 | 2.89 | 26.1 | 2.945 | 2.946 | 25.5 | 3.04 | 3.8 | 2.94 | 28.6 | 2.567 | 2.722 | 3.096 |
| COMP 1-4 | 2/15/96 | 13:27 | 2.64 | 2.99 | 31 | 3.008 | 2.978 | 2.936 | 2.622 | 2.87 | 25.9 | 2.925 | 2.926 | 25.5 | 3.02 | 3.8 | 2.95 | 28.4 | 2.557 | 2.706 | 3.077 |
| STD1-Blank | 2/15/96 | 13:44 | 0.091 | -0.01 | 0.003 | 0.002 | 0.004 | 0.244 | 0.002 | 0.005 | 0.0005 | 0.001 | -2E-04 | 0.062 | 0.0089 | 0.115 | 0.087 | 0.021 | 0.019 | 0.018 | 0.00342 |
| STD3 | 2/15/96 | 13:47 | 2.143 | | | | | | | 1.741 | | | 1.928 | 10.55 | 1.9563 | | | | | 3.053 | |
| STD4 | 2/15/96 | 13:50 | | 1.179 | | | | 9.455 | | | | | | | | 0.813 | | 13.02 | | | |
| STD2 | 2/15/96 | 13:53 | | | 22.57 | 2.321 | 2.936 | | 1.52 | | 4.2017 | 2.307 | | | | | 8.451 | | 19.86 | | 2.6519 |
| STD.1-BLANK | 2/15/96 | 13:58 | -0.01 | -0.02 | 0.001 | 9E-04 | | | 0.001 | -0.001 | 0.001 | -2E-04 | 5E-04 | -0 | -0.003 | | -0.01 | 0.02 | 5E-04 | -9E-04 | 0.0013 |
| STD.1-BLANK | 2/15/96 | 14:00 | -0 | 0 | 0 | 6E-04 | | | 0 | -0.001 | -0.009 | -6E-04 | 7E-04 | 0.017 | -0.003 | | -0.01 | 0.015 | 3E-04 | -6E-04 | 0 |
| COMP1-4 | 2/15/96 | 14:03 | 2.54 | 2.55 | 26.3 | 2.66 | | | 2.591 | 2.6 | 25.6 | 2.604 | 2.599 | 25.9 | 2.61 | | 2.63 | 26.1 | 2.501 | 2.574 | 2.67 |
| STD.1-BLANK | 2/15/96 | 14:07 | -0.01 | -0.01 | 0.001 | 3E-04 | | | -6E-04 | 0 | 0.001 | 0 | 0.004 | 0.014 | -0.004 | | -0 | 0.014 | 3E-04 | -6E-04 | 0.0004 |
| 8-IIC-3 8.5-10cm | 2/15/96 | 14:09 | 1.28 | 0.012 | 0.699 | 7E-04 | | | 0.21 | 0.72 | 0.094 | 0.078 | 0.005 | 0.123 | -0.001 | | 0.024 | 0.517 | 0.004 | 0.006 | 0.1926 |
| 8-IIIA-2 14.5-32cm | 2/15/96 | 14:13 | 1.29 | 0.009 | 0.633 | 0.001 | | | 0.043 | 0.465 | 0.139 | 0.017 | 0.001 | 0.175 | -0.001 | | -0.01 | 0.42 | 0.004 | 0.005 | 0.0946 |
| 8-IIC-3 20-30cm | 2/15/96 | 14:16 | 3.62 | 0.035 | 1.02 | 8E-04 | | | 0.113 | 1.44 | 0.139 | 0.041 | 0.006 | 0.133 | -0.004 | | 0.02 | 0.912 | 0.006 | 0.01 | 0.1339 |
| 8-IIIA-3 22-31.5cm | 2/15/96 | 14:19 | 4.17 | 0.004 | 1.66 | 0.001 | | | 0.228 | 0.392 | 0.254 | 0.044 | 0.002 | 0.322 | 0 | | 0.059 | 1.27 | 0.011 | 0.022 | 0.6126 |
| COMP1-4 | 2/15/96 | 14:23 | 2.58 | 2.61 | 26.9 | 2.745 | | | 2.633 | 2.64 | 26.1 | 2.653 | 2.647 | 26.7 | 2.69 | | 2.67 | 26.7 | 2.583 | 2.612 | 2.738 |
| COMP1-4 | 2/15/96 | 14:27 | 2.57 | 2.6 | 26.9 | 2.733 | | | 2.624 | 2.64 | 25.9 | 2.632 | 2.649 | 26.6 | 2.69 | | 2.67 | 26.6 | 2.524 | 2.606 | 2.731 |
| 8-IIIA-3 31.5-42cm | 2/15/96 | 14:30 | 3.35 | 0.015 | 1.36 | -0 | | | 0.177 | 0.366 | 0.185 | 0.026 | 5E-04 | 0.214 | -0.007 | | 0.087 | 1.13 | 0.009 | 0.015 | 0.2954 |
| 8-IIIA-2 32-42cm | 2/15/96 | 14:33 | 0.904 | -0 | 0.479 | 4E-04 | | | 0.027 | 0.207 | 0.142 | 0.015 | 0.001 | 0.208 | -0.001 | | -0 | 0.342 | 0.003 | 0.004 | 0.0726 |
| 8-IIIA-2 14.5-32cm | 2/15/96 | 14:37 | 2.26 | 0.007 | 0.765 | -0 | | | 0.044 | 0.482 | 0.158 | 0.019 | 0.002 | 0.221 | 0.001 | | -0 | 0.575 | 0.005 | 0.008 | 0.0969 |
| 8-IIIA-2 0-9.5cm | 2/15/96 | 14:42 | 1.47 | 0.027 | 1.05 | 0.002 | | | 0.632 | 2.54 | 0.18 | 0.15 | 0.005 | 0.187 | -0.003 | | 0.053 | 0.91 | 0.009 | 0.014 | 0.5502 |
| 8-IIC-3 10-20cm | 2/15/96 | 14:44 | 3.51 | 1.35 | 2.9 | 0.016 | | | 1.054 | 41.3 | 0.24 | 0.263 | 0.059 | 0.244 | -0.002 | | 0.113 | 4.16 | 0.028 | 0.02 | 1.389 |
| 8-IIC-3 10-20(2) | 2/15/96 | 14:48 | 1.3 | 0.881 | 1.48 | 0.009 | | | 0.541 | 24.4 | 0.108 | 0.145 | 0.037 | 0.09 | -0.004 | | 0.035 | 2.18 | 0.015 | 0.006 | 0.7654 |
| 8-IIC-3 10-20(2) | 2/15/96 | 14:49 | 1.4 | 0.87 | 1.48 | 0.01 | | | 0.537 | 24.3 | 0.108 | 0.145 | 0.036 | 0.096 | 0 | | 0.04 | 2.18 | 0.015 | 0.006 | 0.7584 |
| 8-IIC-3 34-41cm | 2/15/96 | 14:52 | 1.27 | 0.32 | 2.63 | 0.007 | | | 0.176 | 20.9 | 0.159 | 0.193 | 0.031 | 0.089 | -0.001 | | 0.083 | 0.978 | 0.041 | 0.006 | 1.454 |
| 8-IIC-3 34-41cm (2) | 2/15/96 | 14:55 | 1.4 | 0.291 | 2.61 | 0.006 | | | 0.16 | 20.2 | 0.151 | 0.187 | 0.03 | 0.097 | -0.005 | | 0.083 | 1.02 | 0.04 | 0.006 | 1.401 |
| COMP1-4 | 2/15/96 | 14:59 | 2.61 | 2.69 | 27.8 | 2.897 | | | 2.676 | 2.72 | 26.6 | 2.73 | 2.738 | 27 | 2.78 | | 2.76 | 27.8 | 2.558 | 2.657 | 2.859 |
| COMP1-4 | 2/15/96 | 15:01 | 2.61 | 2.74 | 27.9 | 2.876 | | | 2.677 | 2.73 | 26.5 | 2.734 | 2.744 | 27 | 2.79 | | 2.76 | 27.5 | 2.567 | 2.663 | 2.849 |
| 8-IIIA-2 9.5-14.5cm | 2/15/96 | 15:04 | 1.3 | 0.059 | 0.97 | 0.004 | | | 0.367 | 19.3 | 0.164 | 0.059 | 0.03 | 0.166 | 0 | | 0.038 | 2.4 | 0.011 | 0.009 | 0.5728 |
| 8-IIIA-3 11-15cm | 2/15/96 | 15:07 | 2.42 | 0.143 | 1.55 | 0.004 | | | 0.953 | 11.9 | 0.171 | 0.08 | 0.017 | 0.206 | -0.002 | | 0.109 | 1.73 | 0.017 | 0.014 | 0.8522 |
| 8-IIIC-2 10-21cm | 2/15/96 | 15:10 | 4.07 | 0.163 | 3.23 | 0.009 | | | 2.874 | 13.3 | 0.57 | 0.459 | 0.018 | 0.262 | 0 | | 0.236 | 3.23 | 0.029 | 0.065 | 2.017 |
| STD1-Blank | 2/15/96 | 15:16 | 0.091 | -0.01 | 0.002 | 0.002 | 0.003 | 0.249 | 0.002 | 0.005 | 0 | 0.001 | -2E-04 | 0.064 | 0.0088 | 0.123 | 0.07 | 0.022 | 0.019 | 0.018 | 0.00361 |
| STD3 | 2/15/96 | 15:20 | 2.188 | | | | | | | 1.822 | | | 2.04 | 10.97 | 2.0957 | | | | | 3.144 | |
| STD4 | 2/15/96 | 15:23 | | 1.233 | | | | 9.706 | | | | | | | | 0.841 | | 13.27 | | | |
| STD2 | 2/15/96 | 15:26 | | | 23.3 | 2.433 | 3.004 | | 1.564 | | 4.2718 | 2.371 | | | | | 8.626 | | 20.3 | | 2.74942 |
| STD.1-BLANK | 2/15/96 | 15:29 | 0.002 | -0.01 | 0.023 | 0.003 | 0.004 | -4E-04 | 0.011 | -0.001 | 0.028 | 0.003 | -7E-04 | -0.01 | -0.007 | 0 | 0.004 | 0.053 | 0.002 | -9E-04 | 0.0059 |
| STD.1-BLANK | 2/15/96 | 15:31 | 0.009 | 0.026 | 0.004 | 0.001 | 0.002 | -0.002 | 0.003 | -0.001 | 0.02 | 4E-04 | -2E-04 | -0.01 | -0.002 | -0.03 | 0.002 | 0.014 | 4E-04 | -0.002 | 0.0026 |
| COMP1-4 | 2/15/96 | 15:34 | 2.49 | 2.52 | 26 | 2.623 | 2.593 | 2.469 | 2.554 | 2.52 | 25.3 | 2.577 | 2.519 | 26 | 2.54 | 2.6 | 2.62 | 26 | 2.469 | 2.514 | 2.643 |
| 8-IIIB-1 12-20cm | 2/15/96 | 15:38 | 4.39 | 0.03 | 1.86 | 0.004 | 0.003 | -0.007 | 0.245 | 0.602 | 0.297 | 0.065 | 0.003 | 0.469 | -0.004 | 0.11 | 0.05 | 1.49 | 0.014 | 0.022 | 0.2179 |
| 8-IIIB-1 20.5-30.5cm | 2/15/96 | 15:46 | 17 | 0.065 | 3.11 | 0.006 | 0.002 | 4E-04 | 1.651 | 5.86 | 1 | 0.521 | 0.009 | 0.309 | 0.003 | 0.97 | 0.16 | 5 | 0.024 | 0.083 | 1.33 |
| 8-IIIB-1 20.5-30.5cm | 2/15/96 | 15:48 | 17.6 | 0.072 | 3.1 | 0.005 | 0.001 | 1E-04 | 1.648 | 5.86 | 1.03 | 0.519 | 0.01 | 0.3 | 0.081 | 0.99 | 0.17 | 5.11 | 0.024 | 0.085 | 1.327 |
| 8-IIIC-2 10-21cm (2) | 2/15/96 | 15:51 | 5.15 | 0.173 | 3.96 | 0.01 | 0.001 | -4E-04 | 3.38 | 15.1 | 0.728 | 0.55 | 0.023 | 0.338 | 0 | 1.9 | 0.332 | 4.02 | 0.085 | 0.075 | 2.374 |
| 8-IIC-2 11-21cm | 2/15/96 | 15:53 | 3.95 | 0.018 | 1.97 | 0.002 | 0.002 | -0.003 | 0.491 | 1.53 | 0.298 | 0.168 | 0.005 | 0.47 | 0.022 | 0.3 | 0.052 | 1.58 | 0.012 | 0.024 | 0.4813 |
| 8-IIC-2 4.5-8.5cm | 2/15/96 | 15:59 | 5.52 | 0.048 | 2.45 | 0.004 | 8E-04 | -0.004 | 0.941 | 2.9 | 0.436 | 0.36 | 0.006 | 0.47 | -0.002 | 0.56 | 0.091 | 2.08 | 0.017 | 0.034 | 0.8045 |
| 8-IIC-2 21-30cm | 2/15/96 | 16:01 | 1.17 | 0.016 | 0.686 | 0.001 | 5E-04 | -0.006 | 0.129 | 0.399 | 0.09 | 0.039 | 0.002 | 0.084 | -0.001 | 0.08 | 0.009 | 0.482 | 0.004 | 0.005 | 0.1487 |
| COMP1-4 | 2/15/96 | 16:04 | 2.59 | 2.67 | 27.8 | 2.856 | 2.731 | 2.638 | 2.639 | 2.65 | 26.4 | 2.726 | 2.681 | 26.2 | 2.72 | 2.9 | 2.79 | 27.6 | 2.583 | 2.618 | 2.853 |
| COMP1-4 | 2/15/96 | 16:06 | 2.55 | 2.64 | 27.2 | 2.779 | 2.694 | 2.58 | 2.609 | 2.6 | 25.9 | 2.673 | 2.629 | 25.9 | 2.65 | 2.7 | 2.72 | 27 | 2.507 | 2.578 | 2.783 |
| 8-IIIB-1 31-41cm | 2/15/96 | 16:09 | 1.35 | 0.036 | 0.731 | 0.003 | 0.003 | -0.008 | 0.265 | 0.758 | 0.138 | 0.055 | 0.004 | 0.095 | -0.001 | 0.16 | 0.073 | 0.643 | 0.008 | 0.012 | 0.1956 |
| 8-IIIB-1 0-9cm | 2/15/96 | 16:13 | 1.35 | 0.045 | 1.04 | 0.004 | 6E-04 | -0.001 | 0.57 | 2.03 | 0.194 | 0.165 | 0.006 | 0.137 | -0.003 | 0.29 | 0.07 | 0.955 | 0.009 | 0.012 | 0.6774 |
| 8-IIC-2 30-40cm | 2/15/96 | 16:16 | 7.37 | 0.033 | 2.39 | 0.002 | 6E-04 | -0.004 | 0.207 | 0.627 | 0.398 | 0.08 | 0.001 | 0.397 | -0.002 | 0.17 | 0.017 | 1.99 | 0.014 | 0.029 | 0.2688 |
| 8-IIC-2 0-4.5cm | 2/15/96 | 16:18 | 3.76 | 0.064 | 2.42 | 0.004 | 0.001 | -0.007 | 1.148 | 3.59 | 0.426 | 0.416 | 0.007 | 0.356 | -0.003 | 0.77 | 0.103 | 2 | 0.018 | 0.032 | 1.088 |
| 8-IIIC-2 39-42cm | 2/15/96 | 16:21 | 2.91 | 0.023 | 1.55 | 0.001 | 1E-04 | -0.001 | 0.222 | 6.21 | 0.173 | 0.05 | 0.011 | 0.188 | -0.001 | 0.28 | 0.048 | 1.61 | 0.01 | 0.014 | 0.386 |
| 8-IIIC-2 32-39cm | 2/15/96 | 16:24 | 3.86 | 0.007 | 1.92 | 0.002 | -5E-04 | -0.002 | 0.266 | 4.21 | 0.247 | 0.058 | 0.004 | 0.292 | -0.003 | 0.29 | 0.042 | 1.77 | 0.012 | 0.019 | 0.4577 |
| 8-IIC-2 8.5-11cm | 2/15/96 | 16:27 | 2.9 | 0.015 | 1.57 | 0.002 | -6E-04 | -0.007 | 0.527 | 1.59 | 0.257 | 0.223 | 0.002 | 0.391 | -0.005 | 0.29 | 0.046 | 1.36 | 0.01 | 0.019 | 0.5028 |
| 8-IIIC-2 10-21 ALGAE | 2/15/96 | 16:31 | 9.16 | 0.38 | 8.43 | 0.025 | 0.003 | 0.016 | 7.612 | 26.3 | 1.81 | 1.618 | 0.041 | 0.544 | 0.001 | 4 | 0.735 | 7.95 | 0.075 | 0.183 | 5.986 |
| 8-IIIB-1 0-9cm | 2/15/96 | 16:34 | 1.6 | 0.03 | 1.11 | 0.003 | -3E-04 | -0.004 | 0.574 | 2.04 | 0.204 | 0.165 | 0.001 | 0.15 | -0.003 | 0.3 | 0.058 | 1 | 0.009 | 0.013 | 0.6814 |
| 8-IIIC-2 21-32cm | 2/15/96 | 16:37 | 5.24 | 0.073 | 2.9 | 0.011 | -1E-04 | 0.005 | 2.483 | 42.1 | 0.346 | 0.157 | 0.063 | 0.33 | 0 | 0.89 | 0.151 | 6.04 | 0.025 | 0.032 | 2.32 |
| 8-IIIC-2 21-32cm (2) | 2/15/96 | 16:40 | 1.66 | 0.042 | 1.37 | 0.006 | -6E-04 | 0.004 | 1.454 | 23.3 | 0.153 | 0.086 | 0.037 | 0.103 | -0.003 | 0.5 | 0.079 | 3.09 | 0.012 | 0.013 | 1.282 |
| 8-IIIB-1 9-12cm | 2/15/96 | 16:43 | 5.55 | 0.632 | 6.14 | 0.009 | 0.002 | 0.011 | 1.949 | 48.5 | 0.611 | 0.812 | 0.07 | 0.48 | 0 | 6.4 | 0.239 | 4.16 | 0.123 | 0.052 | 1.446 |
| 8-STR.BLANKM DUP | 2/15/96 | 16:48 | -0.04 | 0.005 | 0.012 | 1E-04 | 0 | -0.006 | 0 | 0.013 | 0.011 | -0.001 | 0 | -0.05 | -0.003 | 0.03 | -0.01 | -0.11 | -0 | -0.005 | -0.0024 |
| COMP1-4 | 2/15/96 | 16:51 | 2.59 | 2.72 | 28.1 | 2.902 | 2.77 | 2.66 | 2.652 | 2.68 | 26.5 | 2.747 | 2.734 | 26.4 | 2.77 | 2.9 | 2.82 | 27.8 | 2.536 | 2.631 | 2.9 |
| STD1-BLANK | 2/15/96 | 16:55 | -0.03 | -0 | 0.017 | 0.002 | 0.001 | 0.003 | 0.002 | -0.019 | 0.01 | 0 | 0.002 | 0.007 | 0 | 0.04 | -0.01 | -0.1 | 9E-04 | -9E-04 | -0.0003 |
| COMP1-4 | 2/15/96 | 16:57 | 2.52 | 2.65 | 26.8 | 2.737 | 2.657 | 2.541 | 2.589 | 2.57 | 25.6 | 2.639 | 2.625 | 26.1 | 2.64 | 2.8 | 2.66 | 26.6 | 2.488 | 2.552 | 2.732 |
| COMP1-4 | 2/15/96 | 17:02 | 2.56 | 2.7 | 27.1 | 2.753 | 2.701 | 2.591 | 2.642 | 2.62 | 25.9 | 2.681 | 2.671 | 26.7 | 2.69 | 2.8 | 2.68 | 27 | 2.549 | 2.606 | 2.771 |

| ICAPES data for bead samples analyzed on 3/7/96 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Name | Date | Time | Al | As | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
| STD1-Blank | 3/7/96 | 13:17 | 0.06738 | -0.00733 | 0.00128 | 0.00109 | 0.00171 | 0.21623 | 0.00109 | 0.00342 | -4E-05 | 0.00057 | 0.00023 | 0.06052 | 0.00409 | 0.10566 | 0.04228 | 0.00704 | 0.01814 | 0.01714 | 0.0018 |
| STD2 | 3/7/96 | 13:20 | | | 22.308 | 2.38004 | 2.87047 | | 1.57228 | | 4.36314 | 2.20128 | | | | | 8.64423 | | 19.3695 | | 3.13347 |
| STD3 | 3/7/96 | 13:23 | 2.20152 | | | | | | | 1.75166 | | | 2.4709 | 11.0166 | 1.95971 | | | | | 3.03971 | |
| STD4 | 3/7/96 | 13:26 | | 1.61195 | | | | 8.9989 | | | | | | | | 0.925 | | 12.9843 | | | |
| STD8 | 3/7/96 | 13:29 | | | | | | | | | | | | | | | | | | | |
| BLANK-STD 1 | 3/7/96 | 13:31 | 0 | 0.012 | 0.003 | 0.0003 | 0.0008 | 0.0062 | 0.0006 | -0.007 | 0.008 | 0 | -0.0002 | 0.022 | 0.001 | 0.02 | -0.007 | 0.022 | 0.0003 | 0.0001 | 0.0006 |
| USGS T107 | 3/7/96 | 13:34 | 0.225 | 0.003 | 12.8 | 0.0166 | 0.0139 | 0.0252 | 0.0318 | 0.046 | 2.29 | 0.0517 | 0.0165 | 22.7 | 0.031 | 0.03 | 0.009 | 4.13 | 0.0641 | 0.0014 | 0.0888 |
| USGS T117 | 3/7/96 | 13:37 | 0.068 | 0.002 | 23.4 | 0.0022 | 0.0038 | 0.0256 | 0.0064 | 0.496 | 11.2 | 0.2428 | 0.0129 | 21.9 | 0.007 | 0.26 | -0.013 | 6.31 | 0.2792 | 0.0024 | 0.2028 |
| 8-STR.BLANK | 3/7/96 | 13:40 | 0.033 | 0.008 | 0.032 | 0.0005 | 0.0003 | 0.0056 | -0.0003 | -0.003 | 0.019 | 0.0006 | -0.0017 | 0.011 | 0.003 | 0.01 | -0.019 | 0.021 | 0.0002 | -0.0022 | 0 |
| 8-STR.BLANK2 | 3/7/96 | 13:43 | -0.004 | 0.014 | 0.013 | 0.0005 | 0 | 0.0071 | 0.0003 | -0.002 | 0.013 | 0.0002 | 0.0013 | -0.012 | 0.004 | 0.04 | -0.019 | 0.012 | 0 | -0.0014 | 0.0006 |
| 8-STR.BLANK3 | 3/7/96 | 13:45 | -0.016 | -0.004 | 0.005 | 0.0006 | -0.0002 | 0.0113 | -0.0012 | -0.005 | 0.009 | -0.0002 | -0.0027 | -0.001 | 0.001 | 0.03 | -0.016 | 0.001 | 0 | -0.0011 | -0.0005 |
| 8-BEADBLANK11 | 3/7/96 | 13:47 | 2.72 | -0.002 | 0.732 | 0.001 | 0.0007 | 0.0137 | 0.0009 | 0.013 | 0.146 | 0.0078 | 0.0002 | 0.133 | -0.001 | 0.07 | -0.005 | 0.726 | 0.0041 | 0.0118 | 0.0013 |
| 8-BEADBLANK12 | 3/7/96 | 13:50 | 1.54 | 0 | 0.459 | -0.0002 | 0 | 0.0115 | -0.0003 | 0.011 | 0.079 | 0.0045 | -0.0013 | 0.074 | -0.001 | 0.03 | -0.031 | 0.474 | 0.0026 | 0.0055 | 0.0006 |
| 8-BEADBLANK13 | 3/7/96 | 13:53 | 1.76 | 0.004 | 0.508 | -0.0006 | -0.0002 | 0.012 | 0.0009 | 0.01 | 0.088 | 0.0054 | -0.0017 | 0.083 | -0.004 | 0.07 | -0.004 | 0.532 | 0.0029 | 0.0068 | 0.0012 |
| 8-BEADBLANK14 | 3/7/96 | 13:55 | 1.59 | 0.005 | 0.451 | -0.0002 | 0.001 | 0.0153 | 0.0003 | 0.005 | 0.079 | 0.0039 | -0.0011 | 0.082 | 0.001 | 0.08 | -0.005 | 0.499 | 0.0027 | 0.0068 | -0.0001 |
| 8-IIB-1 8-14cm | 3/7/96 | 13:58 | 1.69 | 0.075 | 0.941 | 0.0028 | 0.0008 | 0.0139 | 0.3992 | 2.75 | 0.167 | 0.1261 | 0.0028 | 0.137 | 0.001 | 0.49 | 0.161 | 0.83 | 0.0098 | 0.0252 | 0.7463 |
| 8-IIB-1 14-26cm | 3/7/96 | 14:00 | 1.54 | 0.061 | 0.781 | 0.0005 | -0.0002 | 0.0126 | 0.2649 | 1.13 | 0.171 | 0.0578 | 0.0007 | 0.151 | -0.002 | 0.19 | 0.085 | 0.667 | 0.0067 | 0.0203 | 0.5797 |
| 8-IIB-1 26-35cm | 3/7/96 | 14:03 | 1.61 | 0.142 | 1.02 | 0.0019 | 0.0012 | 0.0189 | 0.4125 | 3.62 | 0.215 | 0.1197 | 0.0054 | 0.157 | -0.001 | 0.52 | 0.188 | 0.988 | 0.0106 | 0.0298 | 0.4673 |
| 8-IIB-1 35-41cm | 3/7/96 | 14:06 | 2.12 | 0.176 | 1.17 | 0.0032 | 0.0005 | 0.0175 | 0.2964 | 3.1 | 0.229 | 0.1164 | 0.0041 | 0.196 | 0.004 | 0.46 | 0.123 | 0.959 | 0.0116 | 0.0295 | 0.5005 |
| 8-IIC-2 30-40cm | 3/7/96 | 14:09 | 1.58 | 0.015 | 0.65 | 0.0013 | 0.0002 | 0.0133 | 0.1015 | 0.314 | 0.109 | 0.037 | 0.0024 | 0.14 | 0.001 | 0.1 | 0.01 | 0.546 | 0.0042 | 0.0093 | 0.1354 |
| 8-IIIC-2 0-10cm | 3/7/96 | 14:12 | 2.35 | 0.062 | 1.72 | 0.0033 | -0.0007 | 0.0211 | 1.077 | 3.7 | 0.352 | 0.3179 | 0.0044 | 0.182 | -0.001 | 0.75 | 0.114 | 1.59 | 0.0143 | 0.0343 | 0.9279 |
| 8-IIB-GW5 7/6/95 | 3/7/96 | 14:14 | 0.158 | 0.991 | 141 | 0.0044 | 0.01 | 0.1625 | 0.0249 | 229 | 15.6 | 23.09 | 0.3262 | 43.5 | 0.004 | 1.8 | 0.036 | 31.3 | 0.5723 | 0.0216 | 0.095 |
| 8-IIA-GW5 7/6/95 | 3/7/96 | 14:18 | 1.88 | 2.79 | 367 | 0.0118 | 0.0525 | 0.2291 | 1.061 | 223 | 63.2 | 48.6 | 0.3428 | 68.8 | 0.025 | 0.88 | 0.217 | 34.4 | 1.208 | 0.0863 | 2.373 |
| 8-STR.BLANK1 | 3/7/96 | 14:21 | -0.012 | 0.028 | 0.102 | -0.0008 | -0.0013 | 0.0119 | 0 | 0.583 | 0.022 | 0.0132 | 0.0003 | 0.033 | -0.002 | -0.05 | -0.029 | 0.017 | 0.0006 | 0.0005 | -0.0002 |
| FLUSH 40%HCL | 3/7/96 | 14:23 | -0.179 | -0.003 | 0.038 | -0.0052 | -0.0144 | 0.1113 | 0.0045 | 0.526 | -0.105 | -0.0026 | 0.007 | 0.231 | 0 | 0.17 | 0.041 | 0.03 | 0.0046 | 0.0213 | -0.0052 |
| FLUSH 40%HCL | 3/7/96 | 14:28 | 0.034 | 0.005 | 0.015 | 0.0002 | 0.001 | 0.0106 | 0.0003 | 0.059 | 0.012 | 0.0009 | 0.0005 | 0 | 0.003 | 0.04 | -0.014 | -0.001 | 0 | -0.0011 | 0.0012 |
| FLUSH 40%HCL | 3/7/96 | 14:30 | -0.004 | 0.021 | 0.008 | -0.0008 | -0.0007 | 0.0149 | 0.0006 | 0.072 | 0.014 | 0.0002 | -0.0014 | 0.007 | 0.002 | 0.07 | -0.01 | -0.002 | 0.0002 | 0.0003 | 0.0018 |
| USGS T107 | 3/7/96 | 14:33 | 0.238 | 0.029 | 14.8 | 0.019 | 0.0143 | 0.0527 | 0.0339 | 0.055 | 2.52 | 0.0584 | 0.0157 | 24.9 | 0.038 | 0.13 | 0.023 | 4.7 | 0.0708 | 0.006 | 0.1034 |

**Laboratory duplicates (bead samples): Calculations worksheet**
(all concentrations adjusted for sample mass and dilution factor)

| Sample Name | IB-1 0-8cm | Lab Dupl. IB-1 0-8cm | %CHG | IB-1 8-12cm | Lab Dupl. IB-1 8-12cm | %CHG | IA-2 0-12cm(2) | Lab Dupl. IA-2 0-12cm(2) | %CHG | IIC-1 0-11cm | Lab Dupl. IIC-1 0-11cm | %CHG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis date | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | |
| Analysis time | 10:38 | 10:43 | | 10:47 | 11:14 | | 11:33 | 11:50 | | 12:43 | 12:48 | |
| Al | 34.9 | 186 | 137 | 27.1 | 105 | 118 | 29.5 | 63.2 | 72.8 | 39.9 | 85.7 | 72.9 |
| As | BDL | BDL | BDL | 0.78 | 0.61 | 24.9 | 0.48 | 0.46 | 3.2 | BDL | 0.35 | BDL |
| Ca | 8.8 | 9.8 | 10.2 | 9.4 | 11.1 | 16.4 | 13.3 | 14.4 | 7.9 | 12.2 | 12.8 | 5.2 |
| Cd | 0.074 | 0.069 | 7.0 | DL | 0.053 | BDL | DL | DL | DL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cr | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cu | 14.2 | 14.2 | 0.5 | 6.8 | 6.6 | 2.0 | 18.4 | 18.1 | 1.2 | 4.7 | 4.7 | 0.5 |
| Fe | 13.1 | 14.4 | 9.5 | 50.2 | 50 | 0.0 | 39.8 | 40.8 | 2.5 | 15.4 | 16.1 | 4.4 |
| Mg | 14.8 | 19.0 | 24.9 | 4.1 | 6.2 | 40.7 | 6.3 | 7.4 | 15.3 | 1.6 | 3.9 | 40.1 |
| Mn | 16.8 | 16.8 | 0.2 | 6.5 | 6.4 | 0.3 | 7.3 | 7.2 | 0.5 | 1.7 | 1.8 | 2.0 |
| Mo | BDL | BDL | BDL | 0.05 | 0.07 | 22.6 | 0.05 | BDL | BDL | BDL | BDL | BDL |
| Na | 14.7 | 15.1 | 2.7 | 4.0 | 4.3 | 8.9 | 7.7 | 7.9 | 1.9 | 2.4 | 2.6 | 7.5 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| P | 4.4 | 5 | 3.4 | 10.4 | 10.9 | 4.7 | 8.5 | 8.5 | 0.0 | 4.0 | 4.1 | 2.4 |
| Pb | BDL | BDL | BDL | 1.0 | 1.0 | 2.9 | 1.0 | 0.9 | 4.7 | 0.7 | 0.6 | 7.6 |
| Si | 8.1 | 22.0 | 92.7 | 8.1 | 17.8 | 75.1 | 14.5 | 22.3 | 42.3 | 12.6 | 19.1 | 41.1 |
| Sr | 0.08 | 0.08 | 8.3 | 0.12 | 0.13 | 7.3 | 0.13 | 0.14 | 4.1 | 0.09 | 0.10 | 3.7 |
| Ti | 0.17 | 0.40 | 83.2 | 0.17 | 0.34 | 66.4 | 0.28 | 0.40 | 35.3 | 0.24 | 0.36 | 39.4 |
| Zn | 27.7 | 27.7 | 0.1 | 12.3 | 12.2 | 1.0 | 13.8 | 13.7 | 1.0 | 5.2 | 5.3 | 1.1 |

| Sample Name | IIC-1 30-42cm | Lab Dupl. IIC-1 30-42cm | %CHG | IIIB-3 30-41cm | Lab Dupl. IIIB-3 30-41cm | %CHG | IIIB-2 0-8cm | Lab Dupl. IIIB-2 0-8cm | %CHG | IIIA-1 0-5.5cm | Lab Dupl. IIIA-1 0-5.5cm | %CHG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis date | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | |
| Analysis time | 13:01 | 13:03 | | 14:13 | 15:45 | | 14:25 | 15:51 | | 15:28 | 15:34 | |
| Al | 17.9 | 16.7 | 7.2 | 22.1 | 211 | 162.1 | 33.7 | 75.4 | 76.5 | 23.9 | 30.6 | 24.6 |
| As | BDL | BDL | BDL | BDL | BDL | | 2.68 | 2.66 | 0.6 | BDL | BDL | |
| Ca | 8.02 | 7.97 | 0.6 | 9.8 | 13.4 | 30.9 | 22.8 | 25.5 | 11.2 | 14.6 | 15.3 | 4.7 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cr | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cu | 0.9 | 0.8 | 1.7 | 1.6 | 1.8 | 6.5 | 14.2 | 14.1 | 0.4 | 7.7 | 7.7 | 0.0 |
| Fe | 3.54 | 3.46 | 2.3 | 5.54 | 6.93 | 22.4 | 700 | 700 | 0.0 | 34.5 | 35.0 | 1.6 |
| Mg | 1.4 | 1.4 | 1.7 | 1.66 | 6.78 | 121.3 | 1.9 | 3.1 | 50.8 | 2.4 | 1.6 | 8.7 |
| Mn | 0.41 | 0.41 | 0.2 | 0.4 | 0.5 | 30.2 | 0.8 | 0.9 | 5.6 | 2.3 | 1.3 | 1.0 |
| Mo | BDL | BDL | BDL | BDL | BDL | BDL | 1.06 | 1.07 | 1.4 | 0.07 | 0.07 | 4.3 |
| Na | 2.0 | 2.0 | 3.5 | 1.7 | 2.5 | 39.6 | 2.8 | 3.2 | 15.1 | 2.2 | 2.4 | 5.9 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | 0.31 | 0.33 | 7.9 | BDL | BDL | BDL |
| P | 1.9 | 2.1 | 10.0 | 1.0 | 1.3 | 21.3 | 17.6 | 18.1 | 2.8 | 3.4 | 3.5 | 4.4 |
| Pb | BDL | BDL | BDL | 0.6 | 0.5 | 8.0 | BDL | 0.6 | BDL | 0.8 | 0.1 | 2.6 |
| Si | 6.28 | 6.2 | 1.6 | 7.7 | 21 | 94.0 | 64.3 | 68 | 6.1 | 14.2 | 16 | 9.4 |
| Sr | 0.1 | 0.1 | 0.9 | 0.08 | 0.10 | 26.3 | 0.30 | 0.32 | 4.2 | 0.12 | 0.12 | 3.0 |
| Ti | 0.14 | 0.14 | 0.0 | 0.14 | 0.40 | 99.1 | 0.15 | 0.22 | 37.4 | 0.21 | 0.24 | 10.9 |
| Zn | 4.10 | 4.07 | 0.7 | 2.3 | 2.4 | 6.2 | 18.6 | 18.9 | 1.6 | 9.1 | 9.2 | 0.9 |

| Sample Name | IB-3 21-31cm | Lab dupl. IB-3 21-31cm | %CHG | IB-3 11-21cm | Lab dupl. IB-3 11-21cm | %CHG | IB-3 31-41cm | Lab dupl. IB-3 31-41cm | %CHG | IIB-2 20-30cm | Lab dupl. IIB-2 20-30cm | %CHG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis date | 2/6/96 | 2/6/96 | | 2/6/96 | 2/6/96 | | 2/6/96 | 2/6/96 | | 2/6/96 | 2/6/96 | |
| Analysis time | 15:17 | 15:19 | | 15:14 | 15:21 | | 15:24 | 15:26 | | 15:41 | 15:43 | |
| Al | 3.72 | 3.65 | 1.90 | 4.03 | 51 | 170.71 | 5.03 | 4.85 | 3.64 | 4.62 | 3.87 | 17.67 |
| As | 0.009 | -0.001 | BDL | -0.006 | -0.001 | BDL | 0.007 | -0.009 | BDL | 0.017 | 0.019 | BDL |
| Ca | 1.52 | 1.44 | 5.41 | 2.02 | 2.32 | 13.82 | 1.45 | 1.49 | 2.72 | 2.01 | 2 | 0.50 |
| Cd | 0.0066 | 0.0051 | BDL | 0.0107 | 0.0089 | BDL | 0.0055 | 0.0065 | BDL | 0.001 | 0.0016 | BDL |
| Co | -0.0008 | -0.0008 | BDL | 0.0011 | -0.0013 | BDL | -0.0015 | -0.0008 | BDL | -0.0004 | 0 | BDL |
| Cr | 0.0217 | 0.0195 | BDL | 0.0225 | 0.0209 | BDL | 0.0173 | 0.018 | BDL | 0.2281 | 0.2244 | 1.64 |
| Cu | 1.022 | 1.015 | 0.69 | 1.174 | 1.179 | 0.42 | 0.7979 | 0.7957 | 0.28 | 0.4255 | 0.4265 | 0.23 |
| Fe | 0.95 | 0.939 | 1.16 | 1.05 | 1.24 | 16.59 | 0.986 | 0.981 | 0.51 | 3.13 | 3.13 | 0.00 |
| Mg | 1.19 | 1.18 | 0.84 | 1.88 | 2.98 | 45.27 | 1.02 | 0.994 | 2.58 | 0.365 | 0.352 | 3.63 |
| Mn | 1.238 | 1.221 | 1.38 | 2.017 | 2.024 | 0.35 | 0.9862 | 0.9759 | 1.05 | 0.185 | 0.184 | 0.54 |
| Mo | -0.0013 | 0.0003 | BDL | -0.0001 | -0.002 | BDL | -0.0013 | -0.0029 | BDL | 0.0044 | 0.0058 | BDL |
| Na | 1.78 | 1.78 | 0 | 2.45 | 2.53 | 3.21 | 1.07 | 1.09 | 1.85 | 0.441 | 0.441 | 0.00 |
| Ni | 0.008 | 0.008 | BDL | 0.011 | 0.012 | BDL | 0.006 | 0.009 | BDL | 0.271 | 0.268 | 1.11 |
| P | 0.41 | 0.38 | 7.59 | 0.48 | 0.5 | 4.08 | 0.43 | 0.45 | 4.55 | 0.56 | 0.51 | 9.35 |
| Pb | -0.021 | -0.023 | BDL | -0.006 | 0.034 | BDL | 0.001 | -0.002 | BDL | 0.015 | 0.01 | BDL |
| Si | 1.16 | 1.11 | 4.41 | 1.18 | 3.54 | 100 | 1.2 | 1.22 | 1.65 | 1.68 | 1.61 | 4.26 |
| Sr | 0.01 | 0.0095 | 5.13 | 0.0119 | 0.0136 | 13.33 | 0.0095 | 0.0097 | 2.08 | 0.0129 | 0.0128 | 0.78 |
| Ti | 0.0195 | 0.0184 | 5.80 | 0.0206 | 0.0745 | 113.35 | 0.0217 | 0.0217 | 0.00 | 0.0292 | 0.0279 | 4.55 |
| Zn | 1.93 | 1.906 | 1.25 | 3.233 | 3.203 | 0.93 | 1.552 | 1.537 | 0.97 | 0.4571 | 0.4567 | 0.09 |

| Sample Name | IIA-2 22-32cm | Lab dupl. IIA-2 22-32cm | %CHG | IIC-3 8.5-10cm | Lab Dupl. IIC-3 8.5-10cm | %CHG | IIC-3 20-30cm | Lab Dupl. IIC-3 20-30cm | %CHG | IIIA-2 14.5-32cm | Lab Dupl. IIIA-2 14.5-32cm | %CHG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis date | 2/6/96 | 2/6/96 | | 2/15/96 | 2/15/96 | | 2/15/96 | 2/15/96 | | 2/15/96 | 2/15/96 | |
| Analysis time | 16:23 | 16:25 | | 10:35 | 14:09 | | 11:19 | 14:16 | | 14:13 | 14:37 | |
| Al | 4.03 | 4.32 | 6.95 | 0.937 | 1.28 | 30.9 | 2.17 | 3.62 | 50.1 | 1.29 | 2.26 | 54.6 |
| As | -0.003 | -0.005 | BDL | 0.018 | 0.012 | BDL | 0.05 | 0.035 | BDL | 0.009 | 0.007 | BDL |
| Ca | 1.82 | 1.88 | 3.24 | 0.527 | 0.699 | 28.1 | 0.607 | 1.02 | 50.8 | 0.633 | 0.765 | 18.9 |
| Cd | 0.0007 | 0.0005 | BDL | 0.0006 | 0.0007 | BDL | 0.0026 | 0.0008 | BDL | 0.0014 | -0.0001 | BDL |
| Co | -0.0023 | -0.0029 | BDL | | | | | | | | | |
| Cr | 0.0188 | 0.0169 | BDL | | | | | | | | | |
| Cu | 0.171 | 0.1721 | 0.64 | 0.2177 | 0.2102 | 3.5 | 0.1149 | 0.1129 | 1.8 | 0.043 | 0.0439 | 2.1 |
| Fe | 0.736 | 0.739 | 0.41 | 0.729 | 0.72 | 1.2 | 1.44 | 1.44 | 0.0 | 0.465 | 0.482 | 3.6 |
| Mg | 0.311 | 0.313 | 0.64 | 0.095 | 0.094 | DL | 0.118 | 0.139 | BDL | 0.139 | 0.158 | 12.8 |
| Mn | 0.0727 | 0.0724 | 0.41 | 0.0816 | 0.0783 | 4.1 | 0.0387 | 0.0405 | 4.5 | 0.0171 | 0.0194 | 12.6 |
| Mo | -0.0019 | -0.0022 | BDL | 0.0008 | 0.0053 | BDL | 0.0013 | 0.0056 | BDL | 0.0012 | 0.0015 | BDL |
| Na | 0.36 | 0.361 | 0.28 | 0.084 | 0.123 | BDL | 0.091 | 0.133 | BDL | 0.175 | 0.221 | 23.2 |
| Ni | 0.005 | 0.006 | BDL | 0.007 | -0.001 | BDL | 0.001 | -0.004 | BDL | 0.001 | 0.001 | BDL |
| P | 0.42 | 0.43 | 2.35 | 0.28 | | | 0.44 | | 200.0 | | | |
| Pb | -0.02 | -0.025 | BDL | 0.05 | 0.024 | BDL | 0.048 | 0.02 | BDL | 0.009 | 0.004 | BDL |
| Si | 1.36 | 1.41 | 3.61 | 0.457 | 0.517 | 12.3 | 0.562 | 0.912 | 47.5 | 0.42 | 0.575 | 31.2 |
| Sr | 0.0111 | 0.0114 | 2.67 | 0.0041 | 0.0044 | BDL | 0.0046 | 0.0064 | BDL | 0.0036 | 0.0045 | BDL |
| Ti | 0.0239 | 0.024 | 0.42 | 0.0064 | 0.0063 | 1.6 | 0.0074 | 0.0104 | 33.7 | 0.0046 | 0.0075 | 47.9 |
| Zn | 0.221 | 0.2214 | 0.18 | 0.2064 | 0.1926 | 6.9 | 0.1624 | 0.1539 | 5.4 | 0.0916 | 0.0969 | 2.4 |

| Sample Name | IIC-3 18-20(2) | Lab Dupl. IIC-3 18-20(2) | %CHG | IIIB-1 20.5-30.5 | Lab Dupl. IIIB-1 20.5-30.5 | %CHG | IIIB-1 0-9cm | Lab Dupl. IIIB-1 0-9cm | %CHG | IIC-3 30-34cm | Lab Dupl. IIC-3 30-34cm | Lab Dupl. IIC-3 30-34cm | Largest %CHG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis date | 2/15/96 | 2/15/96 | | 2/15/96 | 2/15/96 | | 2/15/96 | 2/15/96 | | 2/15/96 | 2/15/96 | 2/15/96 | |
| Analysis time | 14:48 | 14:49 | | 15:46 | 15:46 | | 16:13 | 16:34 | | 10:44 | 10:52 | 10:54 | |
| Al | 13 | 14 | 7.4 | 17 | 17.6 | 3.5 | 1.35 | 1.6 | 16.9 | 1.09 | 2.28 | 2.13 | 70.6 |
| As | 0.881 | 0.87 | 1.3 | 0.065 | 0.072 | DL | 0.045 | 0.03 | BDL | 0.029 | 0.023 | 0.026 | BDL |
| Ca | 1.48 | 1.48 | 0.0 | 3.11 | 3.1 | 0.3 | 1.04 | 1.11 | 6.5 | 0.691 | 0.739 | 0.757 | 8.1 |
| Cd | 0.0089 | 0.0102 | BDL | 0.0050 | 0.005 | BDL | 0.0036 | 0.0025 | BDL | 0.0023 | 0.0014 | 0.0017 | BDL |
| Co | | | | | | | | | | | | | |
| Cr | | | | | | | | | | | | | |
| Cu | 0.5405 | 0.5374 | 0.6 | 1.651 | 1.648 | 0.2 | 0.5701 | 0.5741 | 0.7 | 0.083 | 0.0823 | 0.0823 | 0.8 |
| Fe | 24.4 | 24.3 | 0.4 | 5.86 | 5.86 | 0.0 | 2.03 | 2.04 | 0.5 | 2.08 | 2.04 | 2.08 | 1.9 |
| Mg | 0.108 | 0.108 | 0.0 | 1 | 1.03 | 3.0 | 0.194 | 0.204 | 5.0 | 0.103 | 0.132 | 0.122 | 24.7 |
| Mn | 0.1454 | 0.1446 | 0.6 | 0.5207 | 0.5194 | 0.2 | 0.1646 | 0.1654 | 0.5 | 0.0396 | 0.0396 | 0.0396 | 0.0 |
| Mo | 0.0365 | 0.0357 | 2.2 | 0.0088 | 0.0103 | DL | 0.0056 | 0.0014 | BDL | 0.0023 | 0.0045 | 0.0014 | BDL |
| Na | 0.09 | 0.096 | DL | 0.309 | 0.3 | 3.0 | 0.137 | 0.15 | 9.1 | 0.088 | 0.09 | 0.085 | BDL |
| Ni | -0.004 | 0 | BDL | 0.003 | 0.001 | BDL | -0.003 | -0.003 | BDL | 0.004 | 0.002 | 0.005 | BDL |
| P | | | | 0.97 | 0.99 | 2.0 | 0.29 | 0.3 | 3.4 | 0.69 | 0.69 | 0.75 | 8.3 |
| Pb | 0.035 | 0.04 | BDL | 0.16 | 0.17 | 6.1 | 0.07 | 0.058 | BDL | 0.05 | 0.063 | 0.068 | BDL |
| Si | 2.18 | 2.18 | 0.0 | 5 | 5.11 | 2.2 | 0.955 | 1 | 4.6 | 0.529 | 0.62 | 0.63 | 17.4 |
| Sr | 0.0151 | 0.0151 | 0.0 | 0.0231 | 0.0237 | 0.4 | 0.0085 | 0.0087 | 2.3 | 0.007 | 0.0069 | 0.0072 | 4.3 |
| Ti | 0.006 | 0.0063 | 4.9 | 0.0826 | 0.085 | 2.8 | 0.012 | 0.0134 | 11.0 | 0.0067 | 0.008 | 0.0087 | 26.0 |
| Zn | 0.7654 | 0.7584 | 0.9 | 1.33 | 1.327 | 0.2 | 0.6774 | 0.6814 | 0.6 | 0.2901 | 0.2797 | 0.289 | 3.7 |

**Statistics on compilation of all laboratory duplicates (bead samples)**

| | MEAN | STD. DEV. | MEAN+ STD.DEV. | # OF DATA | STD. ERR. | 95% CONF. OF MEAN |
|---|---|---|---|---|---|---|
| Al | 55.29 | 54.37 | 109.66 | 20 | 2.86 | 60.89 |
| As | 7.46 | 11.68 | 19.15 | 4 | 3.89 | 15.10 |
| Ca | 11.33 | 12.75 | 24.07 | 20 | 0.67 | 12.64 |
| Cd | 7.04 | NA | NA | 1 | NA | NA |
| Co | | | | 0 | | |
| Cr | 1.64 | NA | NA | 1 | NA | NA |
| Cu | 1.23 | 1.51 | 2.74 | 20 | 0.08 | 1.39 |
| Fe | 3.45 | 6.00 | 9.44 | 20 | 0.32 | 4.07 |
| Mg | 22.32 | 30.09 | 52.42 | 18 | 1.77 | 25.79 |
| Mn | 3.32 | 7.00 | 10.32 | 20 | 0.37 | 4.04 |
| Mo | 7.63 | 10.05 | 17.68 | 4 | 3.35 | 14.19 |
| Na | 7.85 | 10.48 | 18.33 | 16 | 0.70 | 9.22 |
| Ni | 4.49 | 4.78 | 9.27 | 2 | 4.78 | 13.86 |
| P | 17.10 | 47.38 | 64.48 | 17 | 2.96 | 22.90 |
| Pb | 5.32 | 2.29 | 7.60 | 6 | 0.46 | 6.21 |
| Si | 29.56 | 34.75 | 64.31 | 20 | 1.83 | 33.15 |
| Sr | 5.23 | 6.37 | 11.60 | 17 | 0.40 | 6.01 |
| Ti | 31.19 | 34.93 | 66.13 | 20 | 1.84 | 34.80 |
| Zn | 1.80 | 2.07 | 3.87 | 20 | 0.11 | 2.02 |

**Sample duplicates (bead samples): Calculations worksheet**

(all concentrations adjusted for sample mass and dilution factor)

| | | Sample dupl | | | Sample dupl. | | | Sample dupl. | | | Sample dupl. | | | Sample dupl. | | | Sample dupl. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Name | IC-2 18-32cm | IC-2 18-32cm (2) | %CHG | IIB-1 0-8cm | IIB-1 0-8cm (2) | %CHG | IA-2 0-12cm | IA-2 0-12cm(2) | %CHG | IA-2 23-33.8cm | IA-2 23-33.8cm (2) | %CHG | IIA-3 13.8-21.8cm | IIA-3 13.5-21.5(2) | %CHG | IIB-3 25-41cm | IIB-3 25-41cm (2) | %CHG |
| Analysis date | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | |
| Analysis time | 10:24 | 10:28 | | 10:38 | 10:41 | | 11:30 | 11:33 | | 11:47 | 11:53 | | 12:11 | 12:14 | | 12:37 | 12:40 | |
| Al | 23.8 | 29.4 | 21.4 | 34.9 | 16.8 | 69.9 | 18.4 | 29.5 | 46.2 | 53.0 | 50.8 | 4.4 | 38.9 | 36.1 | 7.8 | 41.5 | 12.8 | 105.4 |
| As | 4.3 | 3.8 | 11.2 | BDL | BDL | BDL | 0.4 | 0.5 | 26.0 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Ca | 16.8 | 14.1 | 17.6 | 8.8 | 9.8 | 10.7 | 12.3 | 13.3 | 7.9 | 23.7 | 20.7 | 14.5 | 7.3 | 8.6 | 17.4 | 11.3 | 7.4 | 41.4 |
| Cd | BDL | 0.10 | BDL | 0.1 | 0.1 | 4.0 | BDL | DL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cr | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cu | 10.0 | 10.0 | 0.2 | 14.2 | 14.6 | 2.3 | 16.8 | 18.4 | 8.6 | 11.0 | 10.9 | 0.9 | 1.2 | 1.1 | 13.2 | 1.2 | 1.1 | 11.5 |
| Fe | 270 | 244 | 9.9 | 13.1 | 15.3 | 15.5 | 35.2 | 39.8 | 12.4 | 142 | 138 | 2.6 | 13.7 | 11.3 | 20.8 | 7.0 | 5.7 | 21.1 |
| Mg | 4.8 | 5.2 | 6.7 | 14.8 | 14.1 | 4.9 | 5.4 | 6.3 | 16.3 | 3.9 | 5.2 | 21.1 | 1.7 | 1.8 | 0.9 | 2.3723 | 1.1540 | 69.1 |
| Mn | 7.9 | 7.4 | 5.6 | 16.8 | 16.8 | 0.0 | 6.6 | 7.3 | 9.5 | 3.3 | 2.9 | 20.5 | 0.4 | 0.4 | 6.5 | 0.5 | 0.4 | 18.6 |
| Mo | BDL | BDL | BDL | BDL | BDL | BDL | 0.0 | 0.0 | 1.0 | 0.2 | 0.2 | 5.0 | BDL | BDL | BDL | BDL | BDL | BDL |
| Na | 4.3 | 4.7 | 4.6 | 14.7 | 15.3 | 4.0 | 7.2 | 7.7 | 6.8 | 6.0 | 4.9 | 21.6 | 1.4 | 1.7 | 24.0 | 2.4 | 1.7 | 34.5 |
| Ni | 0.3 | 0.2 | 53.4 | BDL | BDL | BDL | 0 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| P | 29.6 | 27.1 | 8.6 | 4.4 | 4.9 | 11.9 | 10.0 | 8.5 | 16.6 | 3.6 | 5.6 | 2.3 | 4.4 | 5.9 | 15.2 | 2.3 | 2.0 | 12.1 |
| Pb | 1.4 | 1.2 | 17.2 | BDL | 0.3 | BDL | 1.0 | 1.0 | 3.4 | 1.7 | 1.5 | 12.8 | BDL | BDL | BDL | BDL | BDL | BDL |
| Si | 21.2 | 19.8 | 6.4 | 8.1 | 6.9 | 15.4 | 11.5 | 14.5 | 23.1 | 24.4 | 24.1 | 1.1 | 6.3 | 6.9 | 9.9 | 9.1 | 5.4 | 50.2 |
| Sr | 0.2 | 0.2 | 10.9 | 0.1 | 0.1 | 11.9 | 0.1 | 0.1 | 8.1 | 0.1 | 0.1 | 14.7 | 0.1 | 0.1 | 5.6 | 0.1 | 0.1 | 33.8 |
| Tl | 0.2 | 0.2 | 8.6 | 0.2 | 0.1 | 10.9 | 0.2 | 0.5 | 14.7 | 0.2 | 0.2 | 17.0 | 0.2 | 0.2 | 0.0 | 0.2 | 0.1 | 47.0 |
| Zn | 22.6 | 19.8 | 13.2 | 27.7 | 28.0 | 1.2 | 12.3 | 13.8 | 11.8 | 6.7 | 6.0 | 11.5 | 1.3 | 1.3 | 4.9 | 1.4 | 1.2 | 13.4 |

| | | Sample dupl | | | Sample dupl. | | | Sample dupl. | | | Sample dupl. | | | Sample dupl. | | | Sample dupl. | | | Sample dupl | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Name | IIC-1 0-11cm | IIC-1 0-11cm (2) | %CHG | IIC-1 20-30cm | IIC-1 20-30cm (2) | %CHG | IIIB-2 18-29cm | IIIB-2 18-29cm(2) | %CHG | IIIC-1 11-20cm | IIIC-1 11-20cm (2) | %CHG | IA-1 0-12cm | IA-1 0-12cm(2) | %CHG | IIA-2 13.5-21.5c | IIA-2 13.5-21.5(2) | %CHG | IIA-2 22-32cm | IIA-2 22-32cm (2) | %CHG |
| Analysis date | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 1/26/96 | 1/26/96 | | 2/6/96 | 2/6/96 | | 2/6/96 | 2/6/96 | | 2/6/96 | 2/6/96 | |
| Analysis time | 12:43 | 12:45 | | 12:55 | 12:58 | | 14:31 | 14:33 | | 14:55 | 14:58 | | 14:15 | 14:17 | | 16:18 | 16:20 | | 16:23 | 16:27 | |
| Al | 39.9 | 25.5 | 43.9 | 35.6 | 70.8 | 66.2 | 16.3 | 21.5 | 26.5 | 22.4 | 18.4 | | 32.4 | 31.7 | 2.3 | 26.5 | 19.8 | 28.9 | 20.0 | 26.6 | 28.5 |
| As | BDL | BDL | BDL | 0.9 | 0.9 | 6.7 | BDL | BDL | BDL | BDL | BDL | | 0.23 | 0.22 | BDL | -0.01 | 0.05 | BDL | -0.0149 | -0.0302 | BDL |
| Ca | 12.2 | 12.8 | 5.4 | 12.5 | 15.2 | 19.4 | 8.4 | 9.8 | 15.2 | 11.2 | 10.1 | | 10.8 | 8.2 | 28.7 | 9.9 | 10.0 | 0.6 | 9.0 | 10.8 | 18.6 |
| Cd | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 10.1 | 0.020 | 0.020 | BDL | 0.0025 | 0.0030 | BDL | 0.0035 | -0.0010 | BDL |
| Co | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | -0.011 | -0.005 | BDL | -0.0170 | -0.0134 | BDL | -0.0114 | -0.0136 | BDL |
| Cr | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.092 | 0.074 | 21.6 | 0.0811 | 0.0744 | 8.6 | 0.093 | 0.068 | 30.6 |
| Cu | 4.7 | 5.1 | 7.3 | 1.6 | 1.7 | 6.1 | 0.7 | 0.3 | 88.9 | 0.9 | 0.8 | BDL | 4.49 | 4.39 | 2.1 | 1.747 | 1.887 | 7.8 | 0.847 | 0.838 | 1.1 |
| Fe | 15.4 | 16.0 | 3.5 | 100 | 94.5 | 5.6 | 3.3 | 3.1 | 12.1 | 3.4 | 2.8 | 6.9 | 10.04 | 9.92 | 1.1 | 7.409 | 7.889 | 6.3 | 3.646 | 3.768 | 3.3 |
| Mg | 2.6 | 2.4 | 8.7 | 1.9 | 3.2 | 49.0 | 1.2 | 1.4 | 15.7 | 1.6 | 1.4 | 17.4 | 3.61 | 2.85 | 23.3 | 3.38 | 1.55 | 74.2 | 1.341 | 1.731 | 11.6 |
| Mn | 1.7 | 1.9 | 9.3 | 1.3 | 1.3 | 3.8 | 0.1 | 0.2 | 10.4 | 0.4 | 0.4 | 12.9 | 2.97 | 2.49 | 17.4 | 0.636 | 0.659 | 5.3 | 0.3602 | 0.3753 | 4.1 |
| Mo | BDL | BDL | BDL | 0.1 | 0.1 | 8.9 | BDL | BDL | BDL | BDL | BDL | 8.5 | -0.007 | -0.004 | BDL | -0.0220 | -0.0005 | BDL | 0.0094 | -0.0111 | BDL |
| Na | 2.4 | 2.4 | 1.8 | 1.8 | 2.2 | 20.7 | 1.7 | 1.3 | 10.0 | 4.6 | 4.6 | BDL | 3.493 | 2.536 | 31.8 | 1.722 | 1.578 | 8.7 | 1.7836 | 2.0326 | 13.1 |
| Ni | BDL | BDL | BDL | BDL | BDL | BDL | 0.9 | 0.2 | 117.9 | BDL | BDL | 0.7 | 0.040 | 0.020 | BDL | 0.030 | 0.045 | BDL | 0.0248 | 0.0352 | BDL |
| P | 4.0 | 4.2 | 4.6 | 12.5 | 13.1 | 4.3 | BDL | BDL | BDL | 1.1 | 1.0 | BDL | 2.584 | 2.680 | 3.6 | 2.653 | 2.878 | 8.1 | 2.081 | 1.962 | 5.9 |
| Pb | 0.7 | 0.7 | 3.1 | 0.6 | 0.6 | 1.1 | BDL | BDL | BDL | BDL | BDL | 4.5 | 0.308 | 0.263 | BDL | -0.033 | 0.005 | BDL | -0.099 | -0.141 | BDL |
| Si | 12.6 | 10.4 | 19.5 | 12.4 | 15.6 | 22.4 | 5.3 | 7.6 | 36.1 | 8.1 | 6.8 | BDL | 8.496 | 8.188 | 3.7 | 8.91 | 7.74 | 14.1 | 6.738 | 8.301 | 20.8 |
| Sr | 0.1 | 0.1 | 5.7 | 0.1 | 0.1 | 12.0 | 0.0 | 0.1 | 13.4 | 0.1 | 0.1 | 17.2 | 0.075 | 0.080 | 23.0 | 0.065 | 0.065 | 1.4 | 0.055 | 0.064 | 15.0 |
| Tl | 0.2 | 0.2 | 7.0 | 0.2 | 0.3 | 51.0 | 0.1 | 0.1 | 29.6 | 0.1 | 0.1 | 11.2 | 0.169 | 0.135 | 24.1 | 0.1507 | 0.1474 | 2.2 | 0.118 | 0.137 | 14.4 |
| Zn | 5.2 | 5.9 | 12.3 | 3.8 | 3.4 | 11.4 | 1.1 | 0.8 | 28.8 | 3.1 | 2.5 | 20.1 | 5.938 | 6.118 | 3.0 | 1.8888 | 2.0735 | 9.5 | 1.0949 | 1.0601 | 3.2 |

| | | Sample dupl | | | Sample dupl. | | | Sample dupl. | | | Sample dupl. | | | Sample dupl. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Name | IIA-2 22-32cm | IIA-2 22-32cm (2) | %CHG | IIC-3 10-20cm | IIC-3 10-20(2) | %CHG | IIC-3 34-41cm | IIC-3 34-41cm (2) | %CHG | IIIC-2 10-21cm | IIIC-2 10-21cm (2) | %CHG | IIIC-2 21-31cm | IIIC-2 21-31cm (2) | %CHG |
| Analysis date | 2/6/96 | 2/6/96 | | 2/15/96 | 2/15/96 | | 2/15/96 | 2/15/96 | | 2/15/96 | 2/15/96 | | 2/15/96 | 2/15/96 | |
| Analysis time | 16:23 | 16:27 | | 14:44 | 14:49 | | 14:52 | 14:55 | | 15:10 | 15:51 | | 16:37 | 16:40 | |
| Al | 20.0 | 26.6 | 28.5 | 17.46 | 14.06 | 21.53 | 12.80 | 13.87 | 8.06 | 20.30 | 25.48 | 23.43 | 26.19 | 16.69 | 44.34 |
| As | -0.0149 | -0.0302 | BDL | 6.71 | 8.74 | 26.22 | 5.22 | 2.88 | 11.17 | 0.81 | 0.86 | 5.95 | 0.36 | 0.42 | BDL |
| Ca | 9.0 | 10.9 | 18.6 | 14.42 | 14.87 | 5.04 | 26.50 | 25.86 | 2.44 | 16.11 | 19.75 | 20.31 | 14.50 | 13.77 | 3.12 |
| Cd | 0.0035 | -0.0010 | BDL | 0.08 | 0.10 | 28.27 | 0.07 | 0.06 | BDL | 0.04 | 0.05 | BDL | 0.05 | 0.06 | BDL |
| Co | -0.0114 | -0.0136 | BDL | | | | | | | | | | | | BDL |
| Cr | 0.093 | 0.068 | 30.6 | | | | | | | | | | | | BDL |
| Cu | 0.847 | 0.838 | 1.1 | 5.24 | 5.40 | 2.94 | 1.78 | 1.59 | 11.18 | 14.33 | 16.86 | 16.18 | 12.41 | 14.62 | 16.31 |
| Fe | 3.646 | 3.768 | 3.3 | 205.41 | 244.12 | 17.22 | 210.62 | 200.18 | 5.08 | 66.33 | 75.30 | 12.68 | 210.44 | 234.22 | 10.70 |
| Mg | 1.341 | 1.731 | 11.6 | 1.19 | 1.08 | 9.54 | 1.60 | 1.50 | 6.84 | 2.84 | 3.63 | 24.35 | 1.73 | 1.54 | 11.72 |
| Mn | 0.3602 | 0.3753 | 4.1 | 1.31 | 1.45 | 10.36 | 1.94 | 1.86 | 4.42 | 2.29 | 2.74 | 18.01 | 0.78 | 0.86 | BDL |
| Mo | -0.0094 | -0.0111 | BDL | 0.29 | 0.36 | 19.66 | 0.31 | 0.30 | 4.33 | 0.09 | 0.11 | 25.10 | 0.31 | 0.37 | 15.41 |
| Na | 1.7836 | 2.0326 | 13.1 | 1.21 | 0.96 | 22.88 | 0.90 | 0.96 | 6.95 | 1.31 | 1.60 | 25.33 | 1.65 | 1.04 | 45.75 |
| Ni | 0.0248 | 0.0352 | BDL | -0.01 | 0.00 | BDL | -0.01 | -0.05 | BDL | | | BDL | 0.00 | -0.05 | BDL |
| P | 2.081 | 1.962 | 5.9 | | | | | | | | | | 4.43 | 5.05 | 12.19 |
| Pb | -0.099 | -0.141 | BDL | 0.56 | 0.40 | BDL | 0.84 | 0.82 | 1.68 | 1.18 | 1.66 | 53.80 | 0.75 | 0.79 | BDL |
| Si | 6.738 | 8.301 | 20.8 | 20.69 | 21.90 | 5.68 | 9.86 | 10.11 | 2.53 | 16.11 | 20.88 | 21.79 | 30.19 | 31.06 | 2.84 |
| Sr | 0.055 | 0.064 | 15.0 | 0.14 | 0.15 | 7.84 | 0.41 | 0.40 | 3.89 | 0.15 | 0.18 | 18.08 | 0.12 | 0.12 | 1.51 |
| Tl | 0.118 | 0.137 | 14.4 | 0.10 | 0.06 | 44.95 | 0.06 | 0.06 | 1.68 | 0.32 | 0.38 | 15.14 | 0.16 | 0.15 | 22.90 |
| Zn | 1.0949 | 1.0601 | 3.2 | 6.91 | 7.62 | 9.78 | 14.65 | 13.88 | 5.39 | 10.06 | 11.84 | 16.26 | 11.60 | 12.89 | 10.54 |

**Statistics on compilation of all sample duplicates (beads)**

| | MEAN | STD. DEV. | MEAN + STDEV. | # OF DATA | STD. ERR. | 90% CONF. INT. OF MEAN |
|---|---|---|---|---|---|---|
| Al | 33.42 | 27.12 | 60.55 | 17 | 1.60 | 36.56 |
| As | 14.54 | 8.22 | 23.76 | 6 | 1.54 | 17.56 |
| Ca | 14.03 | 10.42 | 24.45 | 17 | 0.61 | 15.23 |
| Cd | 38.27 | NA | NA | 1 | NA | NA |
| Co | NA | NA | NA | 8 | NA | NA |
| Cr | 20.34 | 11.07 | 31.31 | 3 | 5.69 | 2[illegible] |
| Cu | 11.97 | 20.49 | 32.45 | 17 | 1.21 | 14.33 |
| Fe | 10.43 | 6.47 | 16.91 | 17 | 0.30 | 11.10 |
| Mg | 21.58 | 21.76 | 43.34 | 17 | 1.28 | 24.80 |
| Mn | 8.43 | 6.83 | 15.45 | 17 | 0.35 | 10.12 |
| Mo | 11.07 | 8.42 | 19.48 | 7 | 1.20 | 13.42 |
| Na | 16.68 | 12.98 | 29.63 | 17 | 0.76 | 18.15 |
| Ni | 65.88 | 45.40 | 131.29 | 2 | 22.8 | 130 |
| P | 8.47 | 4.70 | 13.17 | 13 | 0.36 | 8.38 |
| Pb | 8.77 | 11.38 | 21.04 | 8 | 1.41 | 12.83 |
| Si | 16.84 | 13.01 | 29.85 | 17 | 0.77 | 17.84 |
| Sr | 13.80 | 8.14 | 19.82 | 17 | 0.40 | 12.48 |
| Tl | 18.31 | 13.84 | 32.15 | 17 | 0.81 | 19.98 |
| Zn | 11.14 | 7.10 | 18.24 | 17 | 0.42 | 11.96 |

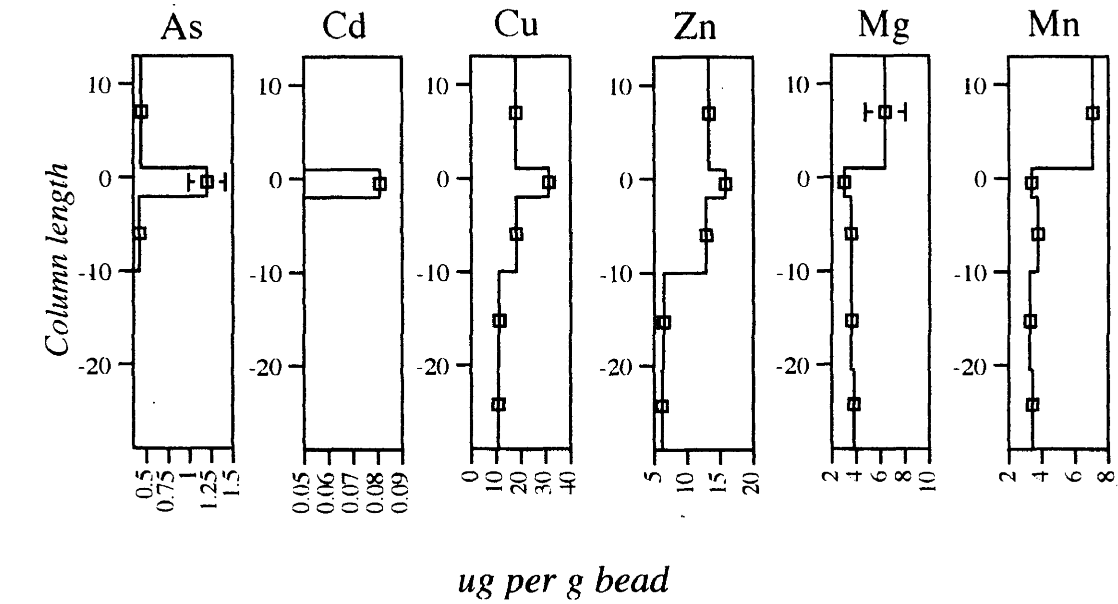
| CONCENTRATIONS ALONG BEAD COLUMNS (adjusted to ug/ g BEAD) | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date | Mass | Dilution | SW/Subs. | Colors on | | | | | | | | | | | | | | | | | |
| Sample Name | Analyzed | analyzed (g) | factor | boundary | bead tube | Al | As | Ca | Cd | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
| BEADBLNK1 | 1/26/96 | 1.0022 | 5 | | (0cm=top); | 20 | BDL | 1.1 | BDL | BDL | BDL | 0.78 | BDL | BDL | BDL | BDL | BDL | BDL | 2.1 | BDL | 0.0324 | 0.024 |
| BEADBLNK2 | 1/26/96 | 0.9939 | 5 | | v=very;l=light | 11 | BDL | 1.3 | BDL | BDL | BDL | 0.58 | BDL | BDL | BDL | BDL | BDL | BDL | 1.9 | BDL | 0.0332 | BDL |
| BEADBLANK3 | 1/26/96 | 0.9999 | 5 | | | 15 | BDL | 3.4 | BDL | BDL | 0.18 | 0.85 | BDL | BDL | 0.88 | BDL | BDL | BDL | 3.9 | BDL | 0.0715 | BDL |
| BEADBLANK6 | 2/6/96 | 1.0076 | 5 | | | 83 | BDL | 15 | BDL | BDL | 0.59 | 3.2 | 0.160 | BDL | 2.5 | BDL | 1.4 | BDL | 14 | 0.077 | 0.213 | BDL |
| BEADBLANK7 | 2/6/96 | 1.0012 | 5 | | | 81 | BDL | 10 | BDL | BDL | 0.76 | 2.5 | 0.119 | BDL | 1.9 | BDL | 1.3 | BDL | 11 | 0.053 | 0.150 | BDL |
| BEADBLANK4 | 2/6/96 | 1.0023 | 5 | | | 84 | BDL | 11 | BDL | BDL | 0.69 | 3.0 | 0.129 | BDL | 1.9 | BDL | 1.5 | BDL | 13 | 0.055 | 0.165 | BDL |
| BEADBLANK8 | 2/15/96 | 0.9961 | 10 | | | 11 | BDL | 2.4 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 4.8 | BDL | BDL | 0.0020 |
| BEADBLANK9 | 2/15/96 | 1.0071 | 10 | | | 11 | BDL | 2.8 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 5.9 | BDL | BDL | 0.0139 |
| BEADBLANK10 | 2/15/96 | 1.0016 | 5 | | | 25 | BDL | 3.9 | BDL | BDL | BDL | 1.2 | 0.057 | BDL | 0.58 | BDL | BDL | BDL | 4.6 | BDL | 0.080 | 0.0120 |
| BEADBLANK 11 | 3/7/96 | 0.9861 | 10 | | | 28 | BDL | 7.4 | BDL | BDL | BDL | 1.5 | 0.079 | BDL | 1.35 | BDL | BDL | BDL | 7.4 | BDL | 0.120 | BDL |
| BEADBLANK 12 | 3/7/96 | 1.0065 | 10 | | | 15 | BDL | 4.6 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 4.7 | BDL | 0.055 | BDL |
| BEADBLANK 13 | 3/7/96 | 1.0062 | 10 | | | 17 | BDL | 5.1 | BDL | BDL | BDL | BDL | 0.054 | BDL | BDL | BDL | BDL | BDL | 5.3 | BDL | 0.068 | BDL |
| BEADBLANK 14 | 3/7/96 | 0.9742 | 10 | | | 16 | BDL | 4.6 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 5.1 | BDL | 0.070 | BDL |
| IA-1 0-13 cm | 2/6/96 | 1.0076 | 5 | 13cm | 0-7 green | 32 | BDL | BDL | BDL | 4.54 | 10 | BDL | 2.73 | BDL | 3.0 | BDL | 2.6 | BDL | BDL | BDL | BDL | 6.03 |
| IA-1 13-21cm | 2/6/96 | 1.0055 | 5 | | 7-13 white | 16 | 1.0 | BDL | BDL | 10.7 | 78 | BDL | 2.25 | 0.10 | 2.4 | BDL | 9.9 | 1.4 | BDL | 0.082 | BDL | 6.58 |
| IA-1 21-31cm | 2/6/96 | 1.0047 | 5 | | 13-21 med. red | 18 | BDL | BDL | BDL | 6.59 | 15 | BDL | 3.67 | BDL | 4.7 | BDL | 4.4 | BDL | BDL | BDL | BDL | 7.33 |
| IA-1 31-41cm | 2/6/96 | 1.0009 | 5 | | 21-31 white,l.red | 13 | BDL | BDL | BDL | 4.37 | 7.6 | BDL | 2.98 | BDL | 4.5 | BDL | 1.7 | BDL | BDL | BDL | BDL | 4.93 |
| | | | | | 31-41 white | | | | | | | | | | | | | | | | | |
| IA-2 0-12cm | 1/26/96 | 1.0052 | 5 | 13 cm | 0-13 green | 37 | 0.44 | 13 | 0.045 | 17.8 | 39 | 6.4 | 7.05 | 0.05 | 7.6 | BDL | 9.0 | 0.97 | 16 | 0.128 | 0.304 | 13.3 |
| IA-2 12-15cm | 1/26/96 | 1.0042 | 5 | | 13-15 light red | 60 | 1.2 | 11 | 0.081 | 31.2 | 140 | 3.0 | 3.36 | 0.20 | 4.1 | BDL | 10 | 1.2 | 41 | 0.108 | 0.142 | 15.8 |
| IA-2 15-23cm | 1/26/96 | 1.0081 | 5 | | 15-42 red | 103 | 0.42 | 9.6 | 0.054 | 18.2 | 210 | 3.6 | 3.77 | 0.31 | 4.8 | BDL | 6.4 | 3.0 | 59 | 0.085 | 0.161 | 12.9 |
| IA-2 23-33.5cm | 1/26/96 | 0.9994 | 5 | | | 52 | 0.21 | 22 | BDL | 10.9 | 140 | 3.6 | 3.25 | 0.21 | 5.4 | BDL | 3.6 | 1.6 | 24 | 0.117 | 0.164 | 6.38 |
| IA-2 33.5-42cm | 1/26/96 | 1.0009 | 5 | | | 48 | 0.22 | 9.0 | BDL | 10.7 | 190 | 3.8 | 3.41 | 0.30 | 5.6 | BDL | 3.1 | 1.6 | 16 | 0.071 | 0.164 | 6.13 |
| IA-3 0-10cm | 1/26/96 | 1.0033 | 5 | 14 cm | 0-10 green | 22 | 0.49 | 11 | 0.061 | 17.8 | 35 | 6.6 | 8.18 | BDL | 9.7 | BDL | 10 | 1.1 | 13 | 0.112 | 0.236 | 17.9 |
| IA-3 10-20cm | 1/26/96 | 1.0057 | 5 | | 10-19 light red | 27 | 0.65 | 8.5 | 0.063 | 13.2 | 75 | 6.7 | 7.67 | 0.09 | 10 | 0.65 | 4.3 | 1.1 | 15 | 0.072 | 0.159 | 13.4 |
| IA-3 20-31cm | 1/26/96 | 0.9986 | 5 | | 19-42 white | 29 | BDL | 8.8 | 0.066 | 7.43 | 5.7 | 10 | 9.85 | BDL | 10 | BDL | 3.0 | BDL | 6.2 | 0.064 | 0.139 | 15.5 |
| IA-3 31-42cm | 1/26/96 | 0.9967 | 5 | | | 29 | BDL | 17 | BDL | 5.40 | 5.6 | 6.6 | 5.43 | BDL | 6.1 | 0.70 | 2.2 | BDL | 8.1 | 0.076 | 0.189 | 8.89 |
| IB-1 0-8 cm | 1/26/96 | 0.9972 | 5 | | | 79 | BDL | 9.5 | 0.073 | 14.3 | 14 | 16 | 16.8 | BDL | 15 | BDL | 4.6 | BDL | 12 | 0.081 | 0.239 | 27.8 |
| IB-1 8-12 cm | 1/26/96 | 1.0068 | 5 | 12 cm | 0-5 green | 66 | 0.70 | 10 | 0.053 | 6.72 | 50 | 5.1 | 6.45 | 0.06 | 4.1 | BDL | 10 | 1.0 | 13 | 0.122 | 0.258 | 12.2 |
| IB-1 12-16cm | 1/26/96 | 1.0025 | 5 | | 5-9 v.light green | 13 | BDL | 7.2 | BDL | 1.45 | 3.8 | 2.0 | 1.25 | BDL | 2.5 | BDL | 2.1 | BDL | 4.5 | 0.054 | 0.124 | 3.89 |
| IB-1 16-21cm | 1/26/96 | 0.9926 | 5 | | 9-11.5 light red | 17 | BDL | 5.1 | BDL | 0.981 | 1.8 | 1.4 | 0.645 | BDL | 1.6 | BDL | 1.9 | BDL | 4.1 | 0.038 | 0.104 | 2.37 |
| IB-1 22-32cm | 1/26/96 | 0.9977 | 5 | | 11.5-41.5 white | 44 | BDL | 7.6 | BDL | 2.30 | 2.6 | 2.5 | 1.03 | BDL | 2.3 | BDL | 2.1 | BDL | 6.7 | 0.050 | 0.170 | 3.29 |
| IB-1 32-41.5 | 1/26/96 | 1.0037 | 5 | | | 29 | BDL | 8.7 | BDL | 3.04 | 7.2 | 3.0 | 1.82 | BDL | 3.4 | BDL | 2.3 | BDL | 6.9 | 0.066 | 0.185 | 3.28 |
| IB-2 0-7.5cm | 2/6/96 | 1.0016 | 5 | 12 cm | 0-12 green | BDL | 0.53 | BDL | BDL | 12.1 | 29 | BDL | 3.73 | BDL | 2.8 | BDL | 4.9 | 0.71 | BDL | 0.107 | 0.198 | 12.1 |
| IB-2 7.5-12cm | 2/6/96 | 0.9965 | 5 | | 12-42 white | BDL | 0.56 | BDL | BDL | 12.9 | 33 | BDL | 3.85 | BDL | 3.0 | BDL | 6.0 | 0.94 | BDL | 0.121 | 0.244 | 10.7 |
| IB-2 12-16cm | 2/6/96 | 1.0054 | 5 | | | BDL | BDL | BDL | BDL | 4.37 | 6.7 | BDL | 3.29 | BDL | 4.2 | BDL | 1.9 | BDL | BDL | BDL | BDL | 5.66 |
| IB-2 16-21.5cm | 2/6/96 | 0.9948 | 5 | | | BDL | BDL | BDL | BDL | 3.38 | 3.3 | BDL | 3.21 | BDL | 4.0 | BDL | 1.7 | BDL | BDL | BDL | BDL | 4.82 |
| IB-2 22-32cm | 2/6/96 | 1.0039 | 5 | | | BDL | BDL | BDL | BDL | 1.97 | 2.3 | BDL | 1.99 | BDL | 3.6 | BDL | 1.2 | BDL | BDL | BDL | BDL | 3.49 |

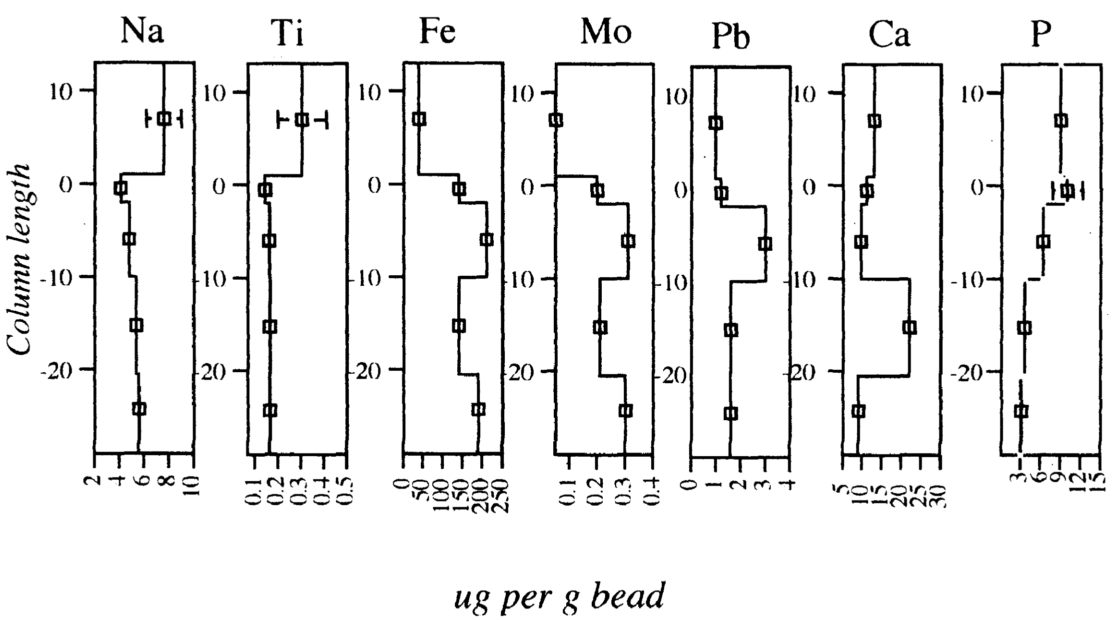
| Sample Name | Date Analyzed | Mass analyzed (g) | Dilution factor | SW/Subs. boundary | Colors on bead tube | Al | As | Ca | Cd | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IB-2 32-42cm | 2/6/96 | 0.9956 | 5 | | | BDL | BDL | BDL | BDL | 2.90 | 6.5 | BDL | 1.88 | BDL | 3.9 | BDL | 1.7 | BDL | BDL | BDL | BDL | 3.36 |
| | | | | | | | | | | | | | | | | | | | | | | |
| IB-3 0-8cm | 2/6/96 | 1.0073 | 5 | 11 cm | 0-8 green | BDL | BDL | BDL | BDL | 7.89 | 19 | 6.5 | 7.26 | BDL | 8.1 | BDL | 3.7 | BDL | BDL | BDL | BDL | 12.3 |
| IB-3 8-11cm | 2/6/96 | 1.0068 | 5 | | 8-10 light red | BDL | BDL | BDL | BDL | 6.61 | 33 | 7.4 | 8.16 | BDL | 11 | BDL | 2.9 | BDL | BDL | BDL | BDL | 13.9 |
| IB-3 11-21 cm | 2/6/96 | 1.0000 | 5 | | 10-41 white | BDL | BDL | BDL | BDL | 5.88 | 5.7 | 12 | 10.1 | BDL | 12 | BDL | 2.5 | BDL | BDL | BDL | 0.238 | 16.1 |
| IB-3 21-31cm | 2/6/96 | 0.9944 | 5 | | | BDL | BDL | BDL | BDL | 5.12 | 4.7 | 6.0 | 6.18 | BDL | 9.0 | BDL | 2.0 | BDL | BDL | BDL | BDL | 9.64 |
| IB-3 31-41cm | 2/6/96 | 0.9966 | 5 | | | BDL | BDL | BDL | BDL | 4.00 | 4.9 | 5.1 | 4.92 | BDL | 5.4 | BDL | 2.2 | BDL | BDL | BDL | BDL | 7.75 |
| | | | | | | | | | | | | | | | | | | | | | | |
| IC-1 0-8cm | 1/26/96 | 0.9973 | 5 | 8 cm | 0-8 green with red | 21 | 0.48 | 9.1 | BDL | 5.55 | 18 | 2.6 | 1.98 | BDL | 2.0 | 0.25 | 3.6 | 0.71 | 8.4 | 0.075 | 0.238 | 6.79 |
| IC-1 8-11 cm | 1/26/96 | 0.9958 | 5 | | streak on tube | 21 | 0.58 | 11 | BDL | 2.65 | 30 | 4.2 | 4.81 | BDL | 3.7 | 0.73 | 5.0 | 1.1 | 7.4 | 0.094 | 0.174 | 8.04 |
| IC-1 11-30 cm | 1/26/96 | 1.0028 | 5 | | 8-11 v.light red | 18 | BDL | 8.0 | BDL | 4.49 | 7.6 | 4.1 | 3.52 | BDL | 4.9 | 0.34 | 2.3 | 0.48 | 4.4 | 0.060 | 0.137 | 9.84 |
| IC-1 30-42cm | 1/26/96 | 0.9982 | 5 | | 11-30 white | 23 | 2.3 | 13 | 0.123 | 18.0 | 300 | 3.8 | 6.46 | 0.43 | 4.4 | 1.6 | 40 | 1.2 | 18.1 | 0.268 | 0.179 | 21.9 |
| | | | | | 30-42 med. red | | | | | | | | | | | | | | | | | |
| IC-2 0-14cm | 1/26/96 | 0.9999 | 5 | 14 cm | 0-14 green | 16 | 0.32 | 12 | BDL | 7.12 | 19 | 2.9 | 3.04 | BDL | 2.0 | 0.55 | 4.0 | 0.78 | 9.3 | 0.098 | 0.228 | 10.5 |
| IC-2 14-18cm | 1/26/96 | 0.9973 | 5 | | 14-18 l.green/ white | 54 | 0.62 | 13 | 0.049 | 8.89 | 27 | 5.2 | 3.56 | BDL | 3.8 | 0.23 | 4.3 | 1.6 | 13 | 0.117 | 0.309 | 8.11 |
| IC-2 18-32 cm | 1/26/96 | 0.9976 | 5 | | 18-32 med. red | 27 | 4.0 | 15 | 0.108 | 10.0 | 260 | 5.0 | 7.64 | 0.35 | 4.6 | 0.21 | 30 | 1.3 | 20 | 0.230 | 0.188 | 21.22 |
| IC-2 32-41cm | 1/26/96 | 1.0031 | 5 | | 32-40 white/ v.l.red | 14 | BDL | 6.8 | BDL | 2.75 | 7.0 | 2.1 | 1.69 | BDL | 2.8 | 0.99 | 2.4 | BDL | 3.8 | 0.048 | 0.119 | 3.29 |
| | | | | | | | | | | | | | | | | | | | | | | |
| IC-3 0-9.5cm | 1/26/96 | 0.9964 | 5 | 9.5 cm | 0-9.5 green | 25 | 0.315 | 10 | BDL | 7.59 | 20 | 2.7 | 2.53 | BDL | 3.3 | 0.52 | 3.8 | 0.94 | 9.4 | 0.081 | 0.210 | 8.02 |
| IC-3 9.5-21cm | 1/26/96 | 1.0043 | 5 | | 9.5-21 v. l.red | 23 | BDL | 7.1 | BDL | 4.54 | 14 | 2.1 | 1.30 | BDL | 2.2 | 0.20 | 2.2 | BDL | 6.1 | 0.050 | 0.178 | 2.61 |
| IC-3 21-32cm | 1/26/96 | 1.0002 | 5 | | 21-32 med.red | 56 | BDL | 6.2 | BDL | 5.54 | 66 | 2.8 | 1.03 | 0.1 | 1.9 | 0.29 | 2.3 | BDL | 15 | 0.047 | 0.253 | 3.84 |
| IC-3 32-42cm | 1/26/96 | 1.0083 | 5 | | 32-42 light red | 30 | BDL | 6.0 | BDL | 4.72 | 27 | 2.6 | 1.62 | BDL | 2.7 | 0.32 | 1.8 | BDL | 7.2 | 0.042 | 0.171 | 3.40 |
| | | | | | | | | | | | | | | | | | | | | | | |
| IIA-1 0-10.5cm | 2/6/96 | 0.9928 | 5 | 15.5 cm | 0-10 dark green | BDL | BDL | BDL | BDL | 4.22 | 10 | BDL | 1.30 | BDL | BDL | BDL | 3.0 | BDL | BDL | BDL | BDL | 3.61 |
| IIA-1 10.5-15.5cm | 2/6/96 | 1.0030 | 5 | | 10-15.5 green | BDL | BDL | BDL | BDL | 2.91 | 9.2 | BDL | 0.880 | BDL | BDL | BDL | 2.9 | BDL | BDL | BDL | BDL | 2.12 |
| IIA-1 15.5-22cm | 2/6/96 | 1.0004 | 5 | | 15.5-20.5 l. green | BDL | BDL | BDL | BDL | 3.11 | 6.3 | BDL | 0.612 | BDL | BDL | BDL | 2.4 | BDL | BDL | BDL | BDL | 1.79 |
| IIA-1 22.5-33cm | 2/6/96 | 0.9999 | 5 | | 20.5-42 white | BDL | BDL | BDL | BDL | 2.98 | 5.5 | BDL | 0.616 | BDL | BDL | BDL | 2.5 | BDL | BDL | BDL | BDL | 4.46 |
| IIA-1 33-42cm | 2/6/96 | 0.9983 | 5 | | | BDL | BDL | BDL | BDL | 1.12 | 3.4 | BDL | 0.410 | BDL | BDL | BDL | 2.3 | BDL | BDL | BDL | BDL | 2.17 |
| | | | | | | | | | | | | | | | | | | | | | | |
| IIA-2 0-10.5cm | 2/6/96 | 0.9974 | 5 | 13.5 cm | 0-13.5 green | BDL | BDL | BDL | BDL | 4.75 | 17 | BDL | 1.82 | BDL | BDL | BDL | 5.0 | BDL | BDL | BDL | BDL | 4.12 |
| IIA-2 11-13.5cm | 2/6/96 | 0.9997 | 5 | | 13.5-42 white | BDL | BDL | BDL | BDL | 2.35 | 9.9 | BDL | 0.780 | BDL | BDL | BDL | 3.4 | BDL | BDL | BDL | BDL | 2.54 |
| IIA-2 13.5-21.5 cm | 2/6/96 | 0.9988 | 5 | | | BDL | BDL | BDL | BDL | 1.82 | 7.6 | BDL | 0.648 | BDL | BDL | BDL | 2.8 | BDL | BDL | BDL | BDL | 1.98 |
| IIA-2 22-32 cm | 2/6/96 | 1.0092 | 5 | | | BDL | BDL | BDL | BDL | 0.846 | 3.7 | BDL | 0.365 | BDL | BDL | BDL | 2.1 | BDL | BDL | BDL | BDL | 1.08 |
| IIA-2 32-42cm | 2/6/96 | 0.9929 | 5 | | | BDL | BDL | BDL | BDL | 0.766 | 4.4 | BDL | 0.340 | BDL | BDL | BDL | 2.0 | BDL | BDL | BDL | BDL | 0.96 |
| | | | | | | | | | | | | | | | | | | | | | | |
| IIA-3 0-8.5cm | 1/26/96 | 1.0013 | 5 | 8.5 cm | 0-8.5 green | 103 | 0.27 | 11 | BDL | 6.59 | 23 | 4.1 | 1.44 | BDL | 1.6 | BDL | 4.7 | 0.69 | 20 | 0.094 | 0.367 | 5.61 |
| IIA-3 8.5-13.5cm | 1/26/96 | 1.0083 | 5 | | 8.5-13.5 red | 35 | 2.1 | 20 | BDL | 4.84 | 270 | 2.2 | 1.81 | 0.38 | 1.5 | BDL | 20 | 0.85 | 21 | 0.274 | 0.178 | 5.18 |
| IIA-3 13.5-21.5cm | 1/26/96 | 1.0005 | 5 | | 13.5-41 white | 37 | BDL | 8.0 | BDL | 1.16 | 13 | 1.7 | 0.432 | BDL | 1.6 | BDL | 4.2 | BDL | 6.6 | 0.069 | 0.158 | 1.31 |
| IIA-3 21.5-29.5cm | 1/26/96 | 1.0009 | 5 | | | 31 | BDL | 6.5 | BDL | 0.941 | 3.8 | 1.5 | 0.295 | BDL | 1.5 | BDL | 2.1 | BDL | 5.5 | 0.048 | 0.139 | 1.92 |
| IIA-3 30-41cm | 1/26/96 | 1.0043 | 5 | | | 24 | BDL | 6.7 | BDL | 1.33 | 3.7 | 1.3 | 0.325 | BDL | 1.4 | BDL | 2.4 | BDL | 5.6 | 0.050 | 0.146 | 1.52 |
| | | | | | | | | | | | | | | | | | | | | | | |
| IIB-1 0-8cm | 1/26/96 | 0.9996 | 5 | 8cm | 0-8 green | 16 | BDL | 10 | BDL | 4.85 | 16 | 1.9 | 1.62 | BDL | 1.6 | 0.19 | 4.1 | 0.66 | 8.4 | 0.083 | 0.192 | 5.13 |
| IIB-1 8-14cm | 3/7/96 | 0.9967 | 5 | | 8-14 v.light red | 17 | 0.75 | 9.4 | BDL | 4.01 | 27.59 | 1.68 | 1.27 | BDL | 1.37 | BDL | 4.92 | 1.62 | 8.3 | 0.098 | 0.253 | 7.49 |
| IIB-1 14-26cm | 3/7/96 | 1.0014 | 5 | | 14-26 white | 15 | 0.6 | 7.8 | BDL | 2.65 | 11.28 | 1.71 | 0.58 | BDL | 1.51 | BDL | 1.90 | 0.85 | 6.7 | 0.067 | 0.203 | 5.79 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IIB-1 26-35cm | 3/7/96 | | 26-41 light red | 16 | 1.41 | 10.14 | BDL | 4.10 | 35.98 | 2.14 | 1.19 | BDL | 1.56 | BDL | 5.17 | 1.87 | 9.8 | 0.105 | 0.296 | 4.65 |
| | Date | SW/Subs. | Colors on | | | | | | | | | | | | | | | | | |
| Sample Name | Analyzed | boundary | bead tube | Al | As | Ca | Cd | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
| IIB-1 35-41cm | 3/7/96 | | | 21 | 1.77 | 11.76 | BDL | 2.98 | 31.15 | 2.30 | 1.17 | BDL | 2.0 | BDL | 4.62 | 1.24 | 9.6 | 0.117 | 0.296 | 5.03 |
| | | | | | | | | | | | | | | | | | | | | |
| IIB-2 0-7cm | 2/6/96 | 7 cm | 0-6 green | BDL | BDL | BDL | BDL | 5.23 | 16 | BDL | 1.75 | BDL | BDL | BDL | 4.4 | BDL | BDL | BDL | BDL | 4.79 |
| IIB-2 7-12cm | 2/6/96 | | 6-8 light green | BDL | BDL | BDL | BDL | 5.50 | 21 | BDL | 1.83 | BDL | BDL | 0.68 | 4.6 | BDL | BDL | BDL | BDL | 4.51 |
| IIB-2 12-19.5cm | 2/6/96 | | 8-40.5 white | BDL | BDL | BDL | BDL | 3.85 | 21 | BDL | 1.34 | BDL | BDL | 1.36 | 3.7 | BDL | BDL | BDL | BDL | 3.53 |
| IIB-2 20-30cm | 2/6/96 | | | BDL | BDL | BDL | BDL | 2.13 | 16 | BDL | 0.923 | BDL | BDL | 1.35 | 2.7 | BDL | BDL | BDL | BDL | 2.29 |
| IIB-2 30-40.5cm | 2/6/96 | | | BDL | BDL | BDL | BDL | 0.922 | 3.1 | BDL | 0.334 | BDL | BDL | BDL | 1.6 | BDL | BDL | BDL | BDL | 1.26 |
| | | | | | | | | | | | | | | | | | | | | |
| IIB-3 0-7cm | 1/26/96 | 10.5 cm | 0-7 green | 22 | 0.29 | 10 | BDL | 3.96 | 14 | 2.7 | 1.49 | BDL | 3.4 | BDL | 4.3 | 0.53 | 9.8 | 0.079 | 0.190 | 4.26 |
| IIB-3 7-15cm | 1/26/96 | | 7-9 v.light red | 23 | 0.84 | 12 | BDL | 4.09 | 21 | 2.2 | 1.81 | BDL | 2.6 | BDL | 4.1 | 1.2 | 10 | 0.102 | 0.272 | 14.1 |
| IIB-3 15-25cm | 1/26/96 | | 9-41 white | 16 | BDL | 7.8 | BDL | 1.44 | 7.0 | 1.5 | 0.382 | BDL | 2.1 | BDL | 2.9 | BDL | 6.0 | 0.058 | 0.170 | 2.80 |
| IIB-3 25-41cm | 1/26/96 | | | 27 | BDL | 9.3 | BDL | 1.18 | 6.4 | 1.8 | 0.423 | BDL | 2.0 | BDL | 2.2 | BDL | 7.3 | 0.062 | 0.191 | 1.27 |
| | | | | | | | | | | | | | | | | | | | | |
| IIC-1 0-11cm | 1/26/96 | 15 cm | 0-11 green | 50 | 0.27 | 13 | BDL | 4.84 | 16 | 3.0 | 1.79 | BDL | 2.5 | BDL | 4.1 | 0.67 | 14 | 0.095 | 0.276 | 5.44 |
| IIC-1 11-20cm | 1/26/96 | | 11-30 light red | 29 | 1.0 | 12 | BDL | 5.82 | 63 | 2.5 | 2.26 | 0.09 | 1.9 | BDL | 6.5 | 2.2 | 15 | 0.106 | 0.375 | 4.47 |
| IIC-1 20-30cm | 1/26/96 | | 30-42 white | 53 | 0.90 | 14 | BDL | 1.69 | 97 | 2.6 | 1.30 | 0.13 | 2.0 | BDL | 10 | 0.61 | 14 | 0.141 | 0.250 | 3.60 |
| IIC-1 30-42cm | 1/26/96 | | | 17 | BDL | 8.0 | BDL | 0.85 | 3.5 | 1.4 | 0.407 | BDL | 2.0 | BDL | 2 | BDL | 6.2 | 0.054 | 0.144 | 4.08 |
| | | | | | | | | | | | | | | | | | | | | |
| IIC-2 0-4.5cm | 2/15/96 | | | 19 | 0.32 | 12 | BDL | 5.80 | 18 | 2.2 | 2.10 | BDL | 1.8 | BDL | 3.9 | 0.52 | 10 | 0.093 | 0.162 | 5.49 |
| IIC-2 4.5-8.5cm | 2/15/96 | | | 28 | 0.24 | 12 | BDL | 4.74 | 15 | 2.2 | 1.81 | BDL | 2.4 | BDL | 2.8 | 0.46 | 10 | 0.088 | 0.172 | 4.06 |
| IIC-2 8.5-11cm | 2/15/96 | 8.5 cm | 0-8.5 green | 20 | BDL | 11 | BDL | 3.55 | 11 | 1.7 | 1.50 | BDL | 2.6 | BDL | 2.0 | BDL | 9.2 | 0.070 | 0.126 | 3.38 |
| IIC-2 11-21cm | 2/15/96 | | 8.5-40 white | 20 | BDL | 9.9 | BDL | 2.46 | 7.7 | 1.5 | 0.843 | BDL | 2.4 | BDL | 1.5 | BDL | 7.9 | 0.062 | 0.122 | 2.41 |
| IIC-2 21-30cm | 2/15/96 | | | 12 | BDL | 6.9 | BDL | 1.29 | 4.0 | 0.90 | 0.390 | BDL | BDL | BDL | BDL | BDL | 4.8 | BDL | BDL | 1.49 |
| IIC-2 30-40cm | 3/7/96 | | | 16 | BDL | 6.5 | BDL | 1.01 | 3.1 | 1.1 | 0.37 | BDL | 1.4 | BDL | BDL | BDL | 5.4 | 0.14 | 0.090 | 1.34 |
| | | | | | | | | | | | | | | | | | | | | |
| IIC-3 0-8.5cm | 2/15/96 | 8.5cm | 0-8.5 cm green | 111 | 0.42 | 13 | BDL | 8.12 | 25 | 5.7 | 3.07 | BDL | 1.6 | BDL | 5.0 | 0.99 | 27 | 0.115 | 0.362 | 9.39 |
| IIC-3 8.5-10cm | 2/15/96 | | 8.5-10 cm white | 14 | BDL | 7.5 | BDL | 2.62 | 8.9 | 1.2 | 0.980 | BDL | 1.3 | BDL | 3.4 | BDL | 6.0 | BDL | 0.08 | 2.45 |
| IIC-3 10-20 cm | 2/15/96 | | 10-20 cm med.red | 15 | 8.1 | 15 | BDL | 5.36 | 230 | 1.1 | 1.41 | 0.34 | 1.0 | BDL | | BDL | 21 | BDL | 0.07 | 7.41 |
| IIC-3 20-30cm | 2/15/96 | | 20-30 cm l.red | 23 | BDL | 7.7 | BDL | 1.13 | 14 | 1.1 | 0.388 | BDL | BDL | BDL | 3.6 | BDL | 6.8 | 0.150 | 0.08 | 1.58 |
| IIC-3 30-34 cm | 2/15/96 | | 30-34 cm white | 18 | BDL | 7.3 | BDL | 0.825 | 21 | 1.2 | 0.396 | BDL | BDL | BDL | 7.1 | BDL | 5.9 | 0.053 | 0.08 | 2.86 |
| IIC-3 34-41cm | 2/15/96 | | 34-41 cm red | 13 | 3.1 | 26 | BDL | 1.68 | 210 | 1.5 | 1.90 | 0.30 | BDL | BDL | | BDL | 10 | 0.410 | 0.06 | 14.3 |
| | | | | | | | | | | | | | | | | | | | | |
| IIIA-1 0-5.5 cm | 1/26/96 | 8 cm | 0-5.5 green | 27 | BDL | 15 | BDL | 7.68 | 35 | 2.5 | 2.29 | 0.07 | 2.3 | BDL | 3.4 | 0.77 | 15 | 0.118 | 0.226 | 9.11 |
| IIIA-1 5.5-8.5cm | 1/26/96 | | 5.5-8 bright red | 27 | 2.1 | 18 | BDL | 5.16 | 330 | 1.8 | 1.06 | 0.50 | 2.0 | BDL | 6.5 | 1.0 | 31 | 0.209 | 0.173 | 12.2 |
| IIIA-1 8-14cm | 1/26/96 | | 8-42 white | 33 | BDL | 11 | BDL | 0.983 | 3.6 | 1.6 | 0.209 | BDL | 2.3 | BDL | BDL | BDL | 9.7 | 0.071 | 0.132 | 2.39 |
| IIIA-1 14-25cm | 1/26/96 | | | 22 | BDL | 10 | BDL | 0.948 | 3.5 | 1.4 | 0.196 | BDL | 2.0 | BDL | BDL | BDL | 8.5 | 0.066 | 0.118 | 2.38 |
| IIIA-1 25-42cm | 1/26/96 | | | 23 | BDL | 11 | BDL | 0.687 | 3.1 | 1.4 | 0.207 | BDL | 2.0 | BDL | BDL | BDL | 8.6 | 0.068 | 0.121 | 2.13 |
| | | | | | | | | | | | | | | | | | | | | |
| IIIA-2 0-9.5cm | 2/15/96 | 9.5cm | 0-9.5 green | 15 | BDL | 10 | BDL | 6.30 | 25 | 1.8 | 1.50 | BDL | 1.9 | BDL | | BDL | 9.1 | 0.087 | 0.138 | 5.49 |
| IIIA-2 9.5-14.5cm | 2/15/96 | | 9.5-14.5 bright red | 13 | 0.59 | 9.7 | BDL | 3.68 | 190 | 1.6 | 0.593 | 0.30 | 1.7 | BDL | | BDL | 24 | 0.110 | 0.09 | 5.74 |
| IIIA-2 14.5-32 cm | 2/15/96 | | 14.5-42 white | 18 | BDL | 7.0 | BDL | 0.437 | 4.8 | 1.5 | 0.183 | BDL | 2.0 | BDL | | BDL | 5.0 | BDL | 0.06 | 0.963 |
| IIIA-2 32-42cm | 2/15/96 | | | 9 | BDL | 4.8 | BDL | 0.269 | 2.1 | 1.4 | 0.153 | BDL | 2.1 | BDL | | BDL | 3.4 | BDL | BDL | 0.724 |

| Sample Name | Date Analyzed | Mass analyzed (g) | Dilution factor | SW/Subs. boundary | Colors on bead tube | Al | As | Ca | Cd | Cu | Fe | Mg | Mn | Mo | Na | Ni | P | Pb | Si | Sr | Ti | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IIIA-3 0-7.5cm | 1/26/96 | 0.9990 | 5 | 11 cm | 0-7 dark green | 19 | BDL | 12 | BDL | 5.61 | 16 | 2.2 | 1.52 | BDL | 1.5 | BDL | 3.2 | 0.61 | 10 | 0.088 | 0.170 | 5.22 |
| IIIA-3 7.5-11cm | 1/26/96 | 1.0014 | 5 | | 7-11 light green | 20 | BDL | 12 | BDL | 4.10 | 11 | 1.8 | 0.865 | BDL | 2.7 | 3.60 | 2.1 | BDL | 9.5 | 0.075 | 0.142 | 4.73 |
| IIIA-3 11-15cm | 2/15/96 | 0.9996 | 5 | | 11-15 red | 12 | 0.72 | 7.8 | BDL | 4.77 | 60 | 0.86 | 0.401 | 0.09 | 1.0 | BDL | | 0.55 | 8.7 | 0.084 | 0.07 | 4.26 |
| IIIA-3 15-21.5cm | 2/15/96 | 1.0016 | 5 | | 15-42 white | 18 | BDL | 5.3 | BDL | 1.65 | 4.7 | 1.2 | 0.211 | BDL | 1.4 | BDL | 2.2 | BDL | 4.2 | 0.043 | 0.100 | 4.98 |
| IIIA-3 22-31.5cm | 2/15/96 | 1.0074 | 5 | | | 21 | BDL | 8.2 | BDL | 1.13 | 1.9 | 1.3 | 0.218 | BDL | 1.6 | BDL | | BDL | 6.3 | 0.054 | 0.109 | 3.04 |
| IIIA-3 31.5-42cm | 2/15/96 | 1.0016 | 5 | | | 17 | BDL | 6.8 | BDL | 0.882 | 1.8 | 0.92 | 0.129 | BDL | 1.1 | BDL | | BDL | 5.6 | 0.046 | 0.08 | 1.47 |
| IIIB-1 0-9 cm | 2/15/96 | 0.9965 | 10 | 12.5 cm | 0-9.5 green | 15 | BDL | 11 | BDL | 5.74 | 20 | 2.0 | 1.66 | BDL | 1.4 | BDL | 3 | BDL | 9.8 | 0.086 | 0.127 | 6.82 |
| IIIB-1 9-12cm | 2/15/96 | 1.0021 | 5 | | 9.5-11 red | 28 | 3.2 | 31 | BDL | 9.72 | 240 | 3.0 | 4.05 | 0.35 | 2.4 | BDL | 30 | 1.2 | 21 | 0.616 | 0.258 | 7.21 |
| IIIB-1 12-20cm | 2/15/96 | 0.9946 | 5 | | 11-41 white | 22 | BDL | 9.4 | BDL | 1.23 | 3.0 | 1.5 | 0.324 | BDL | 2.4 | BDL | BDL | 0.25 | 7.5 | 0.070 | 0.108 | 1.10 |
| IIIB-1 20.5-30.5 cm | 2/15/96 | 1.0041 | 10 | | | 170 | 0.68 | 31 | BDL | 16.4 | 58 | 10 | 5.18 | BDL | 3.0 | BDL | 10 | 1.6 | 50 | 0.237 | 0.835 | 13.2 |
| IIIB-1 31-41cm | 2/15/96 | 1.0004 | 10 | | | 13 | BDL | 7.3 | BDL | 2.64 | 7.6 | 1.4 | 0.547 | BDL | 0.95 | BDL | 2 | BDL | 6.4 | 0.084 | 0.119 | 1.96 |
| IIIB-2 0-8cm | 1/26/96 | 0.9948 | 5 | 0 cm | 0-8 bright red | 55 | 2.7 | 24 | BDL | 14.1 | 700 | 2.5 | 0.860 | 1.1 | 3.0 | 0.32 | 20 | 0.42 | 66 | 0.310 | 0.188 | 18.8 |
| IIIB-2 8-18cm | 1/26/96 | 0.9992 | 5 | (top 12 cm | 8-29 white | 25 | BDL | 11 | BDL | 0.693 | 4.9 | 1.6 | 0.165 | BDL | 1.8 | 0.28 | BDL | BDL | 9.0 | 0.061 | 0.148 | 1.13 |
| IIIB-2 18-29cm | 1/26/96 | 1.0012 | 5 | chopped off; | | 19 | BDL | 9.1 | BDL | 0.518 | 3.3 | 1.3 | 0.152 | BDL | 1.6 | 0.56 | BDL | BDL | 6.5 | 0.050 | 0.103 | 0.940 |
| | | | | all subsurface) | | | | | | | | | | | | | | | | | | |
| IIIB-3 0-4cm | 1/26/96 | 1.0077 | 5 | 9 cm | 0-2.5 red | 27 | 1.4 | 18 | BDL | 8.63 | 120 | 2.1 | 1.39 | 0.18 | 2.5 | BDL | 10 | 1.1 | 17 | 0.241 | 0.171 | 8.16 |
| IIIB-3 4-9cm | 1/26/96 | 1.0013 | 5 | | 2.5-41 white | 24 | BDL | 11 | BDL | 3.02 | 7.0 | 1.7 | 0.382 | BDL | 2.4 | BDL | 1.5 | 0.56 | 9.0 | 0.090 | 0.167 | 4.26 |
| IIIB-3 9-21cm | 1/26/96 | 0.9926 | 5 | | | 20 | BDL | 10 | BDL | 1.93 | 5.6 | 1.4 | 0.355 | BDL | 2.1 | BDL | 1.5 | 0.46 | 7.8 | 0.078 | 0.128 | 4.64 |
| IIIB-3 21-30cm | 1/26/96 | 0.9982 | 5 | | | 28 | BDL | 11 | BDL | 3.05 | 5.7 | 1.8 | 0.264 | BDL | 1.7 | BDL | 1.4 | 0.59 | 9.1 | 0.079 | 0.173 | 3.44 |
| IIIB-3 30-41cm | 1/26/96 | 1.0026 | 5 | | | 117 | BDL | 12 | BDL | 1.70 | 6.2 | 4.2 | 0.417 | BDL | 2.1 | BDL | 1.2 | 0.56 | 14 | 0.089 | 0.271 | 2.33 |
| IIIC-1 0-8cm | 1/26/96 | 1.0014 | 5 | 9.5 cm | 0-8 green w/ red | 30 | BDL | 16 | BDL | 3.58 | 13 | 3.3 | 1.59 | BDL | 7.2 | BDL | 1.9 | 0.47 | 13 | 0.108 | 0.195 | 4.93 |
| IIIC-1 8-11cm | 1/26/96 | 0.9977 | 5 | | streak on tube | 25 | 1.9 | 20 | BDL | 4.60 | 200 | 2.1 | 2.47 | 0.31 | 3.0 | BDL | 20 | 0.81 | 21 | 0.273 | 0.165 | 10.1 |
| IIIC-1 11-28cm | 1/26/96 | 1.0051 | 5 | | 8-11 red | 20 | BDL | 11 | BDL | 0.869 | 3.1 | 1.5 | 0.372 | BDL | 4.6 | BDL | 1.1 | BDL | 7.5 | 0.065 | 0.106 | 2.79 |
| IIIC-1 28-42cm | 1/26/96 | 1.0056 | 5 | | 11-42 white | 17 | BDL | 10 | BDL | 0.727 | 2.2 | 1.5 | 0.470 | BDL | 6.5 | BDL | 0.8 | BDL | 6.7 | 0.063 | 0.104 | 1.84 |
| IIIC-2 0-10 | 3/7/96 | 1.0016 | 10 | 30 cm | 0-21 green | 23 | BDL | 17 | BDL | 10.8 | 3.7 | 3.5 | 3.17 | BDL | 1.8 | BDL | 7.5 | 1.14 | 16 | 0.140 | 0.340 | 9.26 |
| IIIC-2 10-21 cm | 2/15/96 | 1.0026 | 5 | | 21-32 bright red | 23 | 0.84 | 18 | BDL | 15.6 | 71 | 3.2 | 2.52 | 0.10 | 1.5 | BDL | 9.5 | 1.4 | 18 | 0.160 | 0.349 | 10.9 |
| IIIC-2 21-32 cm | 2/15/96 | 1.0003 | 5 | | 39-42 v.light red | 21 | BDL | 14 | BDL | 13.5 | 220 | 1.6 | 0.824 | 0.34 | 1.3 | BDL | 4.7 | BDL | 31 | 0.122 | 0.145 | 12.2 |
| IIIC-2 32-39cm | 2/15/96 | 0.9977 | 5 | | | 19 | BDL | 9.6 | BDL | 1.33 | 21 | 1.2 | 0.289 | BDL | 1.5 | BDL | 1.5 | BDL | 8.9 | 0.060 | 0.096 | 2.29 |
| IIIC-2 39-42cm | 2/15/96 | 0.8606 | 5 | | | 17 | BDL | 9.0 | BDL | 1.29 | 36 | 1.0 | 0.290 | 0.07 | 1.1 | BDL | 1.6 | BDL | 9.4 | 0.060 | 0.080 | 2.24 |
| IIIC-3 0-11cm | 1/26/96 | 1.0027 | 5 | 14 cm | 0-11 green | 31 | 0.24 | 17 | BDL | 5.92 | 23 | 2.6 | 1.55 | BDL | 2.4 | BDL | 3.1 | 0.55 | 14 | 0.119 | 0.234 | 5.57 |
| IIIC-3 11-17cm | 1/26/96 | 0.9989 | 5 | | 11-17 light red | 22 | 0.48 | 12 | BDL | 3.11 | 35 | 1.5 | 0.537 | 0.06 | 2.1 | BDL | 2.7 | 0.67 | 11 | 0.082 | 0.145 | 3.23 |
| IIIC-3 17-31cm | 1/26/96 | 1.0038 | 5 | | 17-42 white | 22 | BDL | 10 | BDL | 1.05 | 3.4 | 1.3 | 0.286 | BDL | 1.6 | 0.18 | 0.9 | BDL | 8.3 | 0.061 | 0.137 | 3.51 |
| IIIC-3 31-42cm | 1/26/96 | 1.0021 | 5 | | | 30 | BDL | 11 | BDL | 0.636 | 2.6 | 1.7 | 0.239 | BDL | 2.1 | 0.13 | BDL | BDL | 9.1 | 0.068 | 0.148 | 2.91 |
| IIIC-2 10-21 ALGAE COATINGS | | | | | 32-39 white | 46 | 1.9 | 42 | 0.122 | 37.9 | 130 | 9.0 | 8.05 | 0.20 | 2.7 | BDL | 20 | 3.7 | 40 | 0.372 | 0.909 | 29.8 |

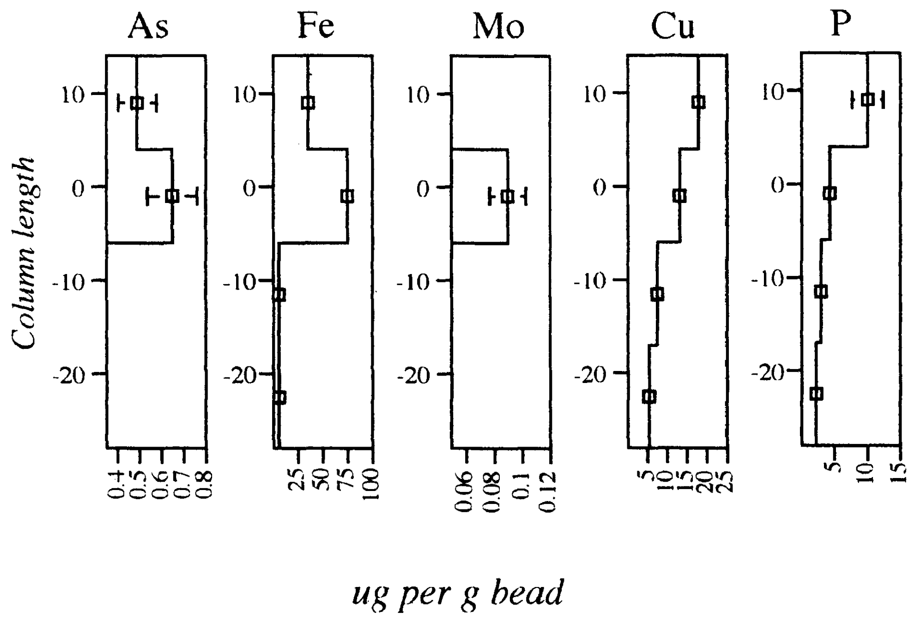
# Bead Column IA-2

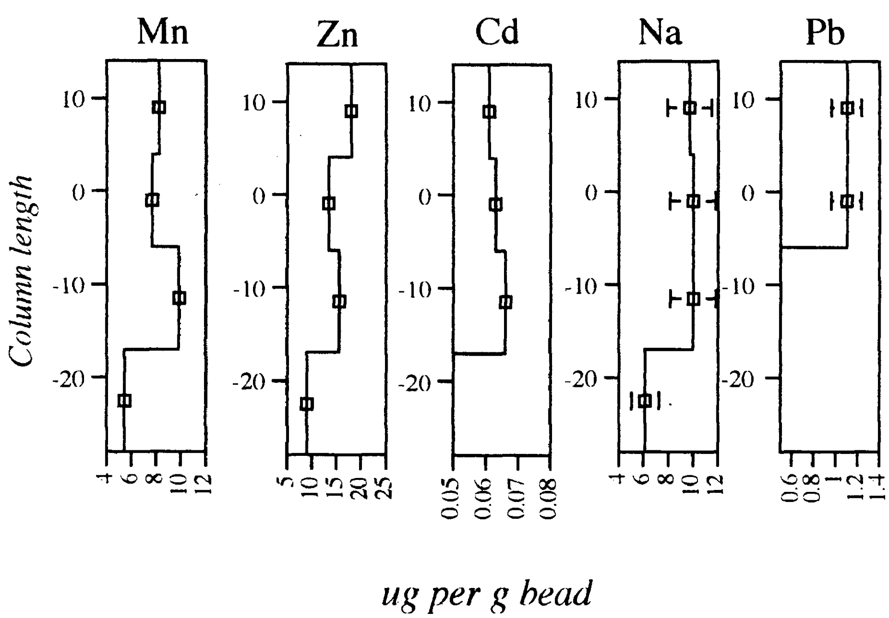



*BDL/ No significant trends: Al, Si, Sr*

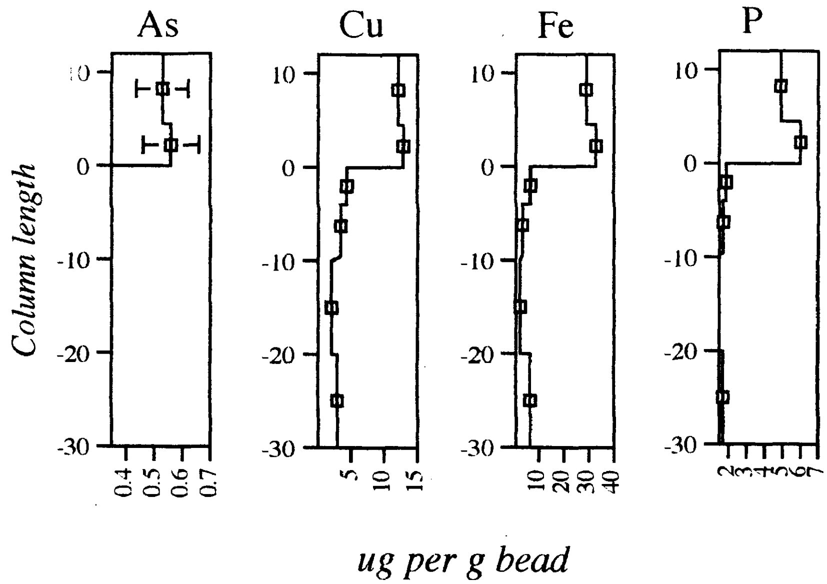
# Bead Column IA-3

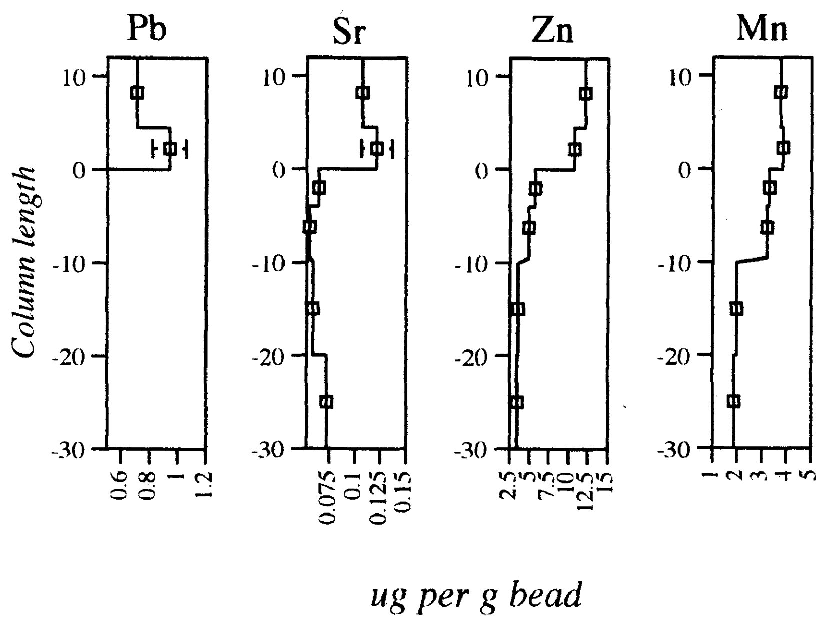



*BDL or insignificant trend:*
*Al, Ca, Mg, Si, Ti*

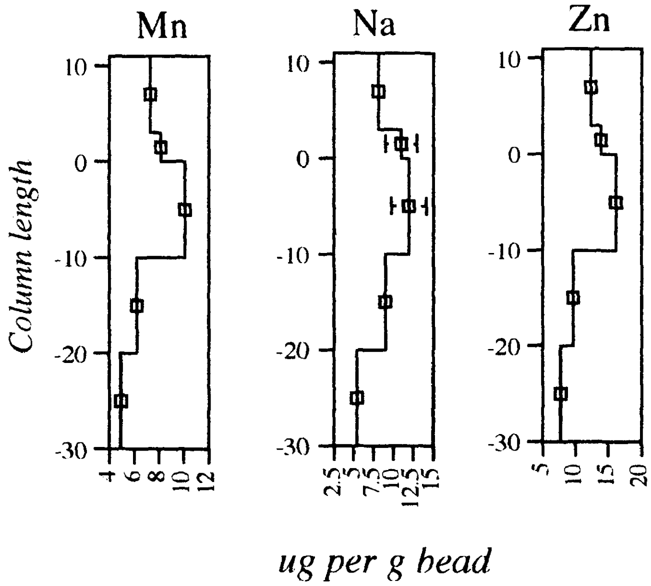
# Bead Column IB-2

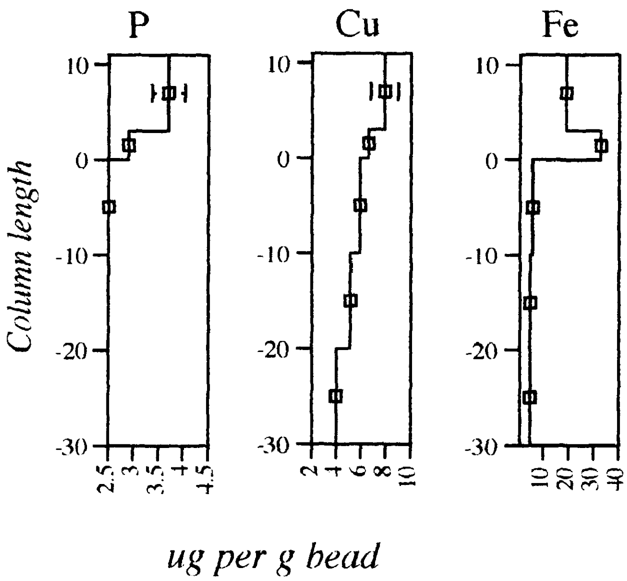



*BDL/ Insignificant trends:*
*Al, Ca, Cd, Mg, Mo, Na, Si*

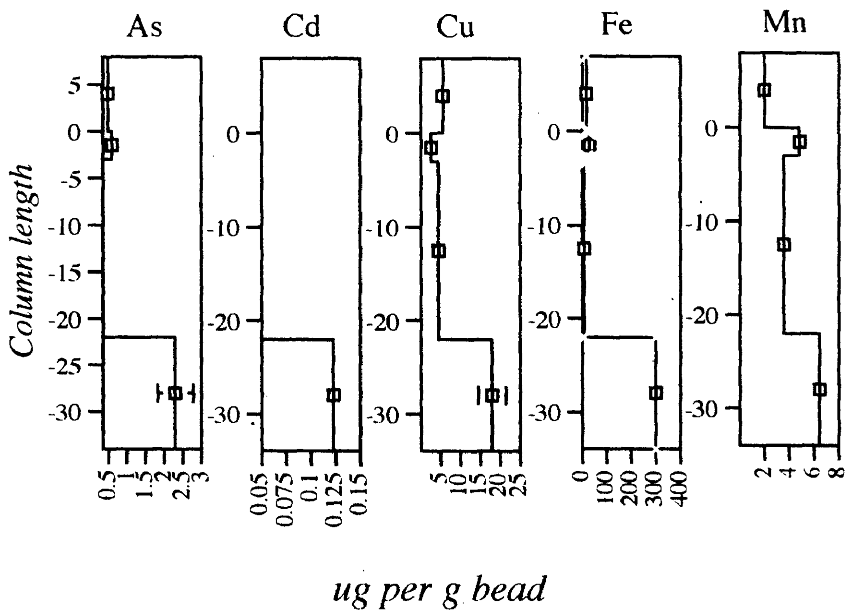
# Bead Column IB-3

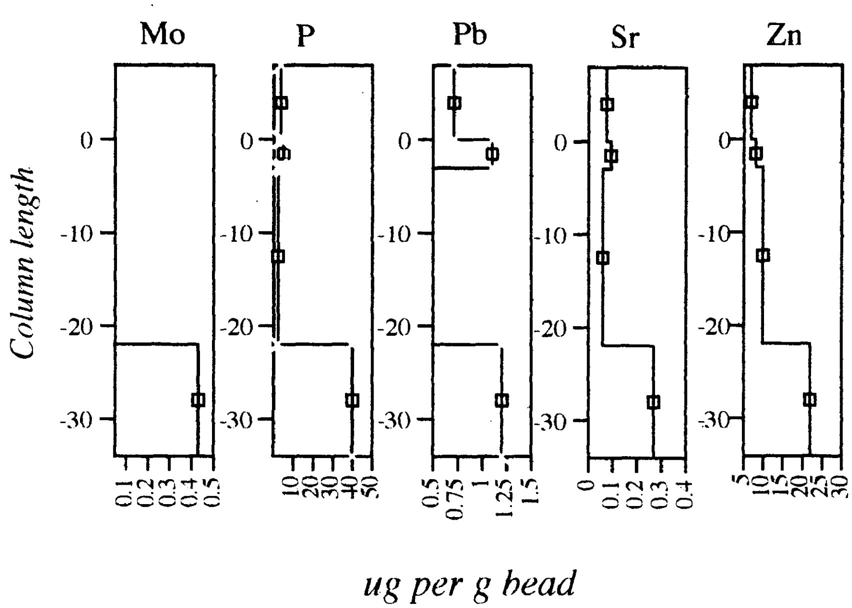



*BDL/ No significant trends:*
*Al, Ca, Cd, Mo, Pb, Si, Sr, Ti*

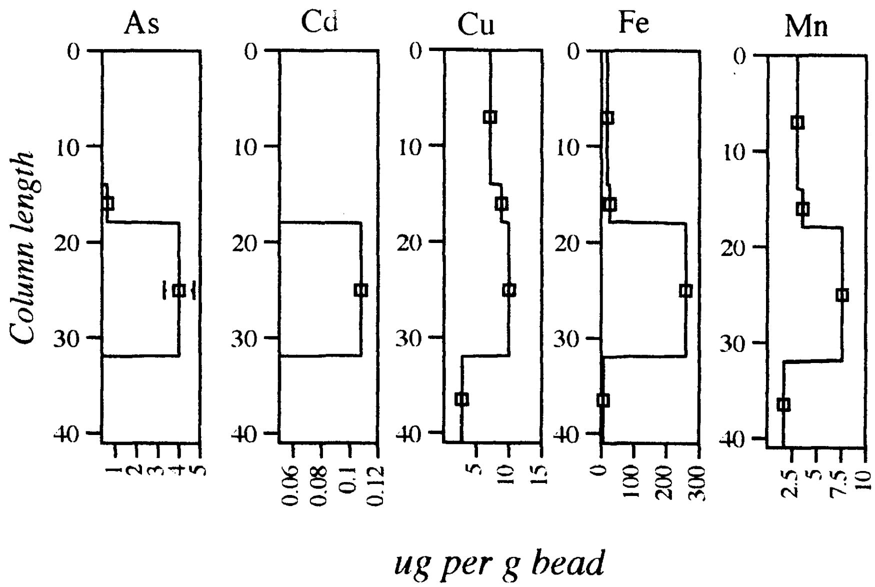
# Bead Column IC-1

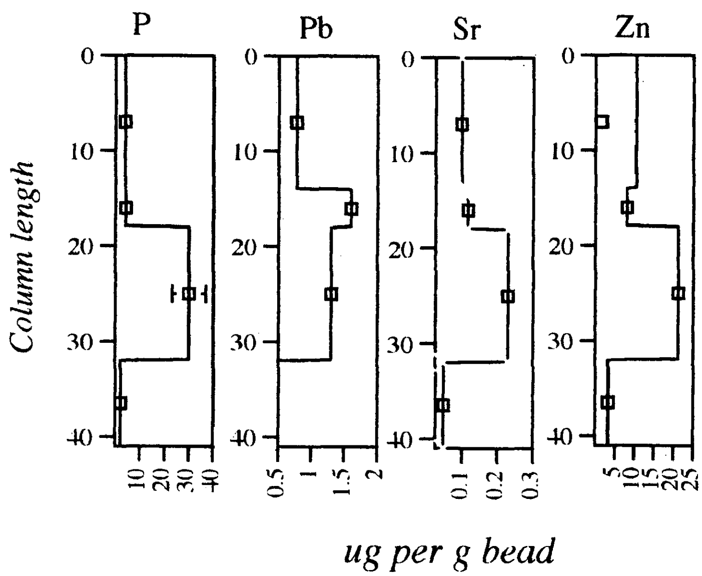



*BDL/ No significant trend:*
*Al, Ca, Mg, Na, Si, Ti*

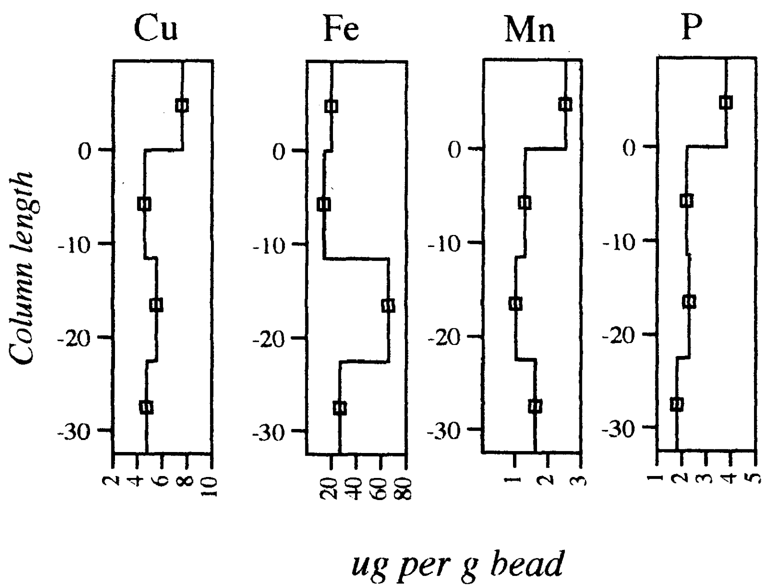
# Bead column IC-2

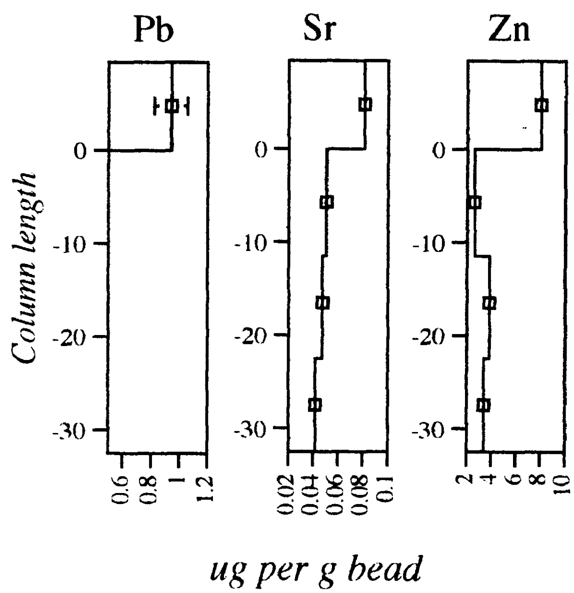



*BDL/ No siginificant trend:*
*Al, Ca, Mo, Na, Si, Ti.* Mo

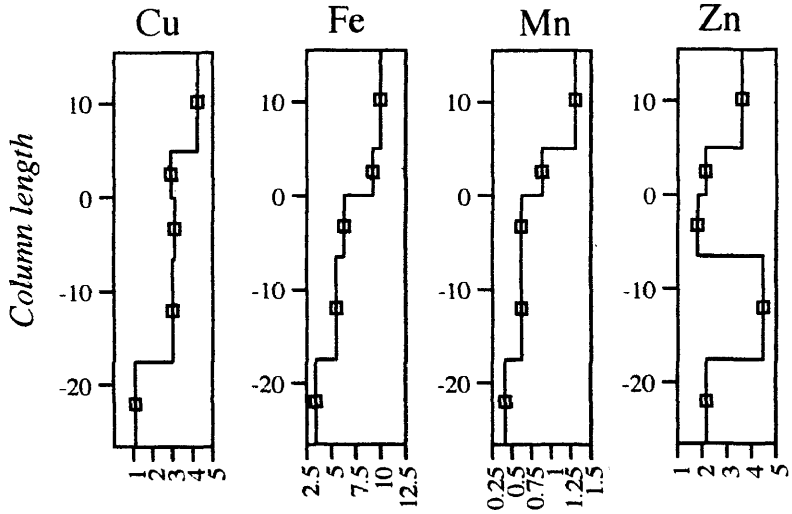
# Bead column IC-3




*BDL/ No significant trend:*
*Al, Ca, Cd, Mg, Mo, Na, Si, Ti*

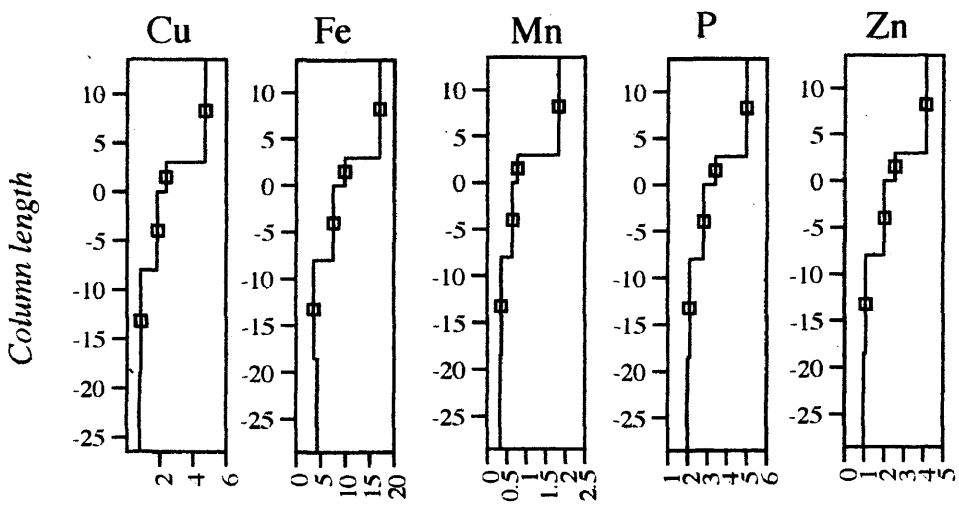
# Bead Column IIA-1




*ug per g bead*

*BDL/ No siginificant trend:*
*Al, As, Ca, Cd, Mg, Mo, Na, P, Pb, Si, Sr, Ti*

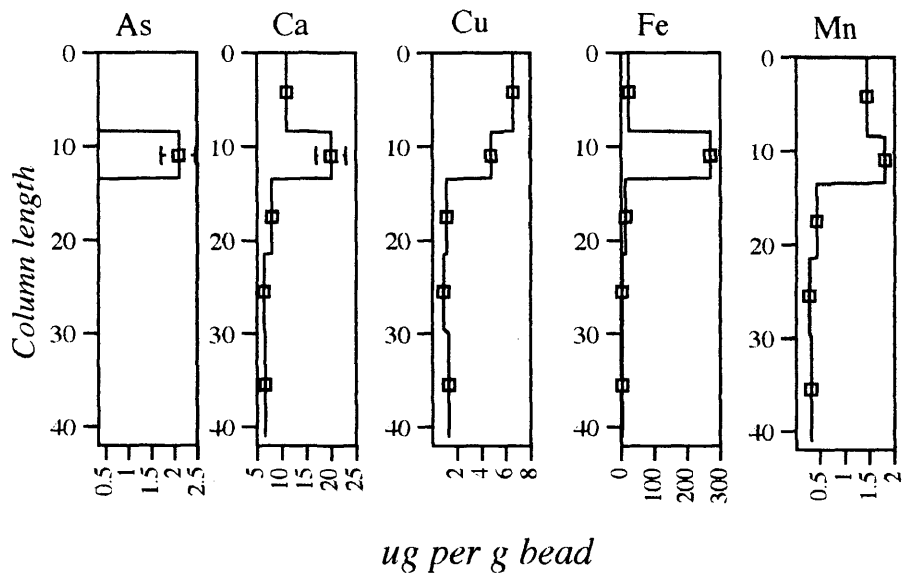
# Bead Column IIA-2

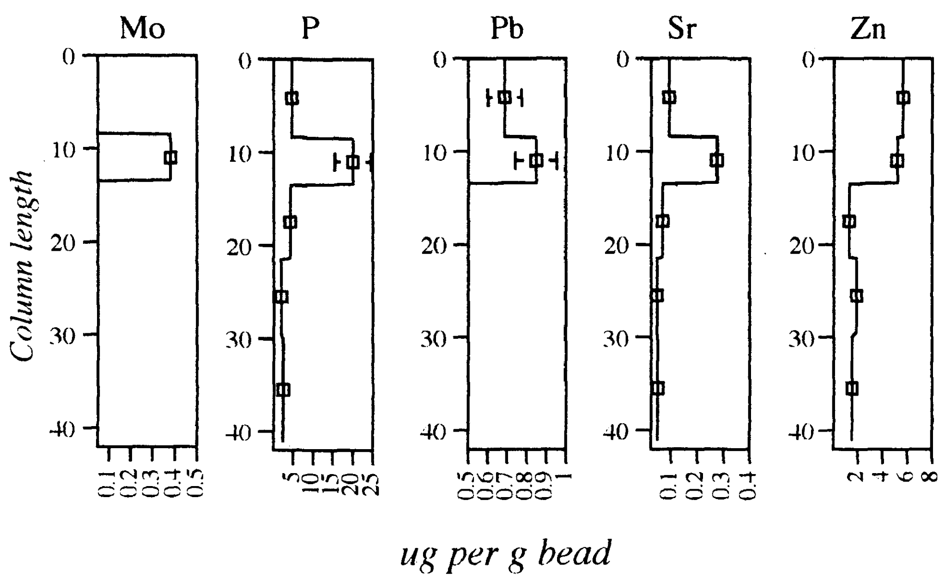



*ug per g bead*

*BDL/ No significant trend:*
*Al, As, Ca, Cd, Mg, Mo, Pb, Si, Sr, Ti*

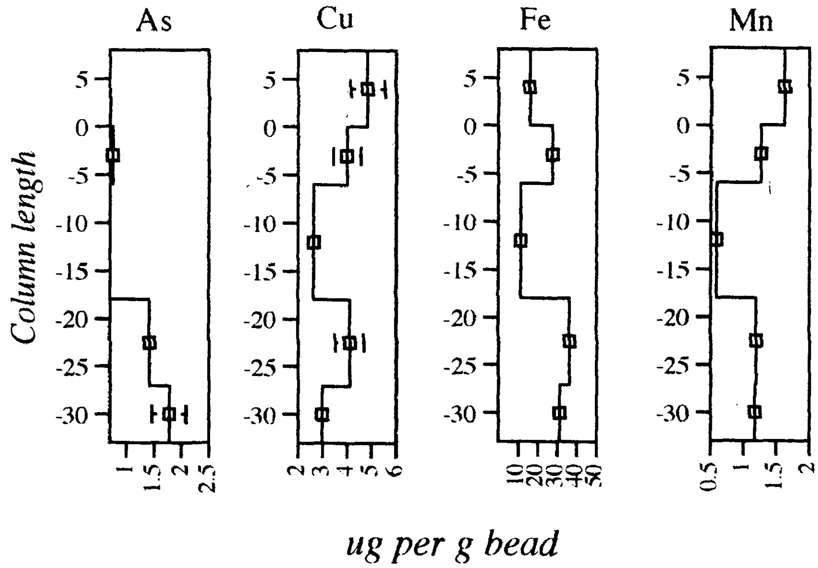
# Bead column IIA-3

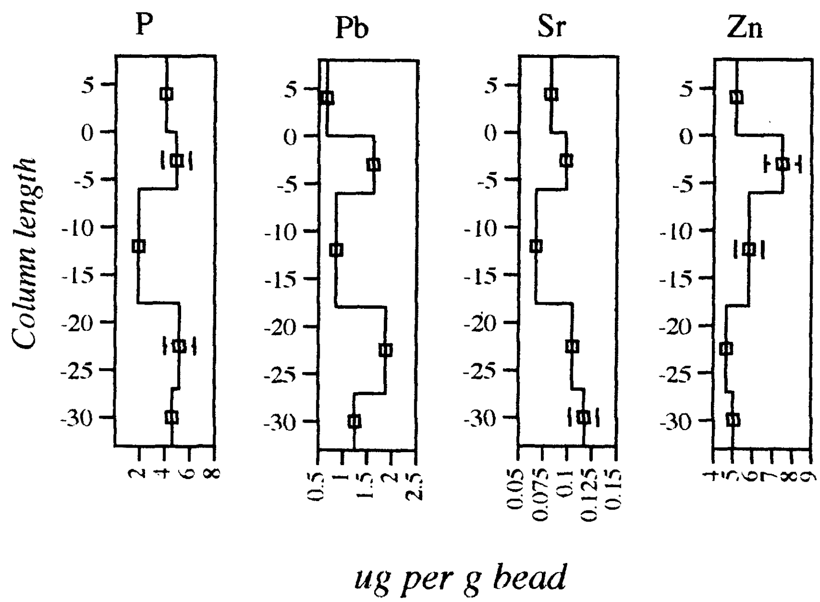



*BDL/ No significant trend:*
*Al, Cd, Mg, Si, Ti*

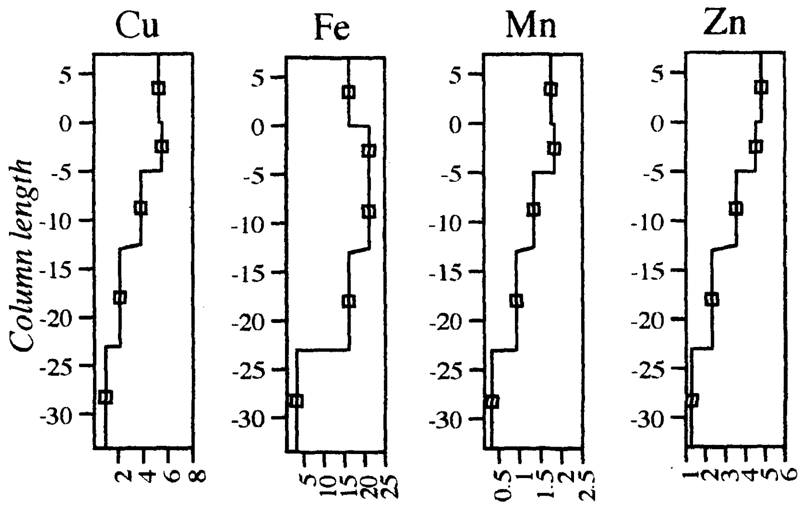
# Bead column IIB-1




*BDL/ No significant trend:*
*Al, Ca, Cd, Mg, Na, Si, Ti*

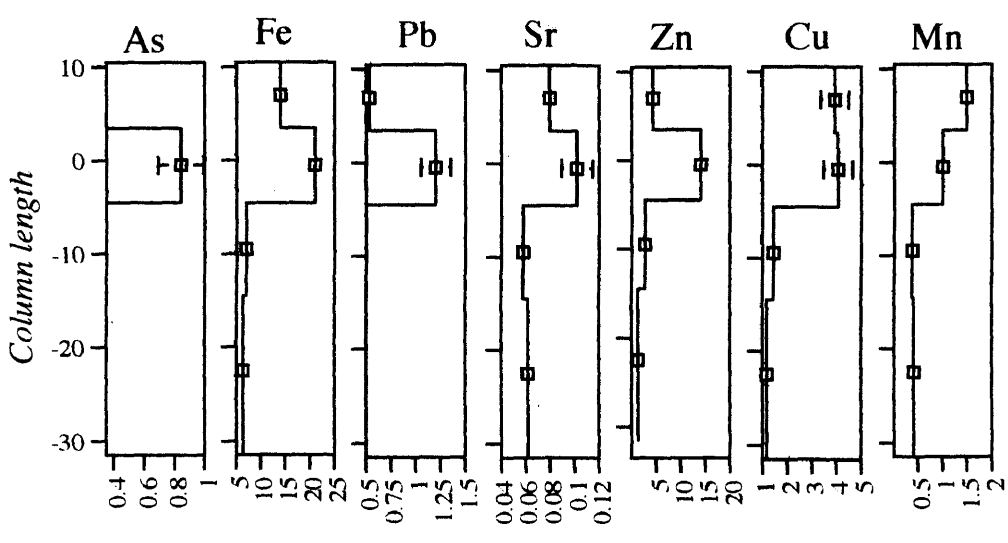
# Bead Column IIB-2




*ug per g bead*

*BDL/ No siginificant trend:*
*Al, As, Ca, Cd, Mg, Mo, Na, P, Pb, Si, Sr, Ti*

# Bead column IIB-3

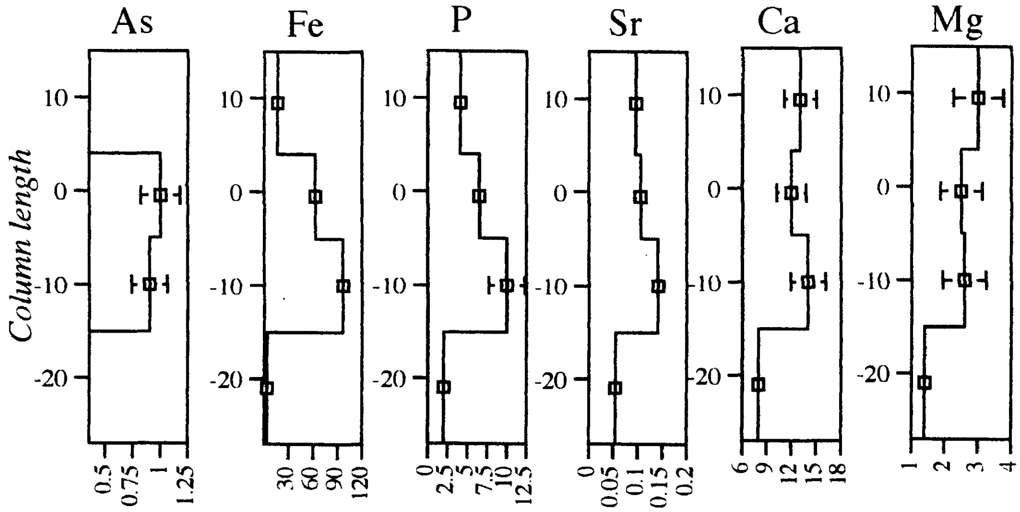



*ug per g bead*

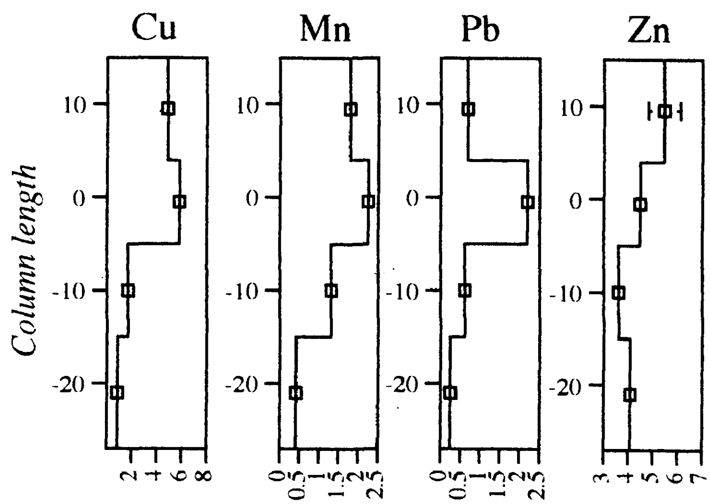
*BDL/ No significant trends:*
*Al, Ca, Cd, Mg, Na, P, Si, Ti*

# Bead Column IIC-1





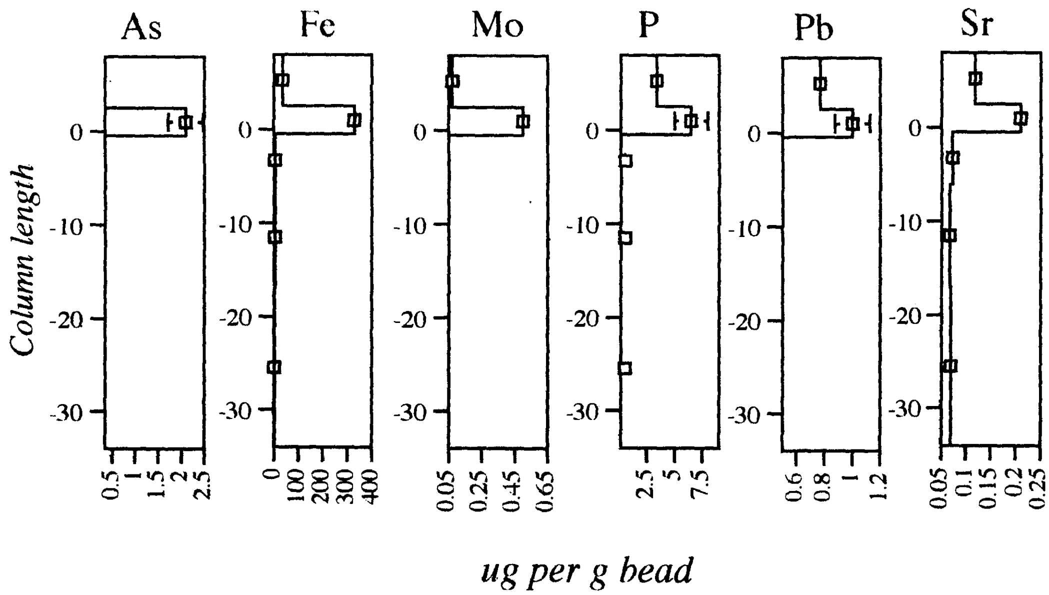

*ug per g bead*

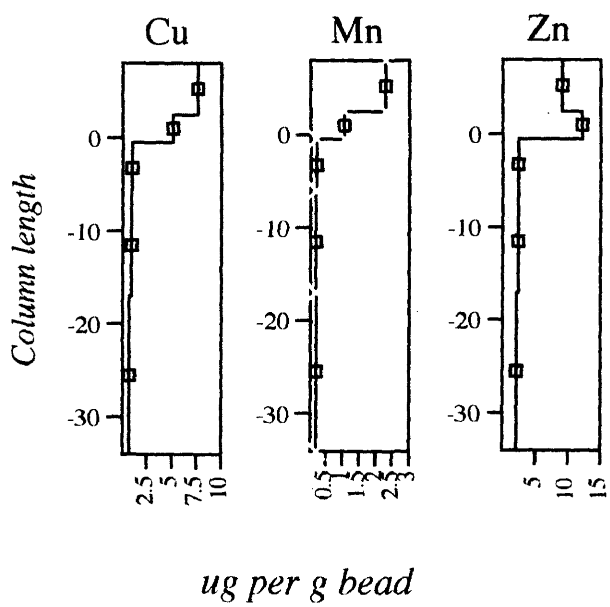



*ug per g bead*

*BDL/ No siginificant trend:*
*Al, Cd, Mo, Na, Si, Ti*

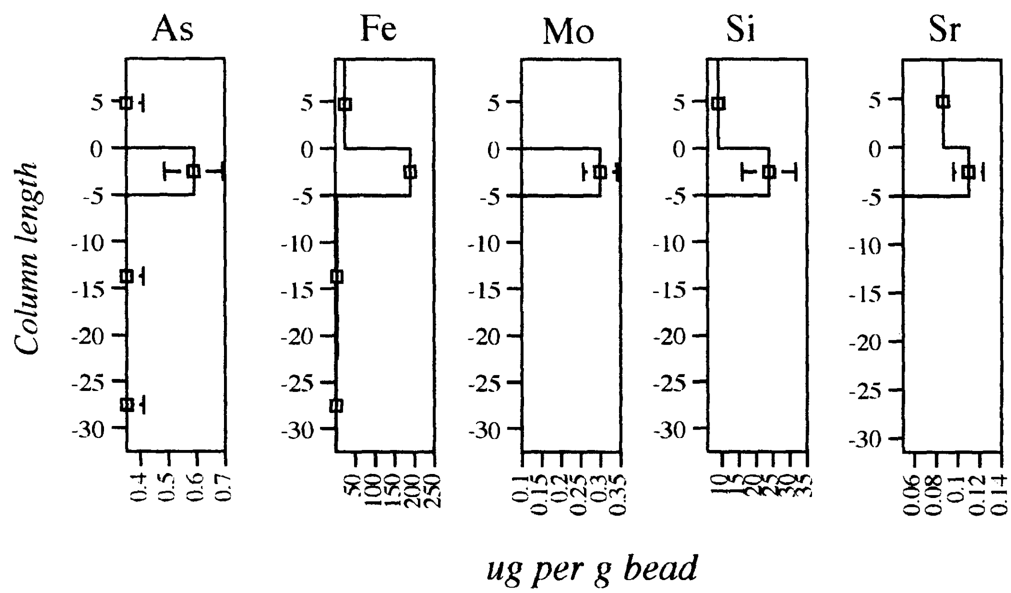
# Bead column IIIA-1

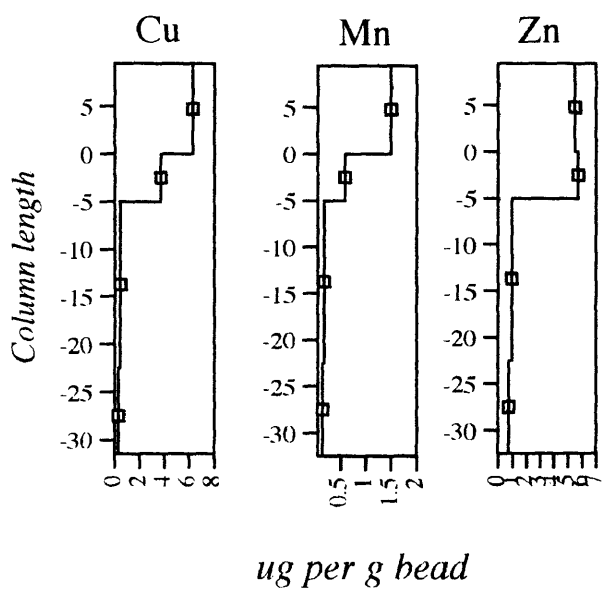



*BDL/ No siginificant trend:*
*Al, Ca, Cd, Mg, Na, Si, Ti*

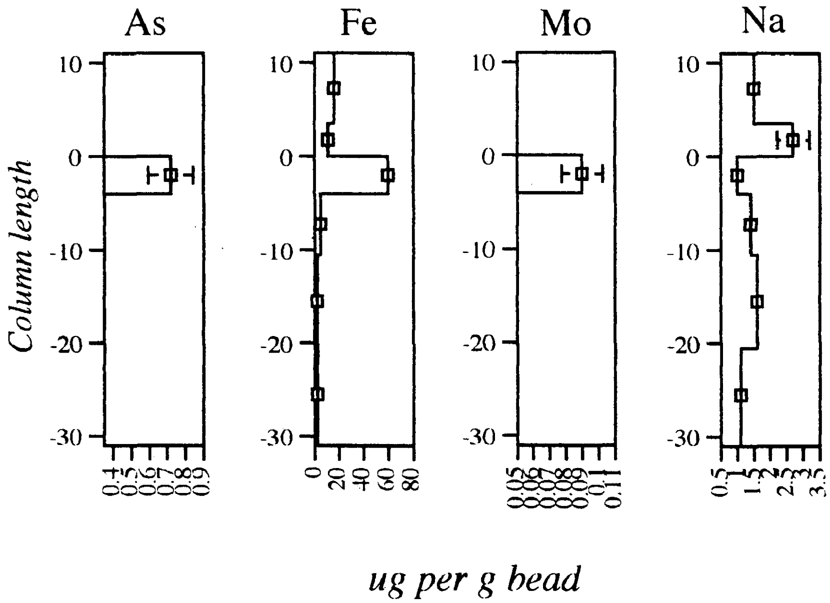
# Bead column IIIA-2

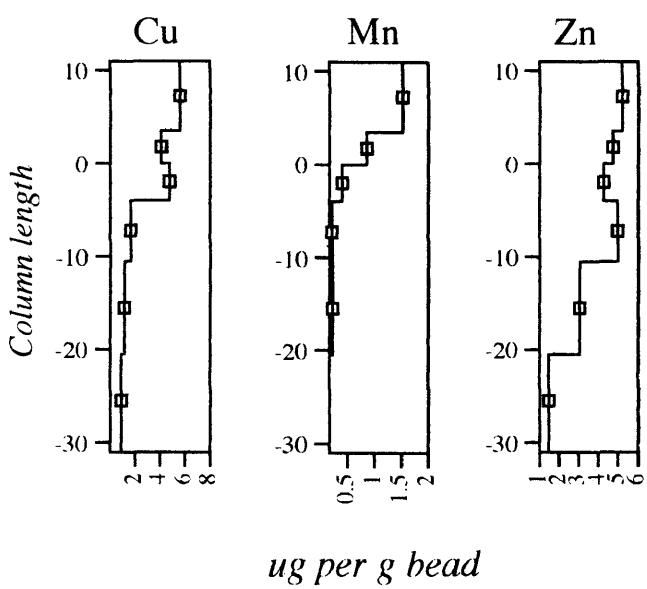



*BDL/ No significant trends:*
*Al, Ca, Cd, Mg, Na, P, Pb, Ti*

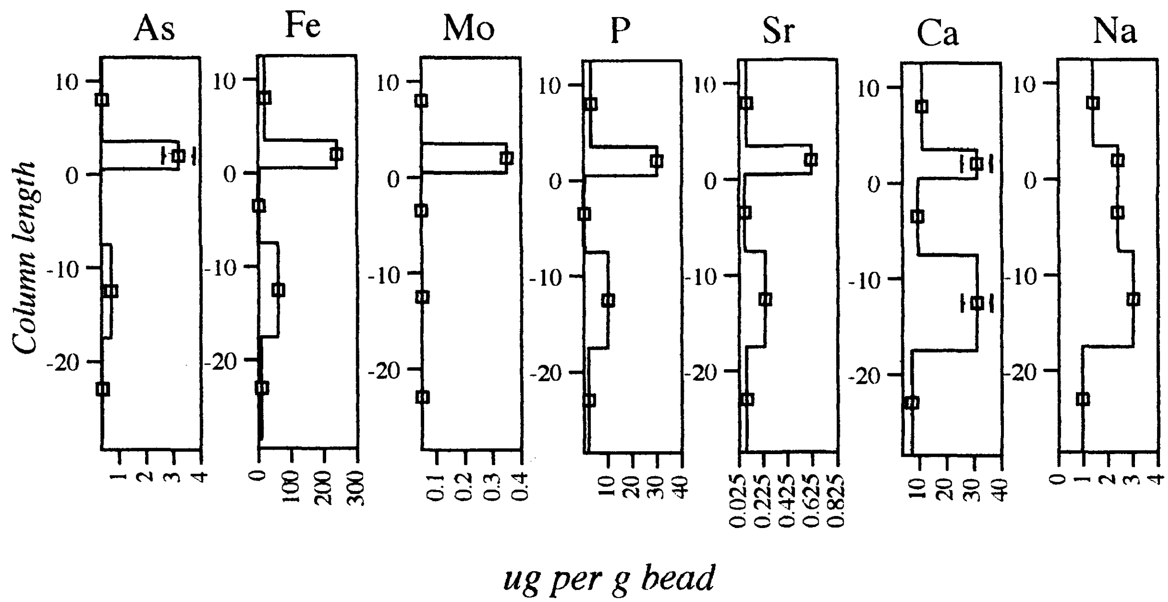
# Bead column IIIA-3

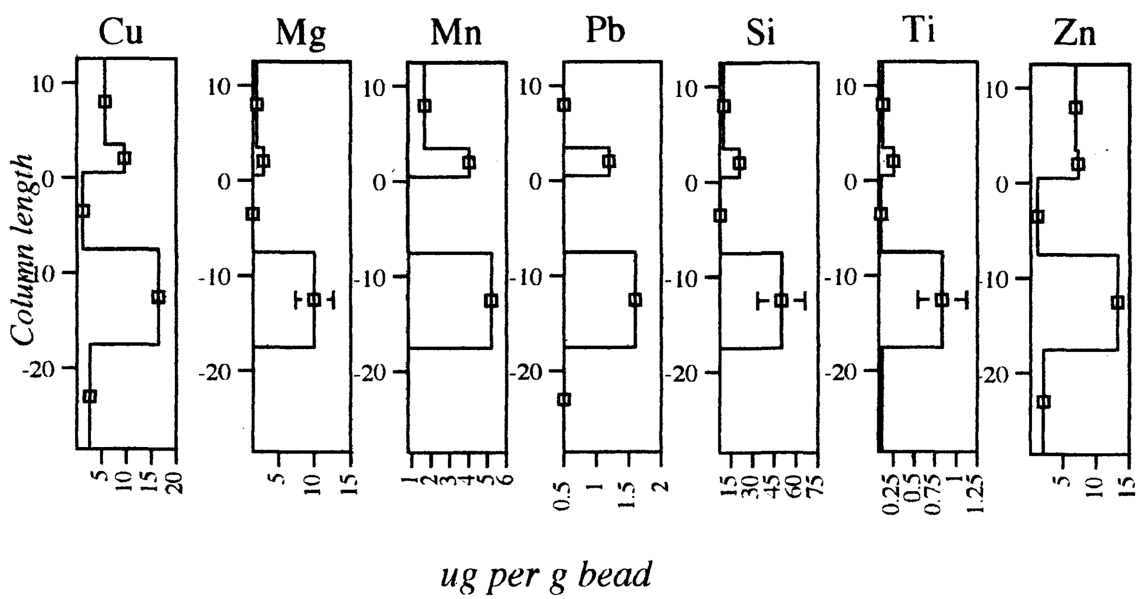



*BDL/ No significant trend:*
*Al, Ca, Cd, Mg, P, Pb, Si, Ti*

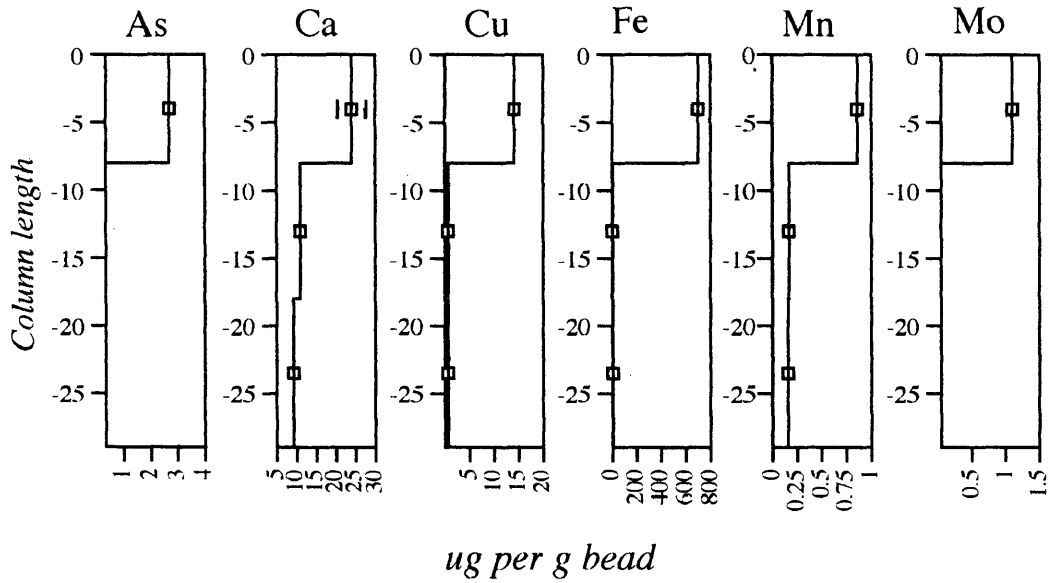
# Bead Column IIIB-1

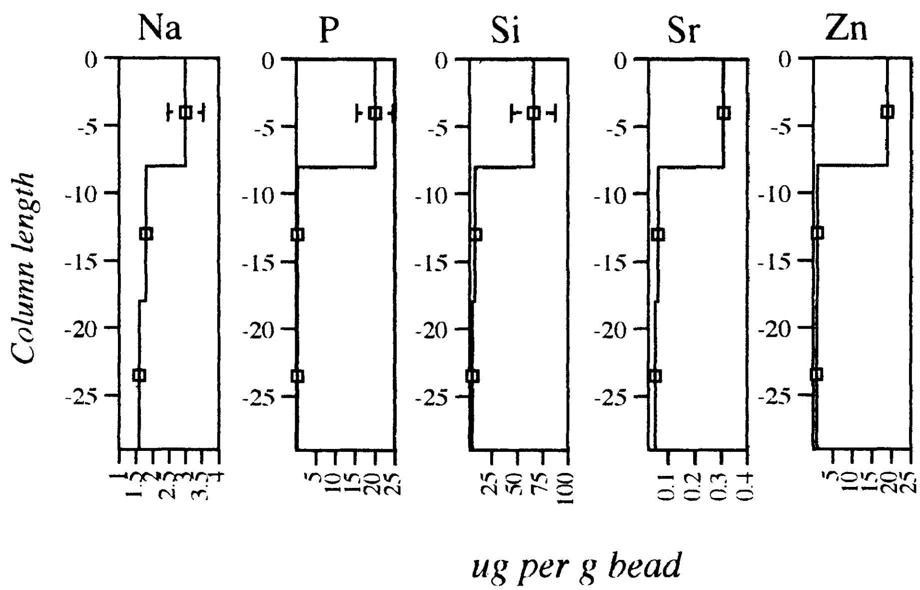



*BDL/ No significant trends:*
*Al, Cd*

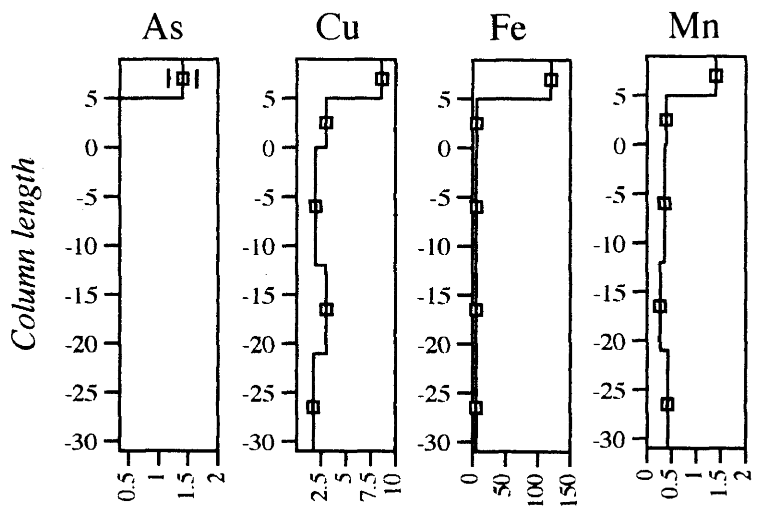
# Bead Column IIIB-2

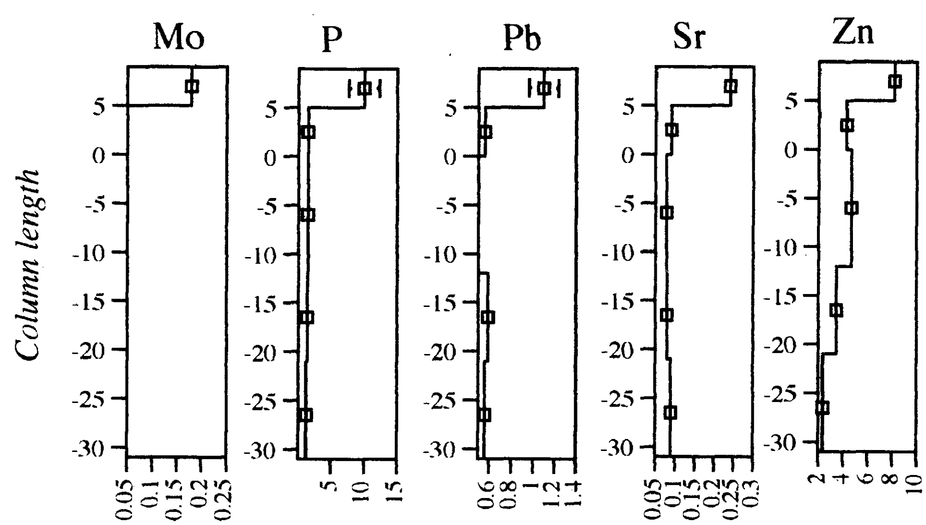



*BDL/ No significant trend:*
*Al, Cd, Mg, Pb, Ti*

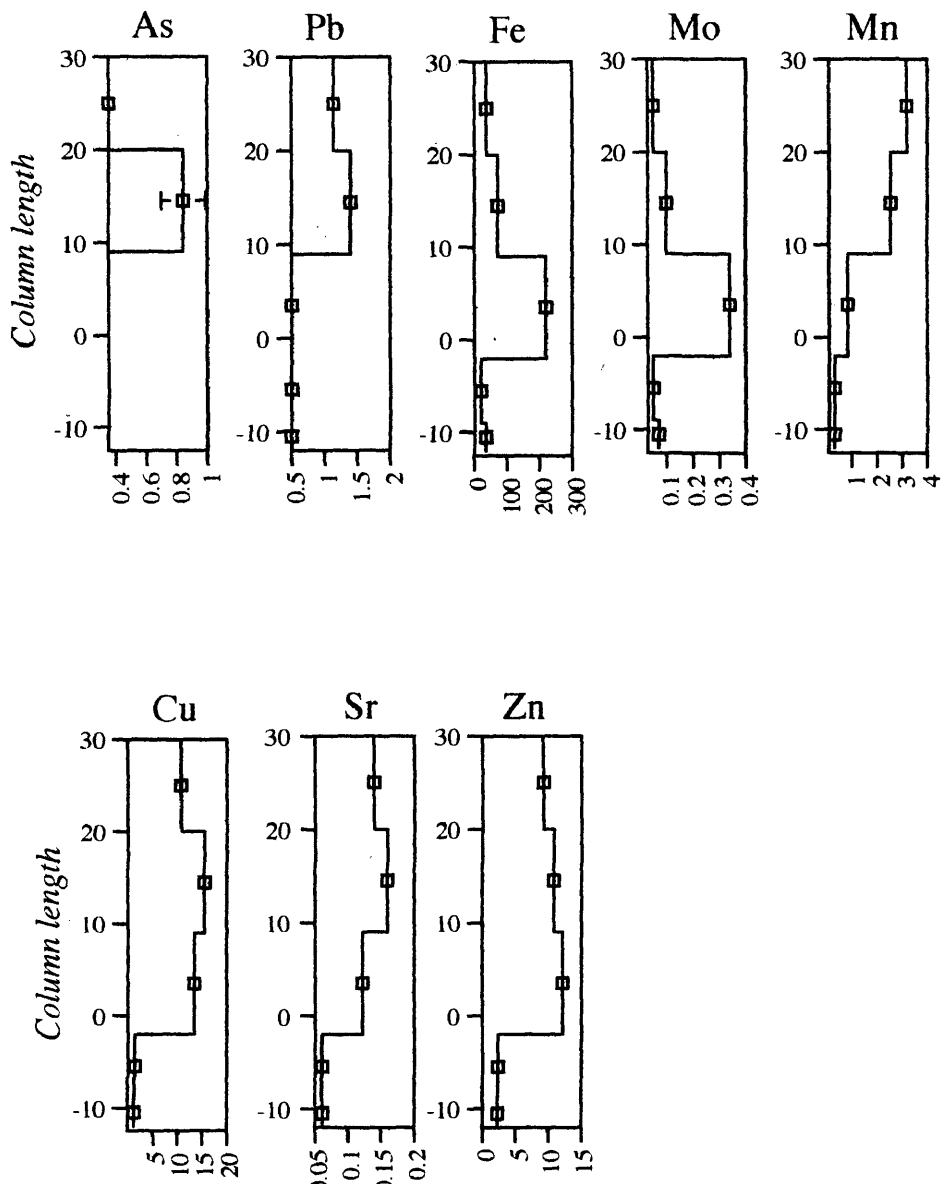
# Bead Column IIIB-3



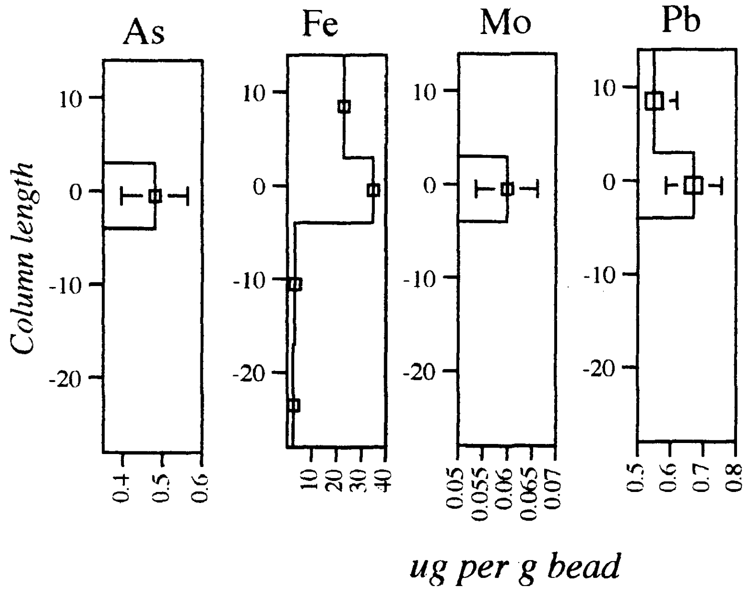

*BDL/ No significant trend:*
*Al, Ca, Cd, Mg, Na, Si, Ti*

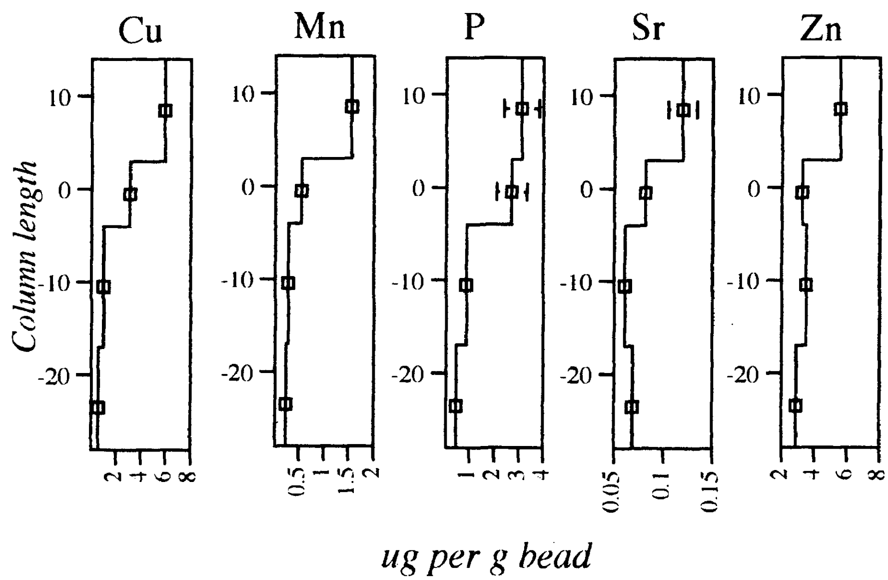
# Bead Column IIIC-2




*BDL/ No significant trend:*
*Al, Ca, Cd, Mg, Na, Si, Ti*

# Bead Column IIIC-3




*BDL/ No significant trends:*
*Al, Ca, Mg, Na, Si, Ti*

**Comparison of solid and dissolved phase metal ratios in the surface water:**

| (mean values) | IN SURFACE WATER (mg/L) (Dissolved phase) | | | | ON SURFACE WATER BEADS (ug/g bead) (Solid phase) | | | |
|---|---|---|---|---|---|---|---|---|
| | SITE I | SITE II | SITE III | **ALL SITES** | SITE I | SITE II | SITE III | **ALL SITES** |
| **Ca/Cu** | 352 | 392 | 337 | **358** | 1.2 | 2.2 | 2 | **1.8** |
| **Ca/Fe** | 293 | 288 | 313 | **296** | 0.46 | 0.65 | 0.7 | **0.58** |
| **Ca/Mg** | 4.6 | 4.6 | 4.6 | **4.6** | 2.5 | 4.1 | 5.81 | **4.3** |
| **Ca/Mn** | 61 | 55 | 54 | **58** | 2.7 | 6.4 | 8.13 | **6** |
| **Ca/Na** | 4.8 | 2 | 2 | **3.6** | 3 | 5.5 | 6.9 | **5.3** |
| **Ca/Zn** | 74 | 82 | 84 | **78** | 1.02 | 2.2 | 2.1 | **1.8** |
| **Fe/Cu** | 1.92 | 1.5 | 1.6 | **1.7** | 2.4 | 3.2 | 3.4 | **2.94** |
| **Fe/Mg** | 0.02 | 0.02 | 0.02 | **0.02** | 5.2 | 5.7 | 10.2 | **7.06** |
| **Fe/Mn** | 0.36 | 0.21 | 0.29 | **0.31** | 5.8 | 9.9 | 13.3 | **9.44** |
| **Fe/Na** | 0.01 | 0.01 | 0.01 | **0.01** | 6.2 | 8.2 | 8.7 | **7.4** |
| **Fe/Zn** | 0.43 | 0.29 | 0.41 | **0.39** | 2.2 | 3.5 | 3.4 | **2.99** |
| **Cu/Mg** | 0.01 | 0.01 | 0.01 | **0.01** | 2.1 | 1.8 | 2.9 | **2.3** |
| **Mg/Mn** | 13 | 12 | 12 | **13** | 1 | 1.7 | 1.5 | **1.4** |
| **Zn/Mn** | 0.83 | 0.67 | 0.63 | **0.71** | 2.5 | 2.9 | 3.8 | **2.99** |
| **Na/Cu** | 164 | 196 | 155 | **170** | 0.5 | 0.44 | 0.31 | **0.41** |
| **Na/Zn** | 37 | 41 | 39 | **39** | 0.4 | 0.44 | 0.31 | **0.39** |
| **Cu/Zn** | 0.21 | 0.20 | 0.22 | **0.21** | 0.9 | 1.1 | 1.02 | **1.01** |
| **Zn/Mg** | 0.06 | 0.06 | 0.06 | **0.06** | 2.4 | 1.8 | 2.8 | **2.4** |
| **Cu/Mn** | 0.17 | 0.14 | 0.17 | **0.16** | 2.3 | 3.2 | 3.9 | **3.1** |
| **Na/Mg** | 2.11 | 2.30 | 2.10 | **2.2** | 1.1 | 0.8 | 0.8 | **0.9** |
| **Mn/Na** | 0.19 | 0.04 | 0.04 | **0.12** | 1.1 | 1.0 | 0.96 | **1.01** |

This table was used to find the sequence of preferential precipitation in the surface water, which is found to be Fe>Cu>Zn>Mn>Na>Mg>Ca.