UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

ASSESSMENT OF GEOCHEMICAL VARIABILITY AND A LISTING OF GEOCHEMICAL DATA FOR SOILS, DRAIN SEDIMENTS, ALFALFA, GREASEWOOD, GROUNDWATER AND WATER EXTRACTABLE SOIL CONSTITUENTS FROM THE TJ-DRAIN STUDY AREA, NEVADA

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CONTENTS

TABLES

TABLES--Continued

FIGURES

FIGURES--Continued

Page

APPENDICES

INTRODUCTION

In 1990, the U.S. Geological Survey (USGS) and the Bureau of Reclamation (BOR) conducted a joint investigation designed to evaluate the geochemical processes at work in the TJ-Drain study area, located in west central Nevada. The purpose of the study was to accumulate baseline information on soils, plants, surface water and ground water in order to determine the effect of irrigation on water quality in the area. Results from this study would be incorporated into a regional irrigation plan examining the optimized use of irrigation waters while minimizing adverse environmental effects in the area.

The TJD study area (18,000 acres) is located in west central Nevada, approximately 83 mi east of Carson City (fig. 1), near the town of Fallon, Nevada. The study area encompasses lands on the Fallon Indian Reservation and several private farms east of the reservation. The study site is bordered on the south by Mission Road, and on the north by the intersection of Indian Lakes and West County Roads. The west side boundary line was constructed approximately 2 mi west of, and parallel to TJD. The east side boundary roughly parallels West County Road in the northeast section of the study area and Stillwater Slough in the southeast.

The study area is influenced by several natural and man-made hydrologic systems including Stillwater National Wildlife Refuge (SNWR), TJ-Drain, Paiute Drain, Stillwater Slough and the local groundwater. The TJ-Drain (TJD) system was of highest concern due to previous studies (Hoffman and others, 1990) which indicated that return flow waters and sediments in TJD contained elevated concentrations of several elements. It was believed that these elevated concentrations could adversely affect downstream waterfowl in the SNWR. Due to these concerns, efforts focused on the TJD system in an attempt to provide detailed information on element distributions within the drain and surrounding area. Because of differences in land use, hydrology and agricultural activity, etc., investigations were expanded beyond the TJD service area to examine how other locations in the study area are affected compared to TJD. This report presents analytical results for the various sample media tested and preliminary data interpretation.

Soils in the general area (Strahorn and Van Duyne, 1911; Dollarhide, 1975) are alkaline in nature and range in consistency from sands to clays, with medium textures predominating. Geochemical surveys (Tidball and others, 1989; Hoffman and others, 1990) conducted in and around the TJD study area indicate that concentrations of boron, arsenic, mercury and selenium may exceed geochemical baseline values for western soils (Shacklette and Boerngen, 1984). These anomalous concentrations may be the result of several factors including climatic conditions, source rock geochemistry, irrigation, and historical mining operations.

SAMPLE COLLECTION

Sediment Samples

A total of 23 sediment samples were collected along TJD at half-mile intervals (fig. 2). A 1-in. stainless steel core sampler containing a removable plastic liner was used. At each site sediment samples were collected as close as possible to the center of the drain. The sampler was driven into the sediment a minimum of 6 in. In cases where water depth in the middle of the drain exceeded 3 ft, sampling occurred below the water surface but closer to the edge of the drain. After sampling, the plastic liner was removed, standing water poured off, the liner capped, labeled, and shipped to the lab at ambient temperature. Field identification codes for TJD sediments were designated as CS## (ex. CS18). The ## term refers to drain site location with numbers decreasing in a northerly direction towards the entrance to Stillwater National Wildlife Refuge.

Soil Samples

Soil samples were obtained using two sample collection formats. The first sample collection format utilized a grid pattern with sample sites located at approximately 1-mi intervals. At these locations three samples were collected representing a surface, mid-depth, and water table depth. Field identification codes for samples collected using the grid format were designated as α #, ##-## (ex. D1, 7-8). Alpha (α) characters correspond to rows running west to east and ranged from A to G. The # values correspond to grid lines running north to south and ranged from 1 to 7 (fig. 2). The ##-## designation corresponds to the depth of collection.

Surface soil samples were collected using a 1-in. stainless steel soil coring device lined with a removable plastic tube. The plastic tube was removed after sample collection, capped and identified with a site location code (ex. A1, 0-1). After the surface sample was obtained, hand-coring continued using a 3-in. stainless steel coring device. At a depth of 2 ft a section of core was isolated and tagged with site location and depth (ex. A1, 2-3). The coring then continued until ground water was reached. At this depth a final sample was collected, and identified with appropriate site location and collection depth (ex. A1, 10-11). Depth of collection for water table samples varied between 5 and 17 ft.

The second soil collection format identified six additional sites (center points) selected randomly at the outset of the study. Center point locations were selected to examine vertical trends in the soil profile. The six sites selected focused on active agricultural areas, proximity to TJD, and location relative to the Stillwater National Wildlife Refuge. At these locations soil samples were collected continuously down to the water table using a 3-in. diameter hand corer. Each 1-ft segment was identified with its collection depth, packaged and sent to the lab for analysis. Field identification codes for center point locations used the following format, CP#, ##-## (ex. CP5, 8-9). CP# identifies center point sample site (1 to 6) and ##-## corresponds to sample collection interval.

Plant Samples

Plant samples were collected at each soil collection site. Due to major differences in agricultural activity, two plant species alfalfa (*Medicago sativa* L.) and greasewood [*Sarcobatus vermiculatus* (Hook.) Torr.] were selected. Greasewood samples were collected primarily in northern and western sections of the study area where there is minimal irrigation. Alfalfa samples were collected primarily in the southern study area where irrigation was available. In cases where both plant species were observed, samples of both were obtained and labeled with the same collection site identification. At sites where neither plant was available, no other plant type was collected. The collection procedure for alfalfa samples involved cutting the plant approximately 1-in. above the ground, shaking to remove extraneous material and then storing in plastic bags. Greasewood samples were obtained from the new growth sections of the plant, generally the outer 6 in. of each branch. Field identification of plant samples corresponds to soil collection sites.

Water Samples

Both drain and ground water samples were collected in this study. TJD water samples were obtained at sediment collection sites using a 5-gal polyethylene bucket. Water samples were filtered into two 100-mL polyethylene containers using 0.45 micron filters. The first aliquot was identified for metals analysis and spiked with approximately 2 mL of concentrated (16<u>M</u>) nitric acid. The second aliquot, destined for anion analysis was left untreated.

Ground water samples were collected at all grid and center point locations. The samples were obtained after the soil cores had been prepared. Ground water was transported to the surface using an electrical pump and allowed to flow until clear.

Approximately 400 mL of ground water was obtained, filtered through a 0.45 micron filter and split into two 100 mL aliquots. One aliquot was prepared for metals analysis by spiking it with 2 mL of concentrated nitric acid (16<u>M</u>). The second aliquot to be used for anion analysis was left untreated. All samples were shipped to the laboratory at ambient temperature.

SAMPLE PREPARATION

Soil and Sediment Samples

Soil and sediment samples were dried at room temperature for a minimum of 3 days. Soil samples were disaggregated using a ceramic auger and sieved using a 2-mm screen. The <2 mm soil material was passed through a riffle splitter and a representative split obtained. Soil samples were then ground using a Bico vertical grinder, equipped with 6-in. ceramic plates. Ground material (<100 mesh) was placed in 3-oz containers and mixed for 1 h. Sediment samples were dried at room temperature for 3 days, and then ground (<100 mesh) using the Bico vertical grinder. Sediment samples were finally transfered to 3-oz containers and mixed.

Plant Samples

Plant samples were disagregated by hand and washed with deionized water to remove surface contamination. The cleaned plant material was dried and then macerated using a Wiley Mill (No. 4) equipped with a 2-mm screen. The final material (<2 mm) was split into two aliquots. One portion was ashed at 300 °C and used for trace and major element analyses. A second unashed fraction was used for selenium and arsenic analyses.

Water Extraction Procedures

Two water extraction procedures were used in this study, and are discussed below. The first procedure, designated a constant extraction ratio (CER) method, combined deionized water with a ground soil sample (<100 mesh) in a 1:5 soil to water ratio. In this procedure 20.0 g of soil were transferred to a 125-mL polyethylene bottle, and 100 mL of deionized water added. The container was sealed, and placed on a horizontal shaker operating at 2 oscillations/sec for 16 h. The next day the bottle was centrifuged at 1,500 rpm for a period of 30 min, to separate solid and aqueous phases. The solution phase was transferred to a high speed polyethylene centrifuge tube (45 mL) and centrifuged at 9,000 rpm for 20 min. The supernatant was then filtered using a disposable 5-cc syringe and 0.45 micron filter. Three aliquiots of the solution were prepared for multielement ICP, hydride, Hg, and anion analyses. The first aliquot (40 mL) for ICP and hydride analyses was preserved using 1 mL of concentrated (16$\underline{M}$) nitric acid. The second aliquot (19 mL) was preserved for mercury analysis by addition of 1 mL of a dichromate/nitric acid. The third aliquot was untreated and designated for anion, pH, and conductivity measurements.

A water saturation paste extraction (WSP) was the second procedure and was performed by BOR personnel using the following format. Air dried soil was ground to pass a 2-mm sieve. Approximately 600 mL of sieved material was added to a tared 800-mL plastic beaker and the weight recorded. Distilled water was added to the soil sample until the mixture's surface glistened, flowed slightly when the cup was tipped, and slid cleanly off the mixing spatula. The beaker was then covered with a watch glass and allowed to sit overnight. The next day an 8-in. diameter porcelain buchner funnel equipped with a Whatman #42 filter paper was prepared and the saturation paste filtered, until 20 mL of extract was obtained. The extract was transferred to prelabeled containers, spiked with 2mL of 16$\underline{M}$ HNO_3, sealed and stored for analysis. Percent saturation was calculated for each sample by preparing a separate 5-g aliquot of saturated material, drying it overnight and reweighing. The weight of the water lost is divided by the dry weight, and a percent saturation calculated.

ANALYTICAL PROCEDURES

Results reported in this study are based on analyses performed only at the USGS, Branch of Geochemistry laboratories in Denver, Colorado. A listing of element determination limits for the techniques used in the study are presented in table 1. Determination limits presented in table 1 are for the "standard" analytical procedures used, and don't reflect correction factors (% saturation, % ash) introduced in the sample preparation step. Results reported in Appendices E, F, H, and I reflect corrected determination limits based on a combination of table 1 values and the sample preparation procedure used.

Soil and Sediment Samples

Hydride Generation—Atomic Absorption Spectroscopy (HYG-AAS)

Total arsenic and selenium were determined using established HYG-AAS techniques (Briggs and Crock, 1986: Crock and Lichte, 1982; Sanzalone, and Chao, 1987). In this procedure 0.25 g of sample was placed in a 30-mL teflon bomb, 1 mL of (16M) HNO_3 added and the sample predigested at room temperature for 1 h. The sample was then decomposed overnight at 100 °C using a combination of nitric, perchloric and hydrofluoric acids. Following overnight digestion, 25 mL of 50 percent (v/v) HCl was added and the solution allowed to stand for 1 h. The solution was finally transferred to a 60-mL polyethylene bottle, using deionized water and diluted to 54 g. The sample was then analyzed in a continuous flow hydride generation system calibrated with appropriate standards. The procedure has a percent relative standard deviation (%RSD) of approximately 10 percent.

Inductively-Coupled Argon Plasma—Atomic Emission Spectroscopy (ICAP-AES)

Samples were analyzed simultaneously for 40 trace and major elements using a Jarrell-Ash model 1160 ICAP-AES system. A 0.200 g aliquot of material was transferred to a 60-mL teflon bomb, spiked with 100 µL of a 500 µg/mL (ppm) lutetium internal standard solution and decomposed at 110 °C using a multiacid digestion procedure (Crock and others, 1983). The acidic solution was taken to dryness and the residue redissolved with 1 mL of aqua regia. The final solution was brought to a mass of 10.00 g with 1 percent nitric acid. Reagent blanks, reference materials, and sample replicates were all digested using the same procedure and analyzed simultaneously. Lower limits of determination are shown in table 1. The %RSD values vary between 2 and 15 percent depending on the element.

Cold Vapor—Atomic Absorption Spectroscopy (CV-AAS)

The total mercury concentration in soil samples was determined using CV-AAS. In this procedure (Kennedy and Crock, 1987), 0.100 g of sample was transferred to a 16 x 100-mm glass test tube, and 0.5 mL of sodium dichromate (25% W/V), and 2 mL nitric acid (16M) added. The tube was transferred to an aluminum heating block and the sample digested for 3 h at 110 °C. Following digestion, the sample was cooled and the volume adjusted to 12 mL with deionized water. Samples were transferred to an automated CV-AAS instrument and analyzed using a continuous flow arrangement. Quantification of the mercury signal utilized aqueous standards and appropriate linear regression procedures. The lower limit of determination is given in table 1. Percent relative standard deviation (%RSD) for the method is approximately 10 percent.

Water Samples

Hydride Generation—Atomic Absorption Spectroscopy (HG-AAS)

In this procedure 10 mL of sample was transferred to a 30-mL teflon bomb, and 1 mL of a saturated potassium persulfate solution added. The bomb was covered with a watch glass and allowed to sit for 1 h at room temperature. At the end of an hour, 1 mL of concentrated hydrochloric acid was added, the bomb recovered, and heated for 1 h at 110 °C. The bomb was then uncovered and heated until the volume was reduced to approximately 5 mL. A 2-mL aliquot of concentrated hydrochloric acid was then added, the bomb covered and heated for an additional hour. The solution was finally transferred to a 60-mL polyethylene bottle and brought to a final mass of 20 g with deionized water. The method's precision for As and Se is ± 10 percent.

Inductively-Coupled Plasma—Atomic Emission Spectroscopy (ICP-AES)

Due to elevated salt concentrations in water extractable samples, analyses were conducted directly on extracted solution without preconcentration. In this procedure a 100 μ L aliquot of a 500 ppm Lutetium standard was added to 50 mL of acidified sample solution. The spiked solution was then analyzed directly on the ICP-AES system (Baedecker, P., 1989). Precision for the method is between 5 and 10 percent depending on the element and concentration range.

Inductively-Coupled Argon Plasma—Mass Spectrometry (ICP-MS)

The ICP-MS procedure was used only for trace element determinations in TJD water samples. In the ICP-MS procedure 10 mL of acidified sample solution was spiked with 100 μ L of indium and lutetium stock (20 ppm) solutions. Samples were then analyzed using a Sciex-Elan model 250, ICP-MS equipped with an argon plasma and quadrapole mass spectrometer.

Ion Chromatography (IC)

Anion analyses were performed using a Dionex 2010 ion chromatograph equipped with a AG4A and AS4A columns. The method used a sodium carbonate (0.0020M)/sodium bicarbonate (0.00075M) eluent, flow rate of 1 mL/minute, with a back pressure of 850 psi. Chloride and sulfate concentrations were quantified using conductivity detection at the 30 or 100 μS full scale range. Peak height measurements and external standards were used for calibration. Precision for the method is ± 10 percent.

Plant Samples

Plant samples were analyzed for total element content using ICP-AES and HY-AAS. In the ICP-AES procedure a 0.1000 g aliquot of ashed plant material was used. The decomposition procedure is identical to that reported earlier for soils. Analysis for total As and Se by HY-AAS used an unashed aliquot of macerated plant sample. A 1.00 g of sample is transferred to a 250 Erlenmeyer flask and 20 mL of concentrated nitric added. The erlenmeyer flask is covered with a watch glass and allowed to sit overnight. The next day the flask is heated to 120 °C for 1.5 h. After cooling, 5 mL of 30 percent hydrogen peroxide is added, the solution heated and the volume reduced to 5 mL. A 2-mL aliquot of concentrated perchloric acid is then added and the solution taken to fumes of perchloric. The solution is cooled and 25 mL of 6$\underline{M}$ HCl added. The solution is transferred to a 50 mL polyethylene bottle and the final mass adjusted to 53 g with deionized water.

RESULTS AND DISCUSSION

TJD Sediment Samples

Sediment samples were collected at 25 locations along TJD. Samples were usually dark brown to black in color and contained significant quantities of organic matter intermixed with fine clay. Sediment samples had a weak to strong hydrogen sulfide smell, which appeared to correlate with the amount of black sediment collected. Total element concentrations for all samples tested are presented in Appendix A. The concentrations of Ag, Au, Bi, Cd, Eu, Ho, Sn, and U for all samples were less than their respective determination limits (table 1) and not tabulated. A summarized compilation of total element data is presented in table 2.

Comparison of total trace element concentrations in TJD sediment samples with previous studies in the Carson Basin (Hoffman and others, 1990) are seen in table 3. For most elements average concentrations and ranges (min and max) are similar in both studies. In the case of Cu, Li, Mn, Hg, V, and Zn, average concentrations in TJD sediments are actually lower than for the Carson Basin. Only in the case of Mo and Se does there appear to be significantly higher average or maximum concentrations in TJD sediments. These results suggest that sediments in TJD are typical of the area and do not represent a unique source to down-stream systems.

To determine variation along the drain, a comparison was made between total element concentrations and sample collection sites. Results from this comparison are presented in figures 3-14. The combination of specific elements in each figure is based solely on similar concentration ranges. The reader is referred to figure 2 for location of sample collection sites.

Figures 3, 4, and 5 present distribution patterns for major elements (Al, Ca, Fe, P, Ti, Na, and K). Examination of distribution patterns reveals relatively consistent total element concentrations in the sediment material. Exceptions are noted for Ca at sites 1 and 10, and possibly Ti at site 7. The lack of anomalous major element concentrations suggest a consistent source of sediment material, and (or) an efficient mixing process in TJD. Uniformity of major element data also suggests that if evaporative processes play a major role in the drain, then they are fairly consistent and have not led to the formation of isolated areas (sinks) of high salt concentrations.

Distribution patterns for 20 trace elements in TJD sediments are presented in figures 6 through 14. As observed in the case of major elements, several trace elements (Ba, Ce, Cu, Ga, Nb, and Yb) also display consistent total element concentrations in TJD sediment samples. In contrast to uniform distribution patterns observed above for major elements, selected trace elements appear to concentrate in sediment material at the intersection of TJ-stub and TJD (sites 10, 11, 12, 13). Total element concentrations of As, Li and Hg are highest at sites 12 and (or) 13. Strontium and Mn sediment concentrations (fig. 10) are also highest at the confluence of TJD and TJ-stub but the maximum concentrations are shifted to site 10 located in TJ-stub. Selenium concentrations were also high at sites 12 and 13, exceeded only by a 6.5 ppm value observed at site 20 (fig. 12). While Se concentrations at sites 12, 13 and 20 appear atypical for TJD, they do represent moderate Se concentrations. Previous studies (Peterson and others, 1988) have associated similar concentrations with potentially toxic Se concentrations in immature birds. Additional sampling is recommended to ascertain if the "atypical" Se concentrations observed in this study persist in TJD throughout the year. Thorium and Y distribution patterns (fig. 8) deviate from other trace elements, by displaying maximum concentrations at site 7.

Several factors may be involved in the elevated trace element concentrations observed at sites 10-13. Evaporative preconcentration is a possibility, but the consistency of major element data suggest that the evaporation process is fairly consistent throughout the drain. One possible explanation for the atypical trace element concentrations could be the presence of a unique water source at this location. If true, then normal hydrologic processes such as sorption, precipitation or redox changes could lead to trace element enrichment in the sediments.

Inspection of distribution patterns for several elements (Co, Cr, Li, Mn, Th, V, and Zn) reveals a general bimodal pattern, where total element concentrations are higher at sites 4-5, 12-13, 22-24 and lower at sites 7-9, and 19-21. This pattern may reflect several factors including: (1) the gradual downstream dilution of contaminated sediments; (2) variations in drain water velocities during the irrigation season leading to deposition of different size sediment material at specific locations; or (3) the location of sample sites in side drains which are not significantly affected by the main TJD flow patterns. If observed patterns are consistent from year to year, it may represent a mechanism to isolate and remove sediments with above average trace element content.

TJD Water Samples

Analytical results for water samples collected at the 25 sediment sites are presented in Appendix B. Sample concentrations of Ba, Be, Bi, Cd, Co, Cu, Fe, Ga, Sn, Sb, V, Zn, and Zr were consistently below their respective determination limits (table 1) and not tabulated. A summary of aqueous total element concentrations is presented in table 4.

To see if element concentrations in TJD water samples were related to sediment values at the sample collection sites, distribution patterns for major and trace element were prepared. Distribution patters for total element concentrations in TJD surface water samples are presented in figures 15 through 23.

Examination of major element distribution patterns (figs. 15-17) suggest that there may be three different parts to the TJD system. In the largest segment, sites 1 through 17, (excluding sites 10 and 11) dissolved element concentrations are uniform and suggest a consistent drain water source or an efficient mixing process. The second drain segment extending from site 18 to 25 demonstrates a gradual increase in dissolved element concentrations as one moves south along TJD. One possible explanation for this pattern is that site 25 contains water with abnormally high dissolved element concentrations. Water containing these elevated concentrations would migrate north along the drain, be diluted, and generate the pattern observed in this study. Support for this theory is derived from field observations indicating large areas of precipitated salt present along the edges of the drain and minimal water flow at sites 25 and 24. These observations reflect the evaporative process at work and are probably the major factors responsible for elevated dissolved element concentrations in this segment of the drain. The lower dissolved element concentrations observed at sites 19 and 22 also support this conclusion since they are out of the main flow pattern and therefore not part of this dilution process.

The third segment of the TJD system is TJ-Stub (sites 10 and 11). Examination of distribution patterns for trace and major elements suggest that TJ-Stub is atypical with respect to dissolved major and trace element concentrations. Concentrations of Ca, Mg, Na, and K (figs.

15-17) are all elevated in TJ-Stub relative to the rest of TJD, a condition which differs dramatically from total element concentrations in TJ-Stub sediments. Dissolved trace element concentrations of B, Li, Mo, Se, Sr, and U are also elevated, in many cases more than double the concentration observed in the rest of TJD.

Based on elevated concentrations of major and several trace elements observed in TJ-Stub, it appears that water in TJ-Stub has undergone either a major preconcentration, or is being affected by a secondary source. Discussions with scientists familiar with the area indicate that TJ-Stub is significantly deeper than other parts of the drain system, and may be intersecting regional ground water. To test this possibility, ground water data from site E4 and drain water results from site 11 (see fig. 2) were compared and a concentration ratio (CR) calculated using equation 1.

eq. 1 $$CR = \frac{[X]siteCS11}{[X]siteE4}$$

If surface water samples at CS11 and ground water at E4 represent the same water supply then calculated CR should approximate 1. A graphical representation of CR for the different elements studied are presented in figure 24. Concentration ratios for 10 of 13 elements tested were virtually identical (avg. = 1.1 ± 0.14). The CR values of nearly 1 and the consistency of these results strongly suggests that water in TJ-Stub and ground water at E4 are in direct contact. Comparison of CR at other TJD and ground water sites suggest that this condition is unique to TJ-Stub. The possible interaction of TJ-Stub with regional ground water is significant because it provides a mechanism for the introduction of groundwater containing high element concentrations directly into TJD. This effect may become even more significant during irrigation periods when local ground water tables rise.

Elevated concentrations of trace and major elements in TJ-stub have a significant impact on the overall water quality in the TJD system. Excluding results from sites 10 and 11 produces up to a 50 percent decrease in average dissolved major and trace element concentrations. The full impact of TJ-stub on TJD water quality will require estimations of water flow (volume) leaving TJ-stub and periodic water quality monitoring to determine if dissolved element concentrations observed in this study are anomalous or represent a persistent trend in TJD.

In order to evaluate the concentration of dissolved constituents in TJD water relative to the surrounding area, results from previous regional studies (Hoffman and others, 1990) were complied and are presented in table 5. Data from the regional study were based on samples collected during March 1987, a time period (pre-irrigation) which coincides with the present study. This period was the start of the irrigation season and considered a low water flow period in the region. Comparison of the two data sets reveals that in every case average element concentrations in TJD surface waters are higher. For most elements average concentrations in TJD waters are almost twice as high as the regional study. Examination of data from South Lead Lake, the receiving location for TJD waters, reveals an even greater difference in element concentrations, especially for As, B, Mo, Ni, and U. Elevated element concentrations in TJD waters will affect the water quality entering South Lead Lake, with the full impact determined by the amount of return flow water entering and leaving the lake.

To evaluate the water quality in TJD relative to potential uses, a comparison between established water quality guidelines and observed elemental concentrations is presented in table 6. Inspection of table 6 reveals that average concentrations of dissolved As, B, and Mo are in excess of established guidelines for fish and wildlife protection. A few samples were also found to contain elevated concentrations of Cr and U. If return flow waters from TJD consistently contain dissolved element concentrations observed in this study, then long term problems could occur for downstream users of TJD water. It is important to note however, that element concentrations in TJD waters reported in this study may represent a worst case condition due to intensive evaporation that occurred over the winter, prior to sample collection.

Soil Samples

Two groups of soil samples were collected in this study. The first group identified as "grid samples" were collected across the study area using a grid arrangement with collection sites located at approximately half-mile intervals. These samples represent an overview of the entire study area and try to identify significant changes in lateral distribution patterns. The second group of samples identified as center points (CP's) consist of six locations where soil core samples were collected continuously from the soil surface to the observed water table. These samples examined element concentrations vertically to examine if element concentrations changed significantly with depth.

Total element concentrations for soils collected using the grid design are presented in Appendix C. Included in Appendix C are samples from each center point site which correspond to three sample collection depths (0-1 ft, 2-3 ft and water table). Total element concentrations in soil samples collected at center point locations are reported in Appendix D. Data in Appendix D are for samples collected continuously from the surface horizon to ground water table. Concentrations of Au, Bi, Cd, Eu, Ho, Sn, and U for all samples were less than their respective determinations limits (table 1) and not tabulated. Summary results for elements above their determination limits are reported in tables 7 and 8 for grid and center point samples respectively.

Examination of total element concentrations in grid samples reveal that several elements (Ag, Cu, Hg, Pb, V, Zn) have maximum concentrations at sites E6, F7, G7, and CP3. The most striking is mercury which has a maximum total element concentrations of 32 ppm at site F7. Scientists familiar with the region indicate that mining operations situated near Carson City used mercury to recover gold from ore material. Processed mine tailings were deposited into the adjacent Carson River which historically flowed through the southeastern part of the study area. The use of a mercury recovery process would also explain the elevated concentrations of Ag, Cu, Pb, and Zn (B-metals) because these elements also form stable intermetallic compounds with mercury. Elevated concentrations of Ni, V, Nd, Nb, Th, V, and Y in the southeastern part of the study area may also reflect the impact of historical mining operations through the transport of these elements as mineralized sediment material.

Concentrations of Hg, Pb, Zn, Cu, and Ag at sites E6, F7, G7, and CP3 area were also examined to see if concentrations varied with depth. Mercury results (Appendix C) at these locations show a significant decrease in concentration with depth. At site F7, the mercury concentration decreases twenty fold from the surface (0-1 ft) to mid-depth (2-3 ft) samples. Concentration differences for the other B-metals showed no significant decrease with depth, except for Pb at site F7 and Zn at site G6. Elevated concentrations of Hg in soils are significant due to the toxic effect it can have on humans and animals. Mercury's toxicity is related to its ability to bioaccumulate into the food chain through the formation of several mercury compounds. A detailed study outlining the distribution of mercury in the historical Carson River drainage would be appropriate, especially as it relates to centers of human and wildlife activity.

Trace and major element concentrations in TJD soils were compared with previous investigations in Carson River Basin (Tidball, 1989) and western United States (Shacklette and Boerngen, 1984) and are presented in table 9. Carson River Basin results used in this comparison are from the area identified as the Carson Desert (fig. 1), the original pleistocene lake bed. Carson Desert and TJD results are compared first to evaluate local (TJD) and regional (Carson Desert) differences. Comparison of geometric means (GM) and deviations (GD) using a student t-test reveals that concentrations of seven elements (Ba, Ce, Cu, Ga, La, Pb, V, Zn) are statistically greater (95% confidence level) in the TJD study area. Only three elements (Li, Mn, Sr) had higher concentrations (GM) in the Carson Desert soils. Table 9 also presents information on total element concentrations in soils from the western United States (Shacklette and Boerngeren, 1984). Comparison of total element concentrations in western soils with results from the TJD study reveals that 16 of the 33 elements examined, had GM's statistically different at the 95 percent confidence level. Concentrations of Al, As, Ba, Ce, Cu, Ga, Li, Mn, Sr, V, and Zn are statistically greater in TJD soils, with greatest between study differences observed for As, Ba, Mn, and Sr. It is apparent that TJD soils are unusual when compared to "average" western soils. This natural condition implies that unique soil and water management problems may exist in this area.

In a final comparison, soils (table 7) and sediments from the TJD study area (table 2) were compared. Statistical (student t-test) evaluation of geometric means and geometric deviations for soils and sediments reveals no statistical difference (95% confidence interval) for the majority of elements (25 of 34). Statistically higher concentrations of Ba, Sr and Mo are observed in the TJD sediment material. Soil samples contained higher, mean concentrations of Ce, Cu, Li, Mn, Ni, and Zn. The higher concentrations of Cu and Zn in the soil probably reflect the bias introduced from the southeastern part of the study area, where mercury contamination effects may be present.

Water Extractions

Saturation paste

Water extractions were performed on soils from the TJD study area in order to evaluate element mobility due to natural or man induced processes. In this study a water saturation paste (WSP) and constant extraction ratio (CER) procedure were used. In the WSP study only soils collected using the grid arrangement were used and only analyzed for As and Se. Analytical results corrected to dry weight are reported in Appendix E. The geometric means, deviations and concentration ranges for As, Se, and percent saturation are summarized in table 10.

In surface soils (0-1 ft) highest concentrations of WSP extractable Se are observed at sites B3, F5, and G1. At the 2-3 ft depths highest Se concentrations are observed at sites C3, F5 and G2. At this depth, sites with the highest concentration are generally located east of TJD, in agricultural areas. At the deepest collection sites (water table), highest WSP Se concentrations are observed at sites F5, G7 and G5. Highest Se concentrations are again located east of TJD. Examination of WSP data reveals that site F5 consistently has some of the highest extractable Se concentrations. At this time no explanation is available for this observation.

Water extractable As was also quantified using the WSP procedure. Highest As concentrations for surface samples (0-1 ft) are located at sites G2 and B2. Several sites contained moderate levels of extractable As, especially in rows B and C. Extractable As concentrations for mid and deep depths are similar to surface values, with highest As concentrations generally observed adjacent to or west of TJD. This pattern differs from Se results which show higher concentrations in the south central study area.

1:5, soil:water extractions

Analytical results for soil:water extractions (1:5) are reported in Appendix F for all grid locations. Three depths from all center point locations are also included. Analytical results for Ag, Be, Bi, Ga, Pb, and Sn are less than their respective determination limits (table 1) and not tabulated. Summary results for elements above their determination limits are reported in table 11.

Soil water extractions are useful in understanding the effect irrigation has on the mobility of elements through the soil profile. Investigations in the San Joaquin valley of central California and the Kendrick irrigation district in south central Wyoming also used soil water extractions to study the mobilization of selenium (Stewart and others, 1990; Erdman and others, 1989). Other studies have examined the effect of irrigation on element mobilization and the correlation with decreased waterfowl production and unusual waterfowl deformities in the area (Ohlendorf and Hothem, 1986; Ohlendof, 1989; Peterson and others, 1988). These problems were traced to the mobilization of soil selenium due to irrigation and the bioaccumulation of selenium in the food chain. In these studies a constant ratio (1:5) extraction procedure similar to the one used in this study were performed. A comparison of TJD, San Joaquin Valley (Stewart and others, 1989) and Kendrick Wyoming (Erdman and others, 1989) results are presented in table 12.

San Joaquin Valley results presented in table 12 are from the Panoche Fan, a region identified as having elevated total and water extractable selenium. The in-house reference standard SJS-1 is also from the San Joaquin valley and represents an agricultural soil from the area. Results listed in table 12 for SJS-1 were based on data accumulated during this study only.

Comparison of water extraction results for the three study areas reveal that pH values and selected dissolved element concentrations (Al, Ba, Ca, Li, Mg, Si, SO_4, and Sr) are similar, and within the range normally observed in western United States soils. In contrast, water extractable B, Cl, Na and conductivity values are significantly higher in TJD soil extracts. Elevated water extractable concentrations of B are especially significant due to the adverse effects elevated B concentrations can have on plants. Previous studies (Branson, 1976) report limits of boron tolerance for semitolerant (corn, wheat, cotton) and tolerant crops (alfalfa, beet, asparagus) at 5 and 10 ppm respectively, using a water saturation paste (WSP) procedure. TJD results show a mean B concentration (1:5 extractions) of 9 ppm with a maximum concentration of 82 ppm. Using information from previous USGS studies (Stewart and others, 1990) a 1:5 water extractable boron value of 85 ppm corresponds to a 10 ppm WSP concentration. Elevated water extractable B concentrations suggest that B may represent an agriculture problem in the TJD study area.

Extractable arsenic is also high in the TJD study area, a significant fact in light of the toxicological effects of arsenic. Molybdenum is somewhat anomalous in TJD soils but the environmental significance is difficult to assess due to molybdenum's complex geochemistry.

Extractable selenium concentrations in TJD soils are significantly lower than the Kendrick, Wyoming study but comparable to San Joaquin Valley results. The availability of selenium in TJD soils contradicts previous results which show low selenium concentrations in TJD water and sediment samples. This discrepancy may be due the numbers of acres under irrigation and the degree of agricultural activity. In the San Joaquin Valley, agricultural operations are conducted year-round and extensive subsurface drain systems have been installed to expedite the removal of excess salts from agricultural soils. Subsurface drainage systems in the San Joaquin Valley were identified as one of the major factors affecting the amount of selenium entering return flow waters. The TJD service area is much smaller (2,000 acres) and relies primarily on surface drains to remove excess irrigation waters. The smaller service area, seasonal agricultural activity and less efficient drainage system are probably responsible for low average concentrations of Se in TJD waters and sediments.

Ground Water

Ground water samples were collected at each grid and center point location. During sample collection it was impossible to determine if ground water samples represented local or regional ground water systems. In cases where sample collection depth was shallow (<5 ft) ground water samples may originate from an isolated water source, "perched" over an impermeable soil layer. Analytical results for element concentrations in ground water are presented in Appendix G. Concentrations of Ag, Be, Bi, Cd, Co, Cr, Cu, Fe, Ga, Ni, Pb, Sn, Ti, Zn, and Zr were consistently below ICP-AES determination limits (table 1) and not tabulated. Results for elements above their respective determination limits are summarized in table 13.

Comparison of mean (geometric) dissolved element concentrations in TJD ground water with appropriate water quality criteria (table 6) reveals that the majority of elements fall below the established criteria. Inspection of Se results show that while the mean concentration is below the water quality criteria, three sites (D1, E2, and F5) have concentrations (Appendix G) in excess of this level. Site F5 is most noteworthy, having a Se concentration of 1,600 ppb. Site F5 also had higher than average extractable selenium concentration suggesting an unusual soil ground water interaction at this location.

Arsenic, B, and Mo differed from the majority of ground water constituents, in having mean (geometric) element concentrations in excess of water quality guidelines. In the case of

As, dissolved concentrations in excess of water quality guidelines were observed in over 88 percent of the sample sites. Elevated concentrations of As are especially significant due to toxicological problems that can occur at elevated concentrations. Studies in New Zealand (Grimmett, 1933) report poisoning in livestock caused by moderate concentrations of arsenic in soil and water. These studies showed that the greatest danger to livestock came from ingestion of both contaminated water and soil.

Boron concentrations in TJD ground water samples are also significant, in light of interactions between surface and ground water. Elevated concentrations of B were observed throughout the study area, with over 95 percent of the samples in excess of the 1,000 ppb water quality criteria. At eight sites B concentrations exceeded 50,000 ppb.

Plants

Baseline information on study area vegetation was accumulated using alfalfa (Medicago sativa) and greasewood [Sarcobatus vermiculatus (Hook.) Torr.]. Plant samples were collected at all grid and centerpoint collection sites. A listing of total element composition in alfalfa and greasewood (dry weight basis) are reported in Appendices H and I respectively. In both plant species total element concentrations of Ag, Au, Be, Bi, Cd, Eu, Ga, Ge, Ho, Nb, Sc, Sn, Ta, Th, U, and Yb were consistently below instramental determination limits (table 1), and not tabulated. In greasewood samples concentrations of Nd, Sc, and Y were also below the respective determination limits and not tabulated. Summary results for alfalfa and greasewood samples are reported in tables 14 and 15, respectively. Analytical results in tables 14 and 15 were corrected to dry weight using the percent ash value. The conversion of total element concentrations in the ash to a dry weight basis produces variable determination limits for qualified (<, less than) elements. Due to this discrepancy, median values for elements with qualified data are reported in tables 14 and 15.

Alfalfa results (geometric mean and deviation) were compared with other studies conducted in the Western United States (table 16). Results from the Big Sky Montana site (Ebens and Shacklette, 1982) reflect alfalfa grown on reclaimed soils used in the rehabilition of this surface coal mine. Data from the Kendrick and San Joaquin Valley studies reflect alfalfa collected from active agricultural areas subject to natural or man made irrigation and return flow systems. Comparison of total element concentrations in alfalfa samples from the four studies reveal that most elements (21) show no significant difference in mean (or median) total element concentrations. Notable exceptions are Fe, Li, Na, and As which are two to four times higher in the TJD study. Elevated Na concentrations probably reflect the natural saline conditions present in the study area. Elevated Li concentrations may be influence by existing geothermal features in the TJD area which are know to contain high concentrations of Li.

In contrast to Li, Na, and As, mean concentrations of Se in TJD alfalfa were lowest of the four studies. This may reflect the low concentrations of selenium in TJD soils or indicate that selenium is unavailable to alfalfa.

A comparison of analytical results for TJD greasewood and previous USGS investigations (Erdman, personal communication) are presented in table 17. Several elements

(Al, Ba, Cu, Li, Sr, Ti, Zn) had higher total element concentrations in TJD greasewood compared to previous work. A more detailed discussion at this time is difficult, due to the lack of information on total element concentrations in greasewood from other areas in the western United States.

Comparison of Water Extraction Procedures

The availability or mobility of elements in soils can be quantified using a number of extraction procedures. One of the most common involves a water saturation paste (WSP) procedure, in which deionized water is continually added to a soil sample until it reaches saturation. Solid and aqueous phases are then separated and the solution analyzed for its constituents. Limitations to the WSP method include the number of samples that can be prepared over a given time period and the operator variance in estimating point of saturation. One alternative to WSP is the CER method in which fixed amounts of soil and water are combined to extract elements of interest. Advantages of a CER procedure include, higher sample throughput, less operator variability and greater volumes of extraction solution per sample weight. In this study the CER procedure utilized a 1:5 soil to water ratio for all extractions. This ratio is considered optimal based on element determination limits and solution (volume) requirements for multi-instrumental analyses.

Widespread use of CER procedures is limited due to the lack of information correlating CER with WSP. This study provided a unique opportunity to compare both procedures for extractable As and Se. Statistical comparison of the two methods is most easily accomplished if normal distribution exist. However, an examination of frequency distributions for observed As and Se data reveals a skewed distribution toward lower concentrations, (figs. 25 and 26). Normal distributions were approximated by taking the natural log of the data. To further simplify the comparison between CER and WSP methods only data sets with both results above their respective determination limits were used. Using these criteria, 76 data sets were used for selenium and 87 for arsenic.

Log transformed Se results for WSP (Y) and CER (X) methods were analyzed using simple linear regression. Graphical presentation of Se data (log) for WSP versus CER are presented in figure 27. Linear regression analysis yields a slope of 1.04, y intercept of -0.34 and a correlation coefficient (r) of 0.88. In figure 27, curved lines above and below the best fit line represent the 95 percent confidence interval. The equation for the best fit line relating Se-WSP (Y) to Se-CER (X) is presented in equation 2.

eq. 2 $$\log]Se_{WSP}]=1.04x\log[Se_{CER}] \quad -0.34$$

Using equation 2, a Se-WSP value can be estimated for a given Se-CER concentration. For example, a Se-CER concentration of 50 ppb yields a WSP value of 27 ± 7 ppb, at the 95 percent confidence level.

A linear regression analysis of log transformed As data (ppb) yields a slope of 1.02, y intercept of -0.90 and a correlation coefficient of 0.8. Graphical presentation of log transformed As data, best fit line, and 95 percent confidence interval is presented in figure 28. The prediction equations relating As-WSP (Y) to As-CER (X) is presented in equation 3.

eq. 3. $$\log[As_{SP}]=1.02x\log[As_{CER}] \quad -0.90$$

Using equation 3, a As-WSP value can be estimated for a given As-CER concentration; for example, an As-CER concentration of 300 ppb yields a As-WSP value of 42 ± 11 ppb, at the 95 percent confidence level.

A comparison of CER and WSP extraction for As and Se are reported in Appendices E and F, respectively. Examination of the data reveals that higher concentrations (dry weight basis) of As and Se are extracted using the CER method. In the case of Se this difference is a factor of 2, and for As, a factor of 9. The higher extractability (dry weight basis) of the CER method is expected based on thermodynamic solubility products of insoluble phases indigenous to the area. While this greater dilution may overestimate short-term availability of certain elements it can provide important information on long-term extractability of elements from soils under irrigation.

To further evaluate the applicability of the CER procedure relative to WSP, water extractable Se results from San Joaquin Valley, and Kendrick irrigation district were compared against TJD results. In these studies both CER (1:5) and WSP methods were used to estimate water extractable Se (Stewart and others, 1990a and b). Linear regression results using log transformed Se data (ppb) are presented in table 18 for each study. Also presented in table 18 are estimates of Se-WSP concentrations using an arbitrary 50 ppb Se-CER concentration.

The similarity in estimated Se-WSP observed in table 18 suggests that a CER extraction procedure provides a reasonable estimate of WSP extractable Se even in different geochemical environments.

Because the CER extraction procedure is much faster than the WSP procedure its use in large studies provides the opportunity to efficiently obtain extraction information, providing a more complete geochemical understanding of the area. Additional testing of the WSP-CER comparison for different elements and study areas is advisable in order to fully evaluate the limitations of the CER method.

SUMMARY

This report provides geochemical information on trace and major element concentrations in plants, soils, ground water, surface water, sediments and water extractable constituents in soils from the TJ-Drain (TJD) study area. Results are based on the collection of samples during April of 1989. This sampling period is prior to the start of the irrigation season and is associated with low water flow in TJD. This time interval may represent an "atypical" condition, especially for surface waters which have been subject to intensive evaporation over the winter. Conclusions regarding dissolved or extractable element concentrations may not therefore be representative of the area throughout the year. It is important to recognize these factors when evaluating effects attributed to human activity, presented below is a summary of results for each sample medium studied.

Sediments

Examination of mean (geometric) values for element concentrations in the TJD sediments reveals that only Mo appears elevated with respect to previous regional studies. TJD sample collection sites 12 and 13 appear to be a concentrating site for several trace elements. Mean concentrations of Se in sediment material is comparable to average soil Se concentrations in the western United States. However, maximum Se concentrations are similar to levels observed in Wyoming studies where waterfowl have been adversely affected.

TJD Water

Concentrations of several elements in TJD water samples are elevated compared to regional studies conducted during similar time periods in previous years. Mean concentrations of As, B, and Mo exceed beneficial use criteria for Fish and Wildlife protection. Maximum concentrations of Ni and U exceed the same criteria. Mean concentrations of Se in TJD waters are 50 times lower than established criteria, and even maximum concentrations fail to exceed the remediation levels. Dissolved element concentrations in TJ-stub are higher than other sections in TJD. Comparison of dissolved element concentrations in TJ-stub and local ground water suggest that the two are strongly interactive. Dissolved element concentrations in TJ-Stub water have a major impact on average water quality in TJD. Additional sampling throughout the irrigation season is recommended in TJ-Stub and adjacent ground water to monitor water quality and evaluate the impact on TJD return flow water.

Ground Water

Mean concentrations of As, B, and Mo are in excess of beneficial use criteria for fish and wildlife. In the case of As and B maximum concentrations are over 10 times higher than these guidelines. At the majority of sites selenium is below the relevant criteria but at site F5 ground water concentrations reached 1,600 ppb. Use of subsurface water for irrigation in the TJD area would appear to be unwise in light of the high B content.

Soils

Highest concentrations of Ag, Cu, Hg, Pb, V, and Zn are located in the southeastern part of the study area. It is believed that these elevated concentrations are the results of historic mining operations along the Carson River. Concentrations of Hg are especially significant in light of its known bioaccumulation properties and high concentration in the upper soil profiles. Comparison of total element concentrations in TJD soils with mean values from the western United States reveal that 11 of the 33 elements were present at significantly higher levels. Concentrations of As, Ba, Mn, and Sr showed the greatest differences.

Soil-Water Extractions

Soil-water extraction information was obtained using a 1 to 5 soil-to-water ratio. Concentrations of As, B, Cl, Mo, and Na are higher compared to previous western United States studies. Concentrations of water extractable B may represent an agricultural problem for B intolerant plants. Extractable selenium concentrations are similar (geometric mean) with results from the San Joaquin Valley, a region with established selenium problems. Highest levels of extractable Se are reported at site F5 and correlate with elevated Se concentrations in ground water at this site.

Plants

Comparison of total element concentrations in TJD alfalfa with previous studies reveal no significant differences for the majority of elements. Notable exceptions include As, Fe, Li, and Na, which are two to four times higher in TJD samples compared to reclaimed or agricultural soils. Concentrations of Se in TJD alfalfa were significantly lower than previous studies. Analysis of greasewood data indicate that several nontoxic elements appear elevated, but the lack of extensive data sources prevents reliable comparison.

Comparison of results for the various sample media consistently show that As and B are the elements of greatest concern. Elevated concentrations of Li and Mo may also represent a problem, but the effect is difficult to assess.

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Table 1 Determination limits for elements analyzed in TJ-Drain study

[Listed concentration limits are based on instrumental analysis of digested solution and do not reflect correction factors due to special sample preparation procedures; %, percent; ppm, parts per million; ppb, parts per billion; -, not determined]

Element	Method	Soils	Plants*	Water
Al	ICP-AES	0.005%	0.01%	10 ppm
Ag	ICP-AES	2 ppm	4 ppm	200 ppb
	ICP/MS	-	-	2 ppb
As	HYG-AAS	0.1 ppm	0.01 ppm	2 ppb
	ICP/MS	-	-	50 ppb
B	ICP-AES	-	-	1 ppb
Ba	ICP-AES	1 ppm	2 ppm	200 ppb
	ICP-MS	-	-	100 ppb
Be	ICP-AES	1 ppm	2 ppm	100 ppb
Bi	ICP-AES	10 ppm	20 ppm	1000 ppb
	ICP-MS	-	-	5 ppb
Ca	ICP-AES	0.005%	0.01%	2 ppm
Cd	ICP-AES	2 ppm	4 ppm	50 ppb
	ICP-MS	-	-	20 ppb
Ce	ICP-AES	4 ppm	8 ppm	-
Co	ICP-AES	1 ppm	2 ppm	100 ppb
	ICP-MS	-	-	10 ppb
Cl	I.C.	-	-	100 ppb
Cr	ICP-AES	1 ppm	2 ppm	100 ppb
	ICP/MS	-	-	50 ppb
Cu	ICP-AES	1 ppm	2 ppm	80 ppb
	ICP/MS	-	-	50 ppb
Eu	ICP-AES	2 ppm	4 ppm	-
Fe	ICP-AES	0.005%	0.01%	5 ppm
Ga	ICP-AES	4 ppm	8 ppm	500 ppb
Hg	CV-AAS	0.02 ppm	0.01 ppm	0.3 ppb
Ho	ICP-AES	4 ppm	8 ppm	-
K	ICP-AES	0.05%	0.1%	20 ppm
La	ICP-AES	2 ppm	4 ppm	-
Li	ICP-AES	2 ppm	4 ppm	100 ppb
Mg	ICP-AES	0.005%	0.01%	1 ppm
Mn	ICP-AES	4 ppm	8 ppm	100 ppb
Mo	ICP-AES	2 ppm	4 ppm	100 ppb
	ICP-MS	-	-	50 ppb
Na	ICP-AES	0.005%	0.01%	20 ppm
Nb	ICP-AES	4 ppm	8 ppm	-
Nd	ICP-AES	4 ppm	8 ppm	-
Ni	ICP-AES	2 ppm	4 ppm	100 ppb
	ICP-MS	-	-	5 ppb
P	ICP-AES	0.005%	0.01%	-
Pb	ICP-AES	4 ppm	8 ppm	500 ppb
	ICP-MS	-	-	10 ppb

Table 1 continued

Element	Method	Soils	Plants*	Water
Sb	ICP-MS	-	-	5 ppb
Sc	ICP-AES	2 ppm	4 ppm	-
Se	HYG-AAS	0.1 ppm	0.01 ppm	1 ppb
Si	ICP-AES	-	-	1 ppm
Sn	ICP-MS	-	-	50 ppb
SO_4	I.C.	-	-	2000 ppb
Sn	ICP-AES	10 ppm	20 ppm	600 ppb
Sr	ICP-AES	2 ppm	4 ppm	50 ppb
Th	ICP-AES	4 ppm	8 ppm	-
Ti	ICP-AES	0.005%	0.01%	100 ppb
U	ICP-AES	100 ppm	200 ppm	-
	ICP-MS	-	-	10 ppb
V	ICP-AES	2 ppm	4 ppm	300 ppb
Y	ICP-AES	2 ppm	4 ppm	-
Yb	ICP-AES	1 ppm	2 ppm	-
Zn	ICP-AES	2 ppm	4 ppm	100 ppb
	ICP-MS	-	-	50 ppb
Zr	ICP-AES	-	-	100 ppb

* Determination limits based on analysis of ash material.

ICP-AES, Inductively Coupled Plasma Atomic Emission Spectroscopy
ICP-MS, Inductively Coupled Plasms-Mass Spectrometry
HYG-AAS, Hydride Generation Atomic Absorption Spectroscopy
I.C., Ion Chromatography
CV-AAS Cold Vapor - Atomic Absorption Spectroscopy

Table 2 Summary geochemical information for sediment samples collected along TJ-Drain

[Detection ratio, number of samples in which the element was found in measureable concentrations to number of samples analyzed; GM, Geometric Mean; GD, Geometric Deviation; ppm, parts per million; %, percent]

Element, unit of measure	Detection Ratio	GM	GD	Observed range Min.	Max.
Al, %	25:25	8.31	1.04	7.57	8.65
As, ppm	25:25	12.7	1.82	3.8	64
Ba, ppm	25:25	870	1.08	677	966
Be, ppm	25:25	2	1.00	2	2
Ca, %	25:25	3.30	1.22	2.65	6.17
Ce, ppm	25:25	46	1.14	35	59
Co, ppm	25:25	11	1.20	8	16
Cr, ppm	25:25	30	1.22	19	48
Cu, ppm	25:25	19	1.57	9	44
Fe, %	25:25	2.68	1.23	1.82	3.64
Ga, ppm	25:25	18	1.06	16	20
Hg, ppm	22:25	0.05	2.15	<0.02	0.36
K, %	25:25	2.15	1.07	1.79	2.45
La, ppm	25:25	27	1.12	21	33
Li, ppm	25:25	32	1.42	18	59
Mg, %	25:25	1.01	1.21	0.72	1.55
Mn, ppm	25:25	530	1.29	353	1160
Mo, ppm	23:25	10	3.08	<2	164
Na, %	25:25	2.90	1.09	2.27	3.27
Nb, ppm	21:25	5	1.34	<4	9
Nd, ppm	25:25	22	1.17	16	31
Ni, ppm	25:25	13	1.25	9	20
P, %	25:25	0.09	1.12	0.07	0.12
Pb, ppm	25:25	17	1.09	14	20
Sc, ppm	25:25	9	1.21	6	12
Se, ppm	23:25	0.34	3.10	<0.1	6.40
Sr, ppm	25:25	670	1.15	573	1070
Th, ppm	25:25	10	1.32	6	23
Ti, %	25:25	0.34	1.18	0.23	0.49
V, ppm	25:25	86	1.27	51	146
Y, ppm	25:25	13	1.16	10	18
Yb, ppm	25:25	1	1.41	1	2
Zn, ppm	25:25	55	1.32	34	89

Table 3 Comparison of trace element constituents in sediment material collected near the Stillwater National Wildlife Management area and the TJ-Drain study site, Nevada

[ppm, parts per million, µg/g; <, less than listed determination limit; Avg., average; Min., minimum; Max., maximum]

	Carson Basin Study [1]			TJ-Drain Study		
Element	Avg.[2] ppm	Max. ppm	Min. ppm	Avg.[2] ppm	Max. ppm	Min ppm
As	12	31	2.8	15	64	3.8
Ba	850	1200	430	870	966	677
Ce	57	85	21	45	59	35
Cr	45	100	20	29	48	19
Co	14	18	12	11	16	8
Cu	36	53	22	21	44	9
Ga	16	19	2	18	20	16
Hg	3.7	18	0.04	0.06	0.36	<0.02
La	31	47	13	26	33	21
Li	58	94	25	33	59	18
Mn	870	1400	530	540	1160	353
Mo	3	11	<2	21	164	<2
Nb	7	10	<4	5	9	<4
Nd	28	43	9	22	31	16
Ni	20	27	11	13	20	9
Pb	22	46	16	17	20	14
Sc	10	13	9	9	12	6
Se	0.5	1.2	<0.1	0.74	6.4	<0.1
Sr	640	810	570	680	1070	573
Th	15	35	10	10	23	6
V	110	190	76	86	146	51
Yb	2	3	<1	1	2	1
Y	15	22	5	13	18	10
Zn	82	110	57	55	89	34

1 Adapted from Hoffman, R., and others, 1990
2 Arithmetic averages

Table 4 Summary information for elemental content of TJ-Drain surface waters.

[Detection ratio; number of samples in which element was found in measureable concentration to number of samples analyzed; GM, geometric mean; GD, geometric deviation; ppb, parts per billion; ppm parts per million; *, not calculated due to insufficient data above determination limit]

Element, unit of measure	Detection Ratio	GM	GD	Observed Range Min.	Max.
Ag, ppb	2:25	*	*	<2	2
Al, ppm	2:25	*	*	<2	5
As, ppb	23:25	110	1.84	<50	440
B, ppb	25:25	11000	2.03	1800	41000
Ca, ppm	25:25	150	2.33	44.4	1380
Cr, ppb	1:25	*	*	<50	60
K, ppm	22:25	45	1.98	<20	270
Li, ppb	25:25	370	2.35	90	4130
Mg, ppm	25:25	180	2.35	37.5	1590
Mn, ppb	25:25	320	3.36	30	1930
Mo, ppb	24:25	330	2.17	<50	920
Na, ppm	25:25	2570	1.89	491	8790
Ni, ppb	24:25	28	1.67	<10	79
Pb, ppb	12:25	<10	1.15	<10	10
Se, ppb	6:25	0.4	3.80	<1	4.7
Si, ppm	12:25	0.28	37.1	<0.2	25.9
Sr, ppb	25:25	4050	2.29	1020	37900
Ti, ppb	1:25	*	*	<20	120
U, ppb	25:25	140	2.34	10	650

Table 5 Comparison of element concentrations in water samples collected in Carson Basin[1], South Lead Lake[1] and TJ-Drain

[ppm, parts per million, µg/g; ppb, parts per billion, µg/Kg; <, less than listed determination limit; Avg., average concentration; Max., maximum concentration]

Element, conc.	Carson Basin Study Avg.[2]	Carson Basin Study Max.	South Lead Lake Avg.[2]	TJ-Drain Study Study Mean[3]	TJ-Drain Study Study Max.
As, ppb	52	190	31	110	440
B, ppb	4,500	28,000	3,900	11,000	41,000
Ca, ppm	105	580	96	150	1,380
K, ppm	21	100	19	45	270
Li, ppb	203	1,400	210	370	4,130
Mg, ppm	97	800	91	180	1,590
Mo, ppb	120	860	100	330	920
Na, ppm	1,044	8,000	690	2,550	8,790
Ni, ppb	1.7	4	1	26	79
Pb, ppb	-	<5	<5	<10	10
Se, ppb	<1	1	<1	1	4.7
U, ppb	61	300	55	140	650

1 Hoffman, R, and others, 1990
2 Arithmetic average concentration
3 Geometric mean concentration

Table 6 Comparison of dissolved element concentrations in TJ-Drain water samples with established water quality criteria for fresh water

[ppb, parts per billion; NLF, not looked for; F&WP, Fish and Wildlife protection; Water use criteria for State of Nevada (1987) unless otherwise noted]

Element	Beneficial use (ppb)	Water use criteria	TJ-Drain Study Average (ppb)	TJ-Drain Study Maximum (ppb)
Arsenic	40	F&WP	110	440
Barium	1000	F&WP	<50	<50
Boron	1000	Irrigation	11,000	41,000
Cadmium	13	F&WP	<20	<20
Chromium	50	F&WP	<50	60
Copper	10	F&WP	<50	<50
Lead	50	F&WP	<10	10
Mercury	0.2	F&WP	NLF	NLF
Molybdenum	200	F&WP[1]	330	920
Nickel	200	Irrigation	26	79
Selenium	50	F&WP	1	4.7
Silver	6	F&WP	<2	2
Uranium	500	F&WP[1]	140	650
Vanadium	1000	Irrigation[1]	<100	<100
Zinc	150	F&WP	<60	<60

1) Canadian water quality criteria: Environment Canada

Table 7 Summary results for total element concentrations in soil samples collected in TJ-Drain study area, Nevada

[Detection ratio, number of samples in which the element was found in measureable concentrations to number of samples analyzed; GM, Geometric Mean; GD, Geometric Deviation; ppm, parts per million; %, percent; <, less than]

Element, unit of measure	Detection Ratio	GM	GD	Observed Range Min.	Observed Range Max.
Ag, ppm	2:109	<2	1.0	<2	4
Al, %	109:109	8.32	1.1	5.85	10.2
As, ppm	109:109	12.3	1.8	4	47
Ba, ppm	109:109	859	1.2	310	1090
Be, ppm	109:109	2	1.0	2	2
Ca, %	109:109	2.66	1.4	1.44	9.84
Ce, ppm	109:109	49	1.2	31	71
Co, ppm	109:109	13	1.3	6	21
Cr, ppm	109:109	29	1.3	8	51
Cu, ppm	109:109	27	1.7	8	70
Fe, %	109:109	3.08	1.4	1.49	5.16
Ga, ppm	109:109	19	1.1	16	26
Hg, ppm	79:109	0.04	4.2	<0.02	32
K, %	109:109	2.13	1.1	1.61	2.67
La, ppm	109:109	28	1.2	18	39
Li, ppm	109:109	43	1.6	18	134
Mg, %	109:109	1.12	1.4	0.53	2.8
Mn, ppm	109:109	549	1.4	238	1260
Mo, ppm	26:109	<2	1.6	<2	13
Na, %	109:109	2.52	1.2	1.22	3.8
Nb, ppm	95:109	6	1.4	<4	13
Nd, ppm	109:109	23	1.2	13	33
Ni, ppm	109:109	16	1.4	7	28
P, %	109:109	0.09	1.3	0.05	0.32
Pb, ppm	109:109	18	1.2	14	41
Sc, ppm	109:109	10	1.4	5	17
Se, ppm	29:109	0.6	1.8	<0.1	1
Sr, ppm	109:109	557	1.2	360	1030
Th, ppm	109:109	11	1.4	5	23
Ti, %	109:109	0.33	1.2	0.17	0.49
V, ppm	109:109	89	1.4	36	155
Y, ppm	109:109	13	1.2	8	19
Yb, ppm	101:109	1	1.5	<2	2
Zn, ppm	109:109	65	1.5	29	122

Table 8 Summary results for total element concentrations in soil samples collected at center point locations, TJ-Drain study area, Nevada

[Detection ratio; number of samples in which element was found in measureable conc. to number of samples analyzed; GM, geometric mean; GD, geometric deviation %, percent; ppm, parts per million, mg/Kg]

Element, unit of measure	Detection Ratio	GM	GD	Observed Range Min.	Max.
Al, %	55:55	8.44	1.07	7.02	10.20
As, ppm	55:55	15	1.77	5.5	45
Ba, ppm	55:55	880	1.17	548	1210
Be, ppm	55:55	2	1.00	2	2
Ca, %	55:55	2.38	1.28	1.44	4.50
Ce, ppm	55:55	50	1.27	29	71
Co, ppm	55:55	13	1.43	6	21
Cr, ppm	55:55	29	1.40	9	42
Cu, ppm	55:55	27	1.88	7	63
Fe, %	55:55	3.08	1.52	1.21	5.16
Ga, ppm	55:55	20	1.14	14	26
Hg, ppm	33:55	0.03	2.28	<0.2	0.92
K, %	55:55	2.16	1.13	1.77	3.07
La, ppm	55:55	28	1.27	16	39
Li, ppm	55:55	42	1.67	15	86
Mg, %	55:55	1.07	1.53	0.32	1.74
Mn, ppm	55:55	527	1.48	220	1030
Mo, ppm	22:55	2	1.61	<2	12
Na, %	55:55	2.40	1.24	1.48	3.28
Nb, ppm	44:55	5	1.50	<4	11
Nd, ppm	55:55	24	1.31	13	34
Ni, ppm	55:55	16	1.50	7	28
Pb, ppm	55:55	18	1.09	15	23
P, %	55:55	0.08	1.23	0.05	0.11
Sc, ppm	55:55	9	1.58	3	16
Se, ppm	19:55	0.21	1.68	<0.2	1.2
Sr, ppm	55:55	513	1.19	360	666
Th, ppm	55:55	11	1.49	4	18
Ti, %	55:55	0.33	1.37	0.14	0.48
V, ppm	55:55	87	1.54	32	154
Y, ppm	55:55	13	1.31	7	19
Yb, ppm	47:55	1	1.49	<1	2
Zn, ppm	55:55	66	1.66	20	122

Table 9 Comparison of geometric mean and deviation for total element concentrations in soil samples from TJ-drain, Carson Basin and Western United States

[GM, Geometric Mean; GD, Geometric Deviation; %, percent; ppm, parts per million]

Element, unit of measure	TJ-Drain Study		Carson Basin Study[1]		Western United States[2]	
	GM	GD	GM	GD	GM	GD
Al, %	8.32	1.1	7.47	1.18	5.8	2.0
As,ppm	12.3	1.8	12	1.9	5.5	1.98
Ba,ppm	859	1.2	810	1.3	580	1.72
Be,ppm	2	1.0	1.5	1.4	0.68	2.30
Ca,%	2.66	1.4	3.8	1.6	1.8	3.05
Ce,ppm	49	1.2	42	1.3	65	1.71
Co,ppm	13	1.3	12	1.4	7.1	1.97
Cr,ppm	29	1.3	30	1.7	41	2.19
Cu,ppm	27	1.7	24	1.8	21	2.07
Fe,%	3.08	1.4	2.83	1.38	2.1	1.95
Ga,ppm	19	1.1	17	1.2	16	1.68
Hg,ppm	0.04	4.4	0.025	9.0	0.046	2.33
K, %	2.13	1.1	2.2	1.2	1.8	0.71
La,ppm	28	1.2	24	1.2	30	1.89
Li,ppm	43	1.6	51	2.1	22	1.58
Mg,%	1.12	1.4	1.34	1.68	0.74	2.21
Mn,ppm	549	1.4	600	1.4	380	1.98
Mo,ppm	<2	1.6	<2	2.7	0.85	2.17
Na,%	2.52	1.2	3.08	1.5	0.97	1.95
Nb,ppm	6	1.4	6.8	1.4	8.7	1.82
Nd,ppm	23	1.2	21	1.3	36	1.76
Ni,ppm	16	1.4	16	1.8	15	2.10
P, %	0.09	1.3	0.092	1.33	0.03	2.33
Pb,ppm	18	1.2	16	1.3	17	1.80
Sc,ppm	10	1.4	9	1.4	8.2	1.74
Se,ppm	0.6	1.8	0.2	2.4	0.23	2.43
Sr,ppm	557	1.2	590	1.3	200	2.16
Th,ppm	11	1.4	10.7	1.38	9.1	1.49
Ti,%	0.33	1.2	0.30	1.34	0.22	1.78
V, ppm	89	1.4	84	1.4	70	1.95
Y, ppm	13	1.2	13	1.3	22	1.66
Yb,ppm	1	1.5	1.5	1.5	2.6	1.63
Zn,ppm	65	1.5	61	1.5	55	1.79

1 Tidball, R. (oral communication) data from Lahontan Basin soils
2 Shacklette, H.T., and Boerngen, J.G., 1984

Table 10 Summary information for water saturation paste extractable As and Se in TJ-Drain study area soils

[Detection Ratio, number of samples in which the element was found in measureable concentrations to number of samples analyzed; GM, Geometric Mean; GD, Geometric Deviation; ppb, parts per billion; <, less than]

Element, unit of measure	Detection Ratio	GM	GD	Observed Range Min	Max
As, ppb	90:90	85	4.3	1.4	1800
Se, ppb	75:90	5.6	5.4	<0.7	470
% Saturation	90:90	52.0	3.9	27.1	83.8

Table 11 Summary information for 1:5 (soil:water) extractable element concentrations, in TJ-Drain study area soils

[Detection ratio, number of samples in which the element was found in measureable concentration to number of samples analyzed; GM, geometric mean; GD, geometric deviation; ppm, parts per million; ppb, parts per billion; µS, microsiemns; *, not calculated due to insufficient data; all data corrected to dry weight]

Element, unit of measure	Detection Ratio	GM	GD	Observed Range Min.	Max.
Al,ppm	37:108	4.1	11.70	<10	750
As,ppb	108:108	570	3.13	20	6500
B, ppb	107:108	8740	2.84	700	81700
Ba,ppb	36:108	215	2.25	<200	2000
Ca,ppm	108:108	113	4.95	10	3170
Cd,ppb	2:108	*	*	<50	80
Cl,ppm	108:108	660	7.68	10	76200
Co,ppb	2:108	*	*	<100	200
Cr,ppb	76:108	111	1.49	<100	600
Cu,ppb	53:108	81	2.56	<80	590
Fe,ppm	51:108	5	12.60	<5	848
Hg,ppb	82:108	0.86	2.02	<0.7	32
K, ppm	102:108	73	2.47	<20	610
Li,ppb	107:108	363	2.20	<100	3400
Mg,ppm	108:108	49	3.63	5	1212
Mn,ppb	61:108	139	4.90	<100	3400
Mo,ppb	55:108	224	4.23	<100	7200
Na,ppm	108:108	1080	3.55	60	16700
Ni,ppb	49:108	101	1.81	<100	500
Se,ppb	82:108	13	5.26	<5	1000
Si,ppm	108:108	100	2.45	30	2240
SO4,ppm	108:108	810	6.45	20	87500
Sr,ppb	108:108	1600	4.49	199	41500
Ti,ppb	81:108	327	5.27	<100	19400
V,ppb	85:108	730	3.53	<300	10000
Zn,ppb	26:108	*	*	<100	1400
Zr,ppb	17:108	*	*	<100	1300
pH	108:108	8	1.05	7.60	9.4
Conduct., µS	108:108	1550	3.51	190	26000

Table 12 Comparison of water extractable element concentrations in soils from the western United States

[GM, geometric mean; GD, geometric deviation; ppb, parts per billion, µg/L; ppm, parts per million, mg/L; µS, microsiemens; <, less than; all data corrected to dry weight]

Element, unit of conc.	TJ-Drain study, Nv. GM	GD	San Joaquin Valley, Ca. GM[1]	SJS-1 GM[2]	Kendrick Wyo. Mean[3]	Mean[4]
Al, ppm	<10	11.7	<10	<10		
As, ppb	570	3.1		16		
B, ppb	8700	2.8	3400	4000	1500	1400
Ba, ppb	220	2.2	<200	240		
Ca, ppm	110	5.0	290	270		
Cd, ppb	76	1.5				
Cl, ppm	660	7.7	54	310	12	9.5
Co, ppb	16	1.6	<100			
Cr, ppb	110	1.5	240	100		
Cu, ppb	80	2.6	<80			
Fe, ppm	<5	2.6	<5	<5		
Hg, ppb	0.9	2.0	0.7			
Li, ppb	360	2.2	<400	300		
Mg, ppm	49	3.6	52	40		
Mn, ppb	150	4.4	<100	<100		
Mo, ppb	230	4.0		150		
Na, ppm	1100	3.6	490	595		
Ni, ppb	110	1.7	<500	<100		
Se, ppb	14	5.1	14	20	41	30
Si, ppm	100	2.4	76	56		
SO_4, ppm	810	6.4	1200	1200	420	390
Sr, ppb	1600	4.5	2000	2000		
Ti, ppb	330	5.3	170	200		
V, ppb	750	3.4	<600	<300		
Zn, ppb	<100	4.4	<300	<100		
Zr, ppb	220	2.3		<100		
pH	8.1	1.0	8.2	7.9	8.1	7.9
Cond., µS	1550	3.5	880	1200	700	690

1 Stewart, K.C., and others, 1990, U.S. Geological Survey OFR 90-292

2 Results for SJS-1; USGS inhouse reference standard collected from the San Joaquin Valley, California. Data compiled from TJ-Drain study only

3 Mean (arithmetic) water extractable element concentrations from native soils. Crock, J.G., 1990 personnal communication

4 Mean (arithmetic) water extractable element concentrations from agricultural soils. Crock, J.G., 1990, personnal communication

Table 13 Summary information for ground water samples collected in the TJ-Drain study area

[Detection Ratio, number of samples in which element was found in measureable concentration to number of samples analyzed; ppm, part per million; ppb, part per billion; GM, Geometric mean; GD, Geometric deviation; *, not calculated due to insufficient data]

Element, unit of measure	Detection Ratio	GM	GD	Observed Range Min.	Max.
Al ppm	6:36	*	*	<2	8
As ppb	36:36	182	3.35	16	2000
B ppb	36:36	12000	3.97	800	102000
Ba ppb	16:36	44	1.67	<40	130
Ca ppm	36:36	194	4.50	14.4	2470
Li ppb	36:36	610	3.25	100	6910
K ppm	12:36	49	3.31	<20	470
Mg ppm	36:36	150	5.93	6.8	2250
Mn ppb	23:36	100	6.82	<20	11900
Mo ppb	20:36	440	3.09	<200	4600
Na ppm	36:36	2000	3.87	127	13000
Se ppb	18:36	3	6.62	<1	1600
Si ppm	36:36	29	1.31	16.6	48.1
Sr ppb	36:36	4100	5.18	270	70400
V ppb	5:36	*	*	<100	300

Table 14 Summary information for total element concentrationsin alfalfa samples collected in the TJ-Drain study area

[Detection ratio, number of samples in which the element was found in measureable concentration to number of samples analyzed; GM, Geometric Mean; GD, Geometric Deviation; ppm, parts per million, mg/Kg; All data corrected to dry weight; *, median values calculated]

Element, unit of measure	Detection Ratio	GM	GD	Observed Range Min.	Max.
Al, %	12:12	0.098	3.12	0.02	0.45
As, ppm	12:12	0.77	1.66	0.37	1.90
Ba, ppm	12:12	33	1.92	10.2	73.1
Ca, %	12:12	2.3	1.20	1.5	2.98
Ce, ppm	4:12	<1.0	*	<0.8	3.0
Co, ppm	12:12	0.7	1.50	0.3	1.2
Cr, ppm	12:12	2.7	2.29	0.9	12
Cu, ppm	12:12	13	1.18	10.4	16.8
Fe, %	12:12	0.06	2.49	0.02	0.22
K, %	12:12	1.74	1.28	1.17	2.52
La, ppm	12:12	1.0	1.63	0.5	2.2
Li, ppm	12:12	6.6	1.25	4.3	9.5
Mg, %	12:12	0.39	1.24	0.29	0.64
Mn, ppm	12:12	52	1.34	33	85
Mo, ppm	12:12	3.4	1.42	1.6	5.0
Na, %	12:12	0.25	1.64	0.08	0.46
Nd, ppm	9:12	1.4	*	<0.07	2.2
Ni, ppm	12:12	1.1	1.50	0.6	2.0
P, %	12:12	0.39	1.33	0.26	0.60
Pb, ppm	3:12	<1.0	*	<0.8	1.3
Sc, ppm	2:12	<0.5	*	<0.4	0.7
Se, ppm	12:12	0.1	2.25	0.02	0.48
Sr, ppm	12:12	245	1.18	157	293
Ti, ppm	10:12	40	*	<10	190
V, ppm	8:12	1.4	*	<0.4	6.2
Y, ppm	2:12	<0.5	*	<0.4	0.6
Zn, ppm	12:12	30	1.37	18	50
Ash, %	12:12	12.1	1.15	10.1	16.0

Table 15 Summary information for total element concentrations in Greasewood samples collected in the TJ-Drain study area. All data corrected to dry weight

[GM, Geometric Mean; GD, Geometric Deviation; Detection Ratio, number of samples in which element was found in measureable concentration to number of samples analyzed; ppm, parts per million (mg/Kg); Min., minimum value; Max., maximum value; *, represent median values]

Element, unit of measure	Detection Ratio	GM	GD	Observed Range Min.	Max.
As, ppm	29:29	0.13	1.54	0.06	0.32
Al, ppm	29:29	508	1.66	210	1160
Ba, ppm	29:29	10	1.58	4.5	23.5
Ca, ppm	29:29	7300	1.47	1900	11600
Cd, ppm	1:29	<0.4	*	<0.2	0.6
Ce, ppm	8:29	<1.	*	<0.3	1.4
Co, ppm	25:29	0.3	*	<0.3	0.5
Cr, ppm	29:29	1.4	2.38	0.4	6.7
Cu, ppm	29:29	8.6	1.55	4.0	16.8
Fe, ppm	29:29	300	1.54	140	650
K, ppm	29:29	12300	1.49	5590	27900
La, ppm	19:29	0.4	*	<0.3	1.0
Li, ppm	29:29	2.6	1.88	0.7	10
Mg, ppm	29:29	1600	1.59	720	6100
Mn, ppm	29:29	86	1.96	13.1	172
Mo, ppm	26:29	0.9	*	<0.2	5.1
Na, ppm	29:29	16100	2.05	3100	43800
Ni, ppm	16:29	0.3	*	<0.3	1.0
P, ppm	29:29	1270	1.77	103	3760
Pb, ppm	6:29	<1	*	<0.3	3.2
Se, ppm	29:39	0.14	2.95	<0.01	1.3
Sr, ppm	29:29	77.9	1.41	39.1	140
Ti, ppm	29:29	29	1.67	10	68
V, ppm	9:29	0.7	*	<0.4	1.5
Zn, ppm	29:29	11	1.70	3.7	29.4
Ash, %	29:29	9.69	1.55	3.6	19.5

Table 16 Comparison of total element concentrations in alfalfa samples collected from selected study sites in the western United States.

[GM, Geometric Mean; GD, Geometric Deviation; ppm, parts per million; %, percent; All data corrected to dry weight basis; *, Median values calculated for TJ-Drain data; NC, result not calculated

Element, unit of conc.	TJ-Drain Study		Kendrick[1] Wyoming		San Joaquin Valley[2] California		Big Sky[3] Montana	
	GM	GD	GM	GD	GM	GD	GM	GD
Al,ppm	980	3.12	220	1.99	160	1.55	950	1.43
As,ppm	0.77	1.66	NC	NC	NC	NC	0.17	1.18
Ba,ppm	33	1.92	21	1.46	18.7	2.55	15	1.09
Ca,%	2.3	1.20	1.6	1.19	1.8	1.25	1.1	1.23
Ce,ppm	<1.0	*	NC	NC	NC	NC	NC	NC
Co,ppm	0.70	1.50	0.3	1.37	0.52	1.55	0.1	1.49
Cr,ppm	2.7	2.29	0.8	1.43	0.61	1.43	NC	NC
Cu,ppm	13	1.18	8.3	1.19	0.01	1.24	8.1	1.16
Fe,ppm	570	2.49	98	1.28	200	1.34	190	1.27
K,%	1.7	1.28	1.8	1.33	3.46	1.36	1.9	1.08
La,ppm	1.0	1.63	0.5	1.23	0.67	1.29	NC	NC
Li,ppm	6.6	1.25	1.0	2.20	2.43	1.28	0.5	1.42
Mg,%	0.40	1.24	0.33	1.24	0.33	1.21	0.42	1.35
Mn,ppm	52	1.34	29	1.25	43.5	1.27	30	1.83
Mo,ppm	3.4	1.42	2.6	1.51	4.23	1.63	8.5	1.30
Na,ppm	2500	1.64	550	1.70	900	2.24	60	1.19
Nd,ppm	1.4	*	NC	NC	NC	NC	NC	NC
Ni,ppm	1.1	1.50	1.3	1.51	1.86	1.65	1.2	1.55
P, ppm	3900	1.33	2900	1.19	4700	1.29	1000	1.30
Se,ppm	0.1	2.25	0.98	3.49	0.37	2.05	0.22	2.13
Sr,ppm	245	1.18	150	1.32	1270	1.42	83	1.34
Ti,ppm	40	*	NC	NC	NC	NC	21	1.16
V, ppm	1.4	*	NC	NC	NC	NC	<1	NC
Y, ppm	<0.5	*	NC	NC	NC	NC	NC	NC
Zn,ppm	30	1.37	28	1.24	38	1.27	39	1.24
Ash,%	12.1	1.15	8.63	1.14	11.5	1.24	8.1	1.10

1 Severson, R.C. and others, 1989, USGS open file report 89-652
2 Severson personnal communication
3 Gough, L.P., and Severson, R.C., 1983, Reclamation and Revegitation Rsh. 2:103-122

Table 17 Total element median concentrations in greasewood samples collected from TJ-Drain service area and Lyon county, Nevada.

[ppm, parts per million, mg/Kg; %, percent; Total element concentrations in plant ash]

Element, unit of measure	TJ-Drain Study Area	Lyon county, Nevada
Al,%	0.58	0.14
As,ppm	0.12	0.05
Ba,ppm	123	27
Ca,%	7.13	3.09
Ce,ppm	6	<8
Co,ppm	3	<2
Cr,ppm	14	6
Cu,ppm	87	42
Fe,ppm	0.33	0.10
La,ppm	5	<4
Li,ppm	25	13
Mg,%	1.29	1.04
Mn,ppm	980	597
Mo,ppm	9	8
Na,ppm	18.1	25.5
Ni,ppm	5	<4
P, %	1.23	0.67
Se,ppm	0.14	0.05
Sr,ppm	822	259
Ti,ppm	300	<100
V, ppm	7	<4
Zn,ppm	106	50
Ash,%	10.3	18.4

Table 18 Comparison of water extractable selenium using water saturation paste and constant ratio extractions for TJ-Drain, San Joaquin Valley, and Kendrick irrigation district.

[Results refer to linear regression analysis of log transformed extractable Se data, ppb]

location Site	Slope	Y-intercept	correlation coefficient	Estimated[1] Se-WSP ppb
TJ-Drain study area	1.04	-0.34	0.88	27±7[2]
San Joaquin Valley	1.22	-0.82	0.77	14±6[2]
Kendrick Irrigation District	1.22	-0.82	0.89	18±9[2]

1 Estimated water saturation paste extractable Se (WSP-Se) concentration using 50ppb constant ratio extractable Se (CR-Se).

2 ±, value represent 95% confidence interval

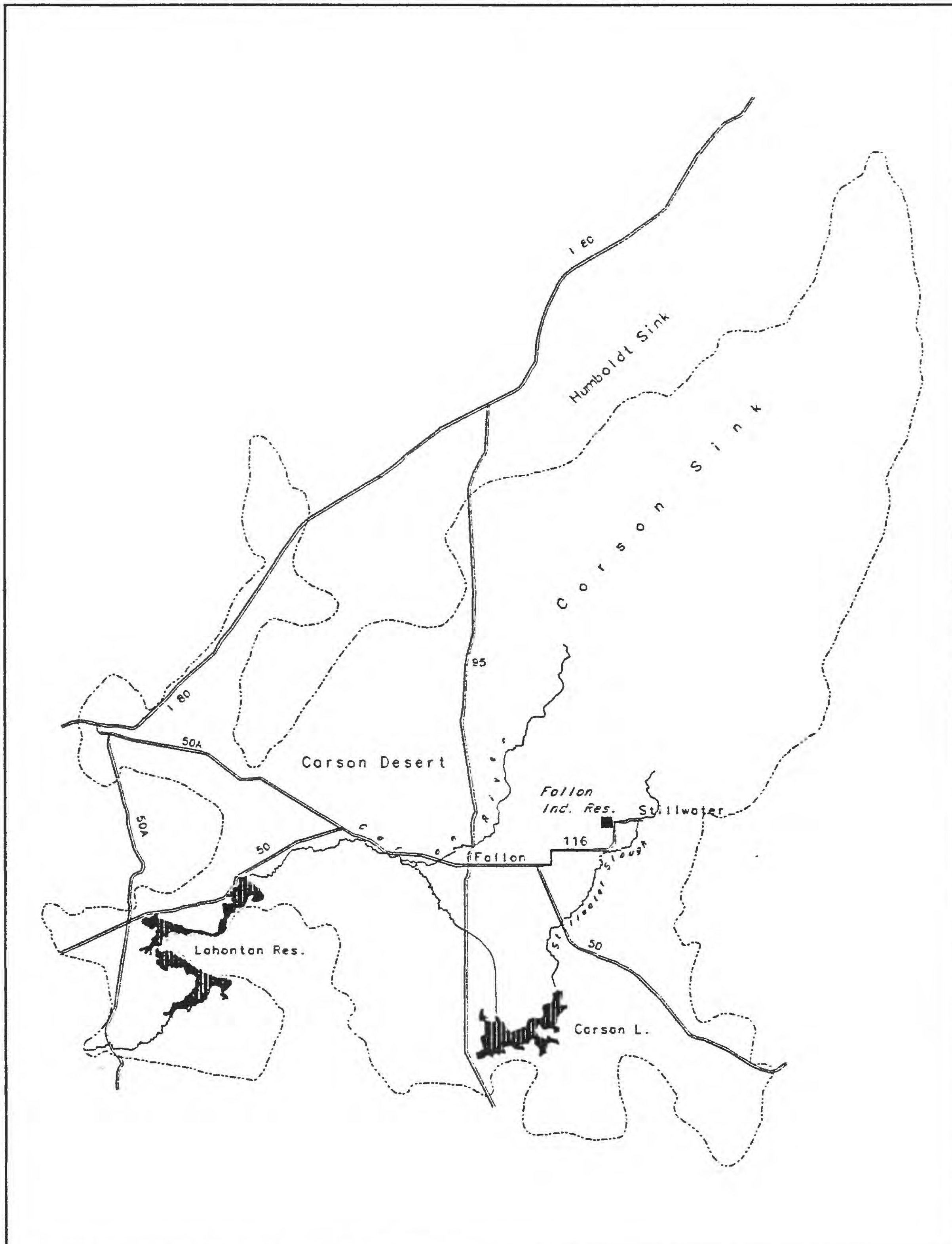


Figure 1.--Location of TJ-Drain study area.

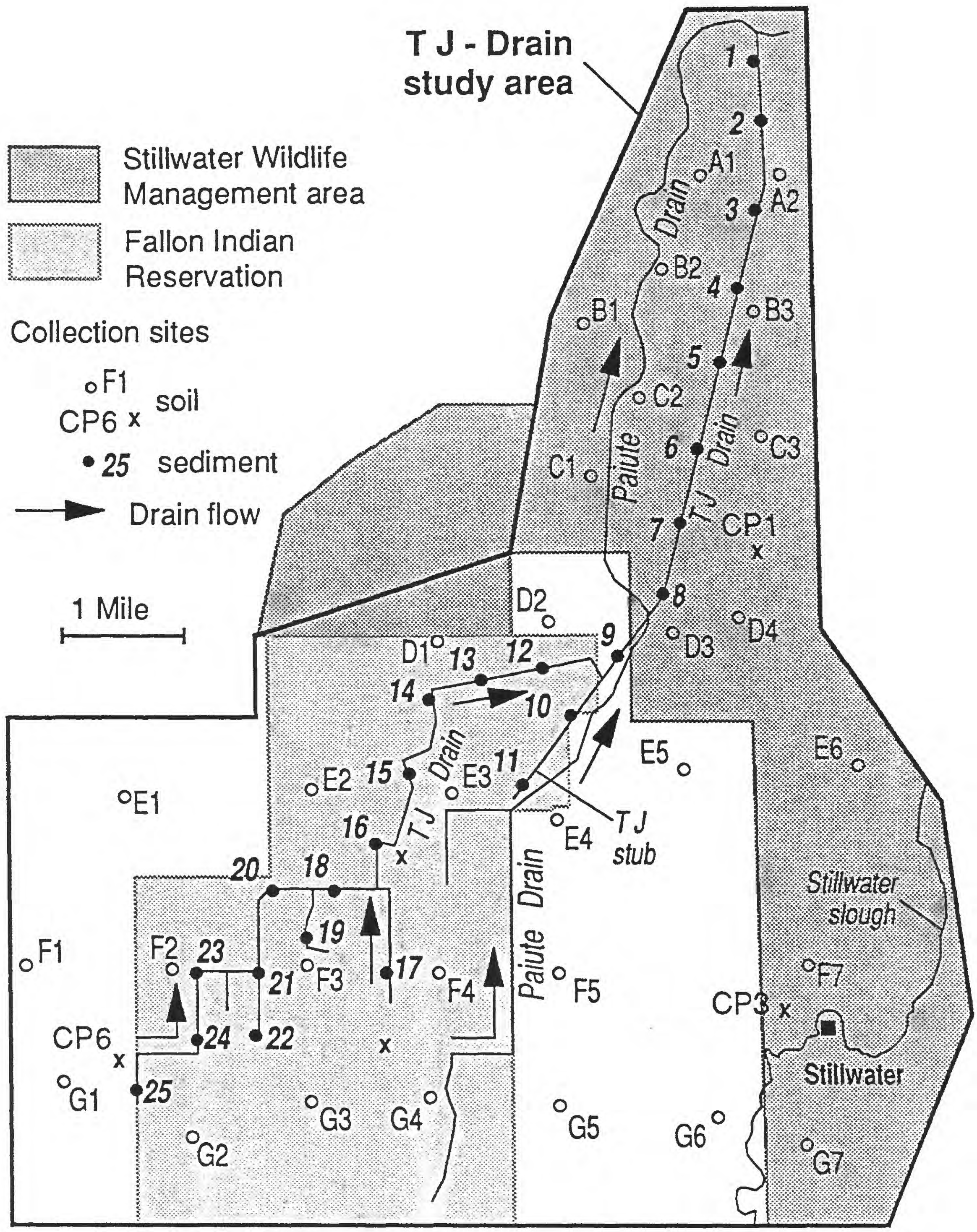


Figure 2. TJ-Drain Study area, sample collection sites

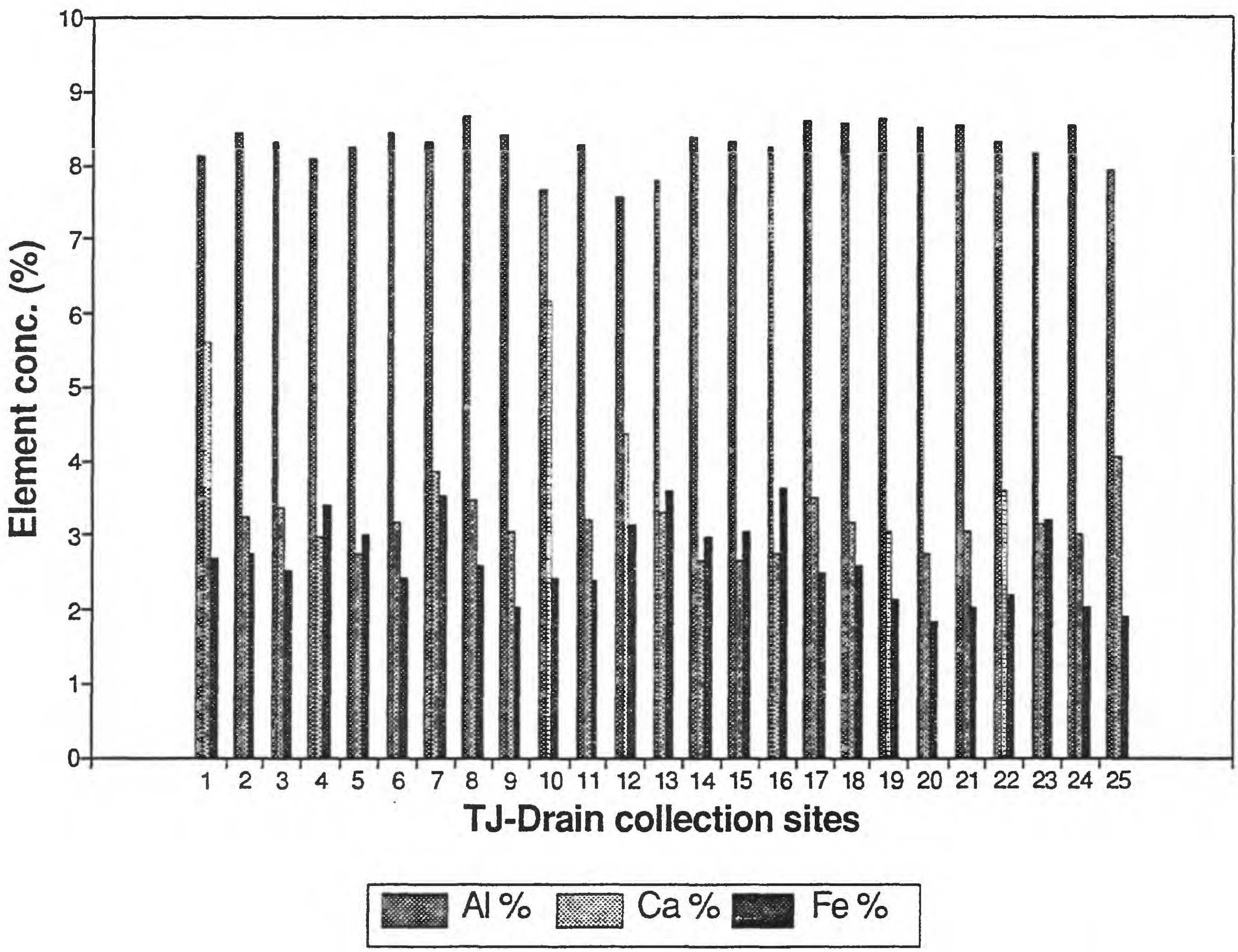


Figure 3. Total concentration of Al, Ca, and Fe in TJ-Drain sediments

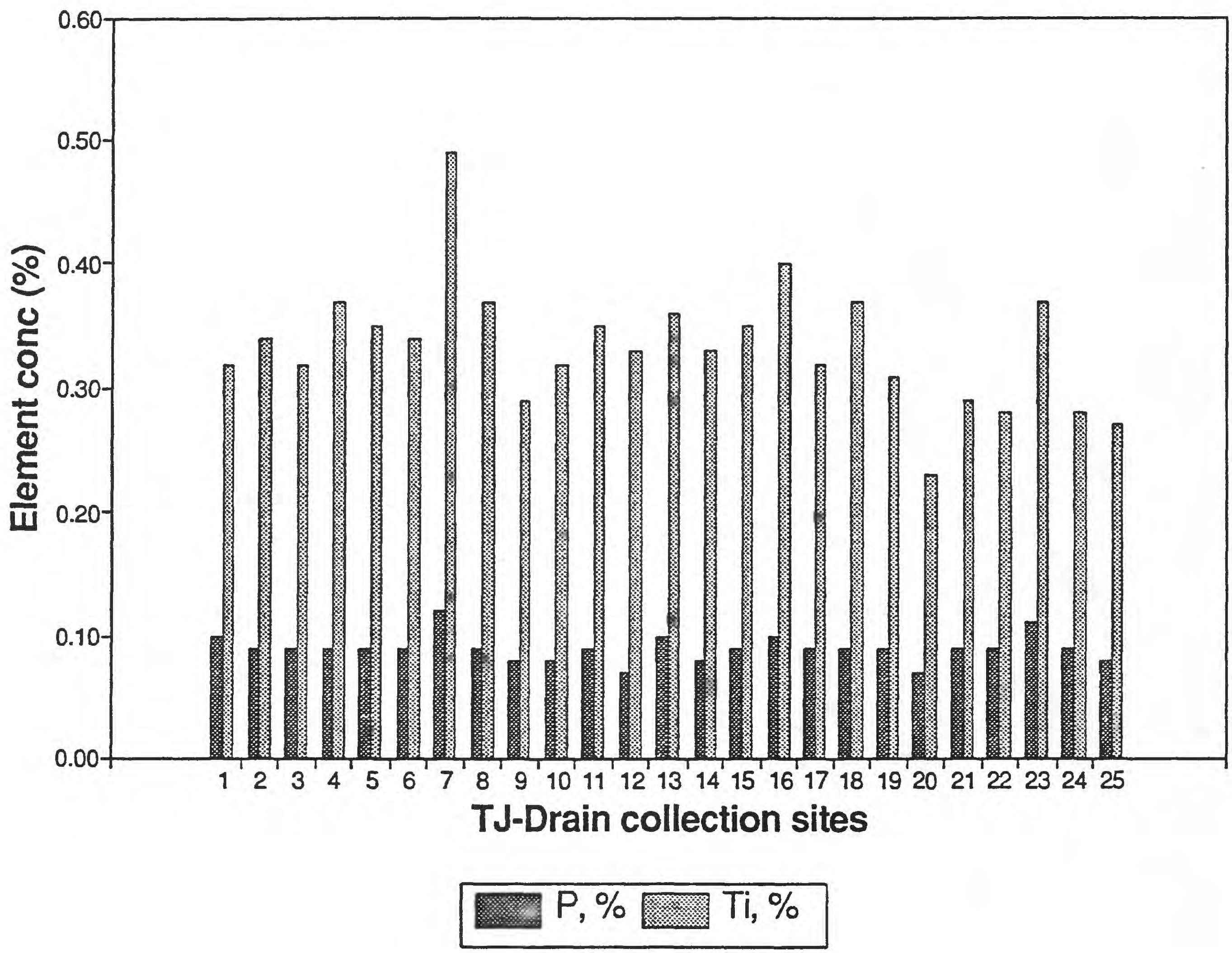


Figure 4. Total concentration of P and Ti in TJ-Drain sediments

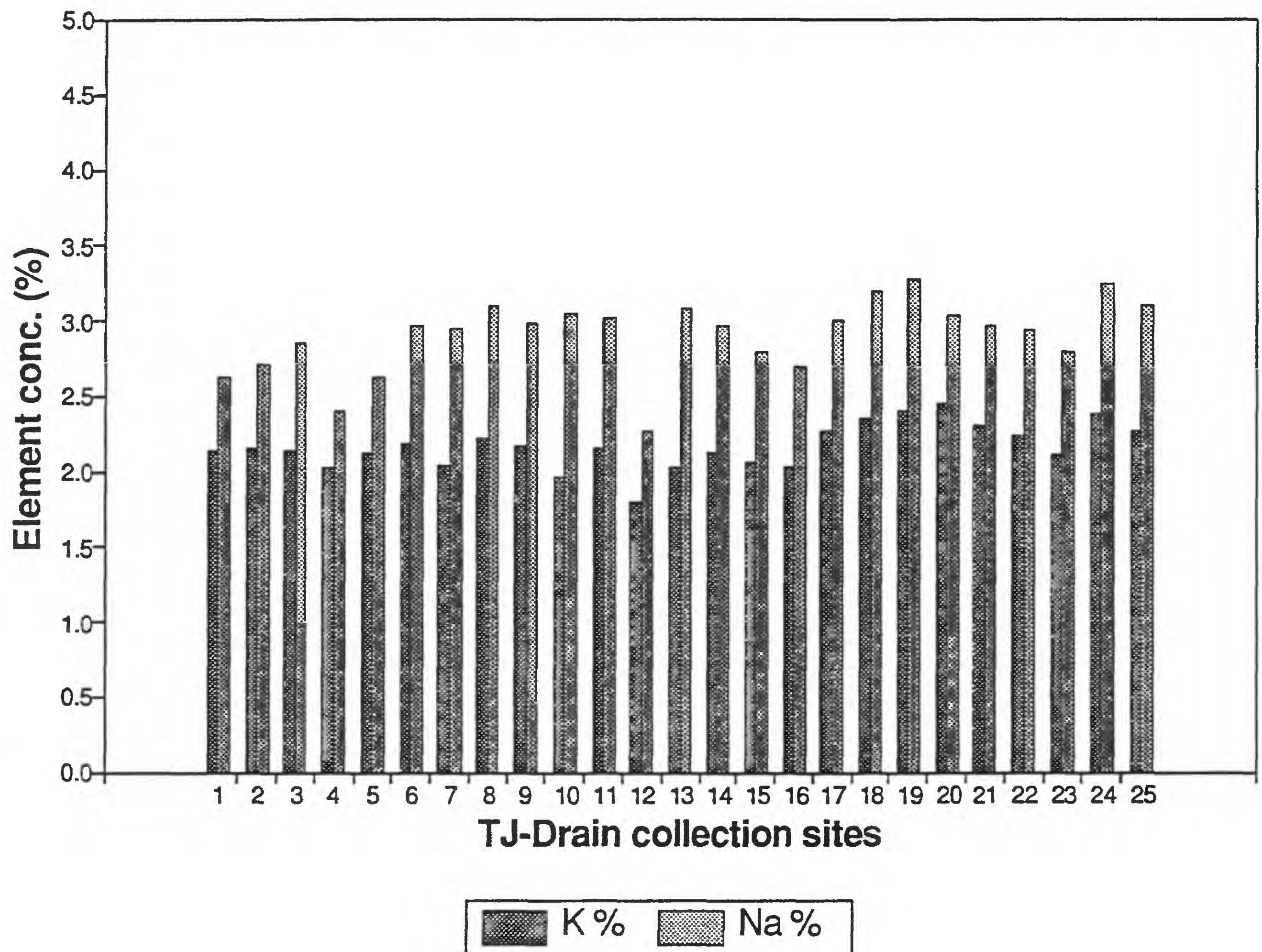


Figure 5. Total concentration of Na and K in TJ-Drain sediments

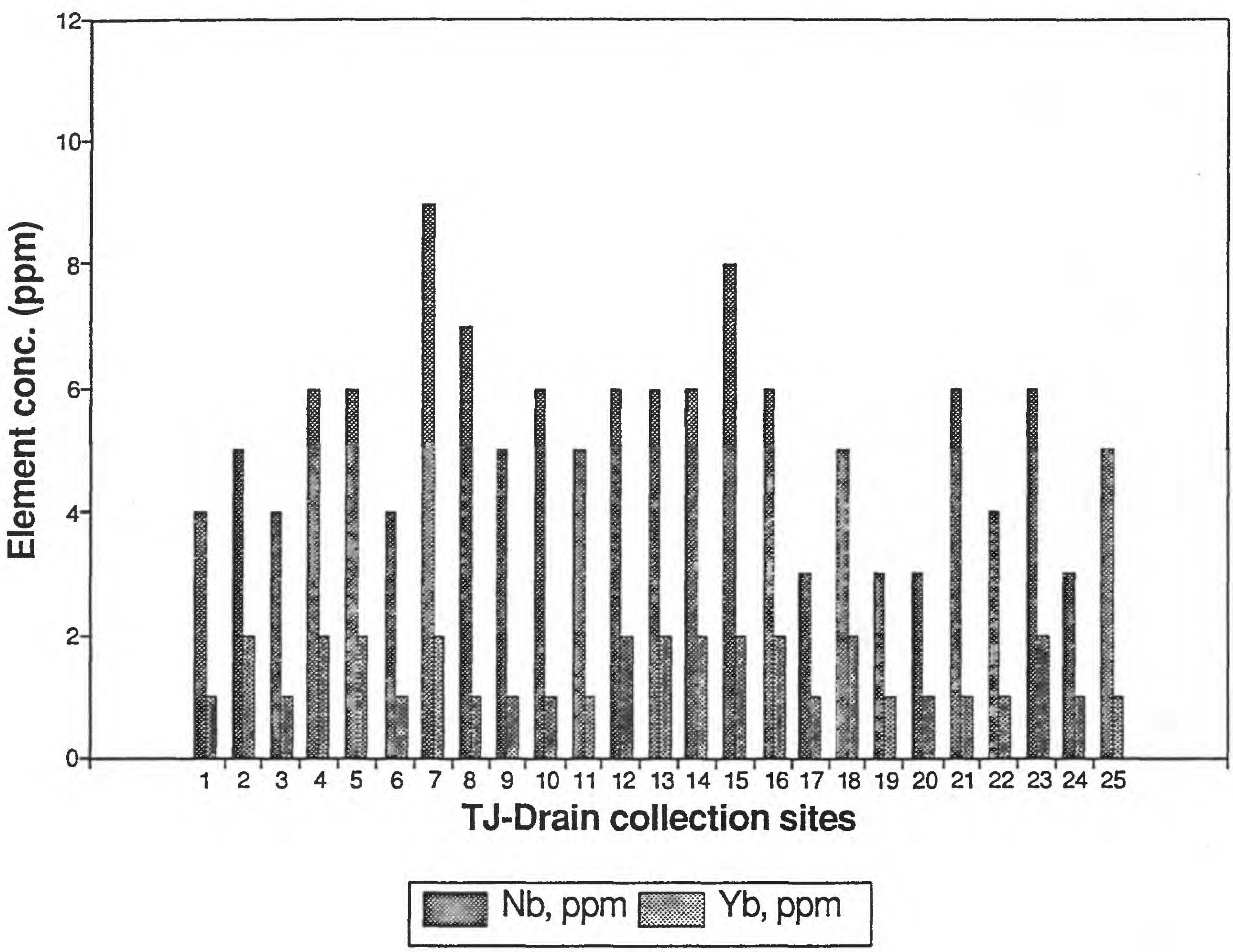


Figure 6. Total concentration of Nb and Yb in TJ-Drain sediments

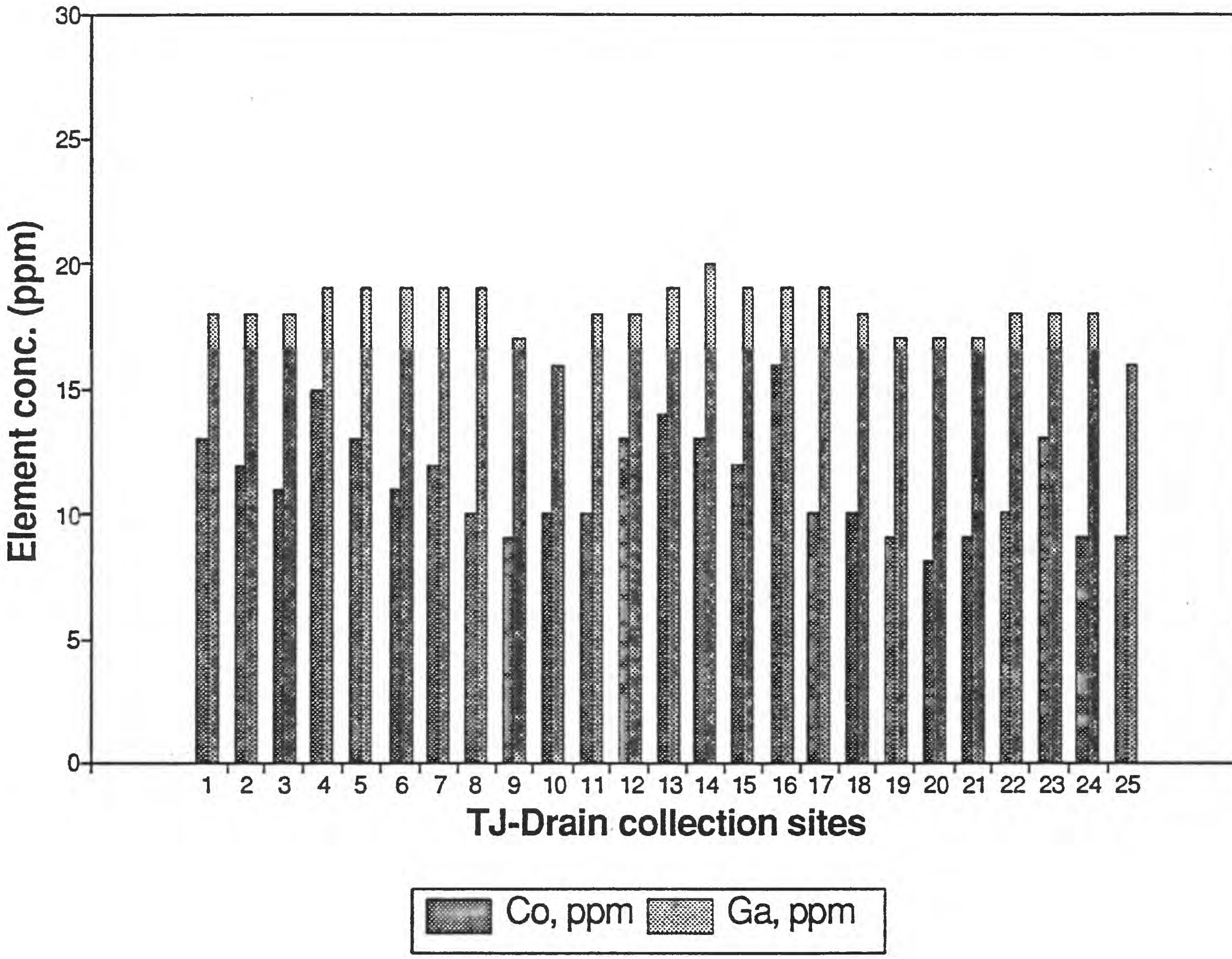


Figure 7. Total concentration of Co and Ga in TJ-Drain sediments

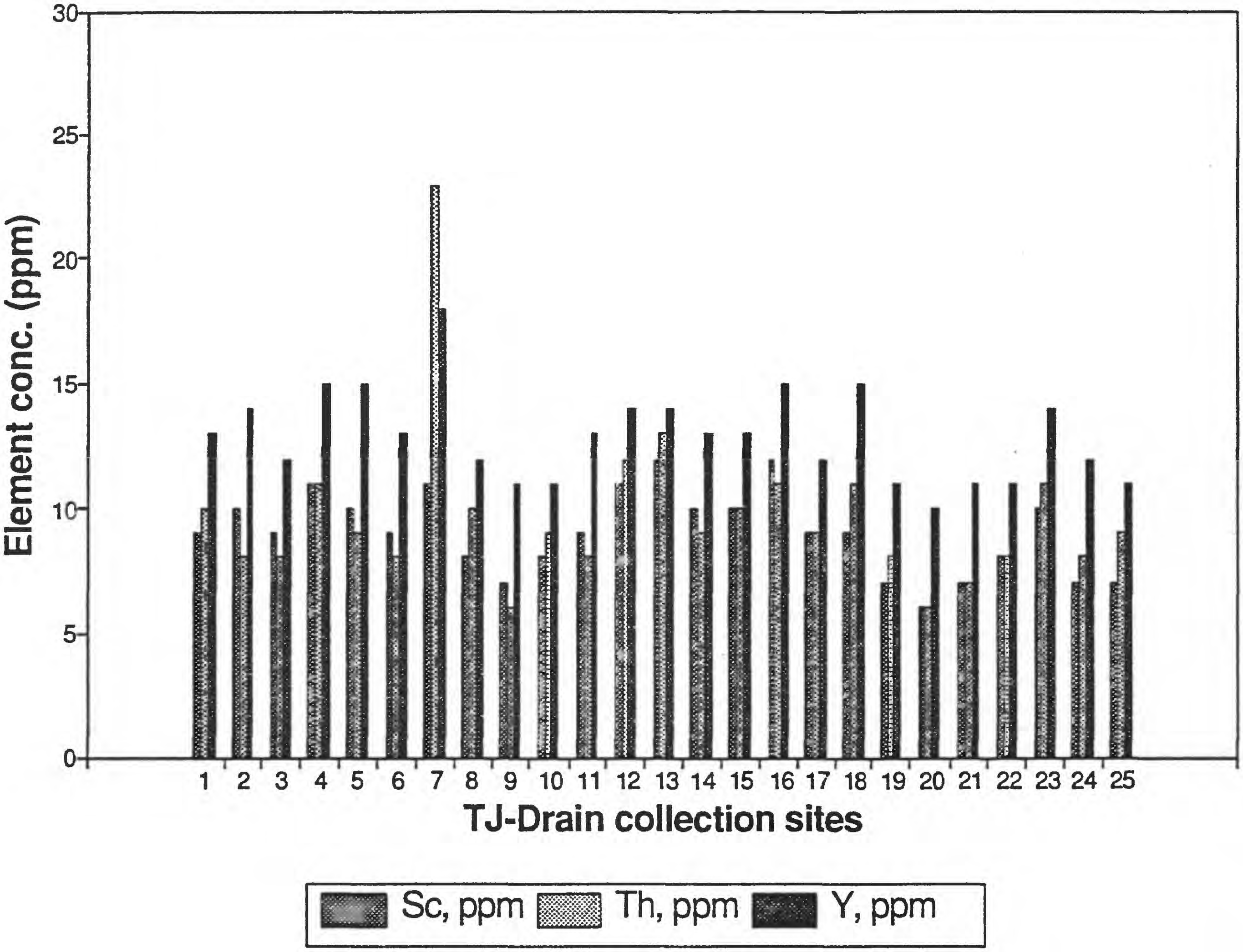


Figure 8. Total concentration of Sc, Th and Y in TJ-Drain sediments

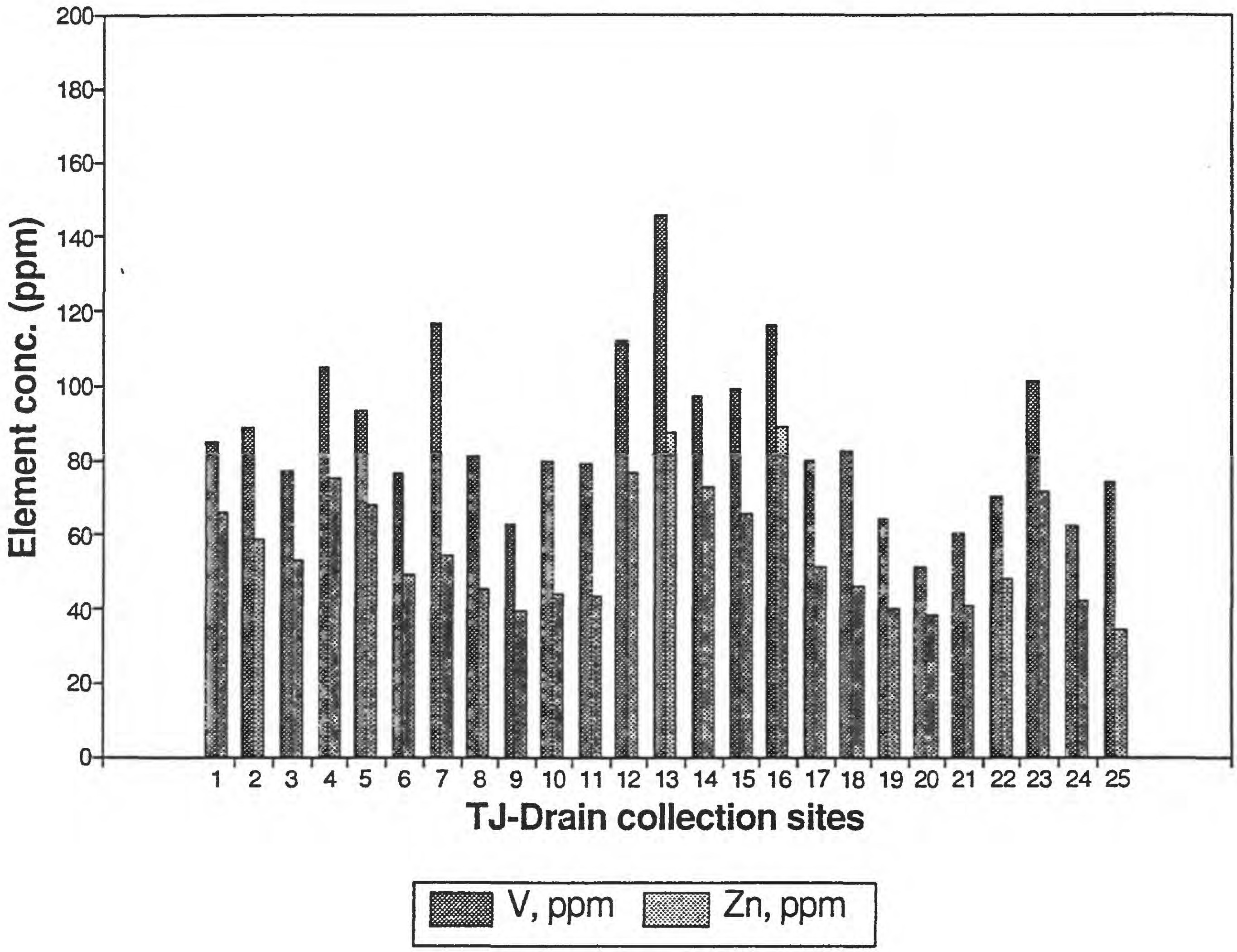


Figure 9. Total concentration of V and Zn in TJ-Drain sediments

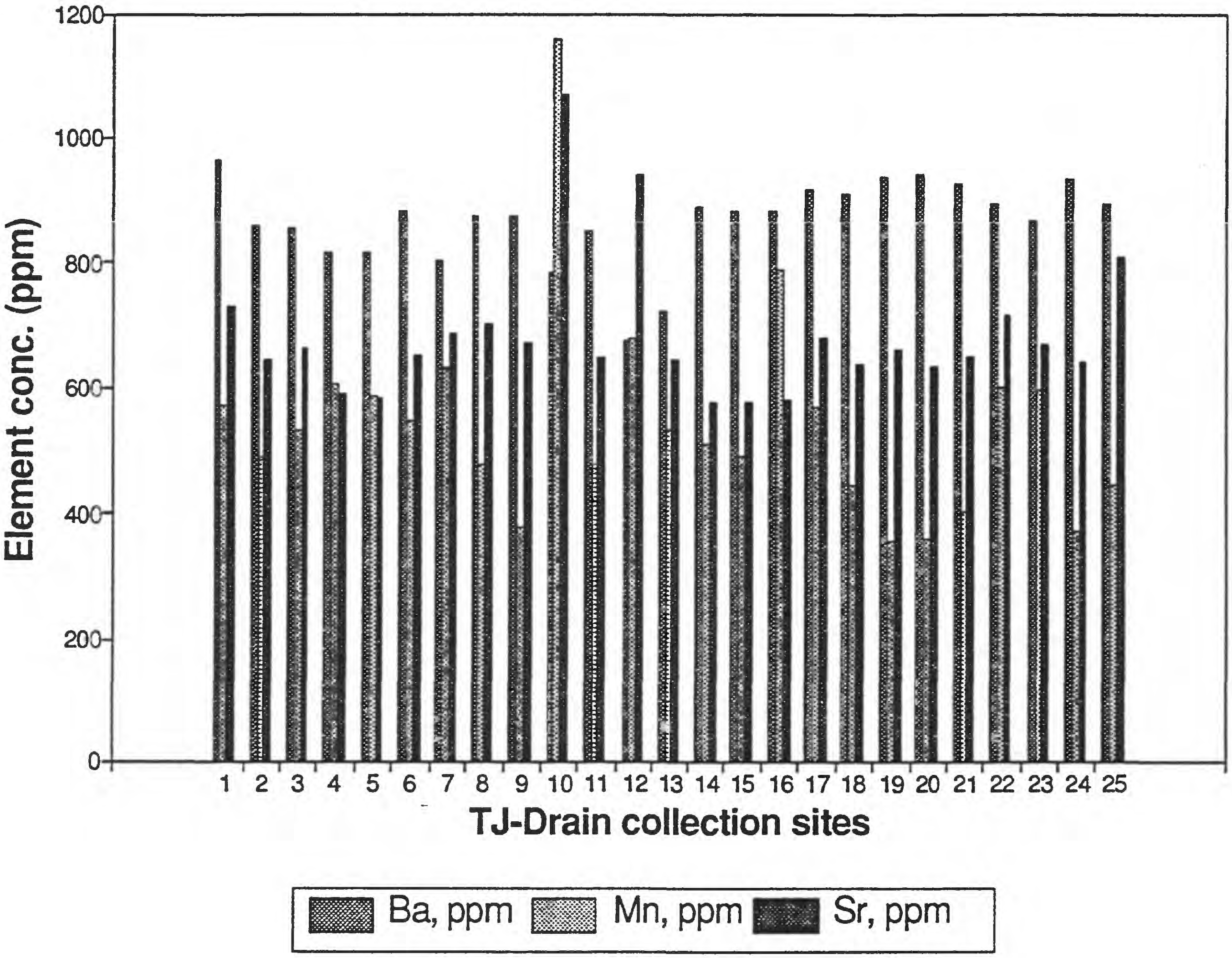


Figure 10. Total concentration of Ba, Mn, and Sr in TJ-Drain sediments

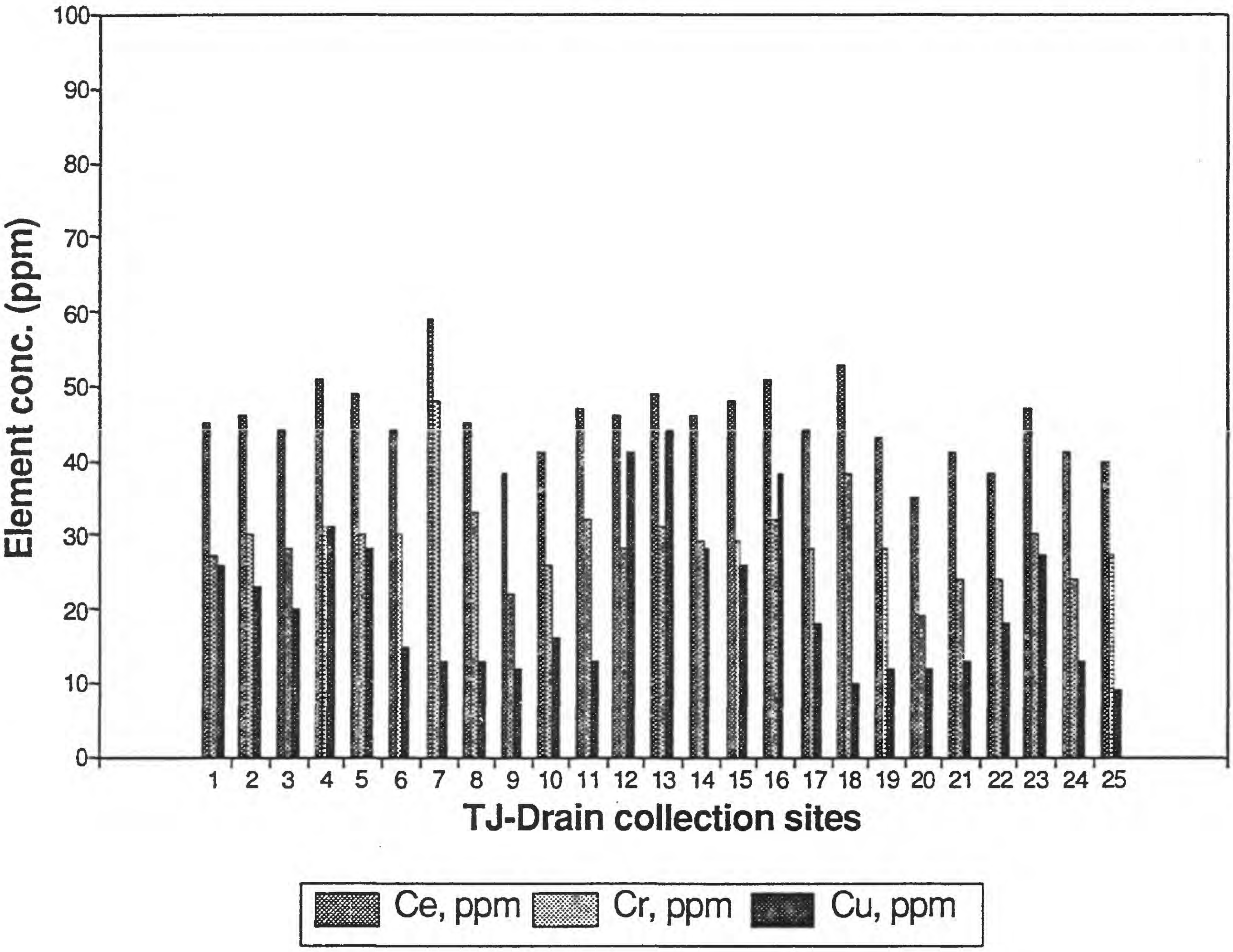


Figure 11. Total concentration of Ce, Cr, and Cu in TJ-Drain sediments

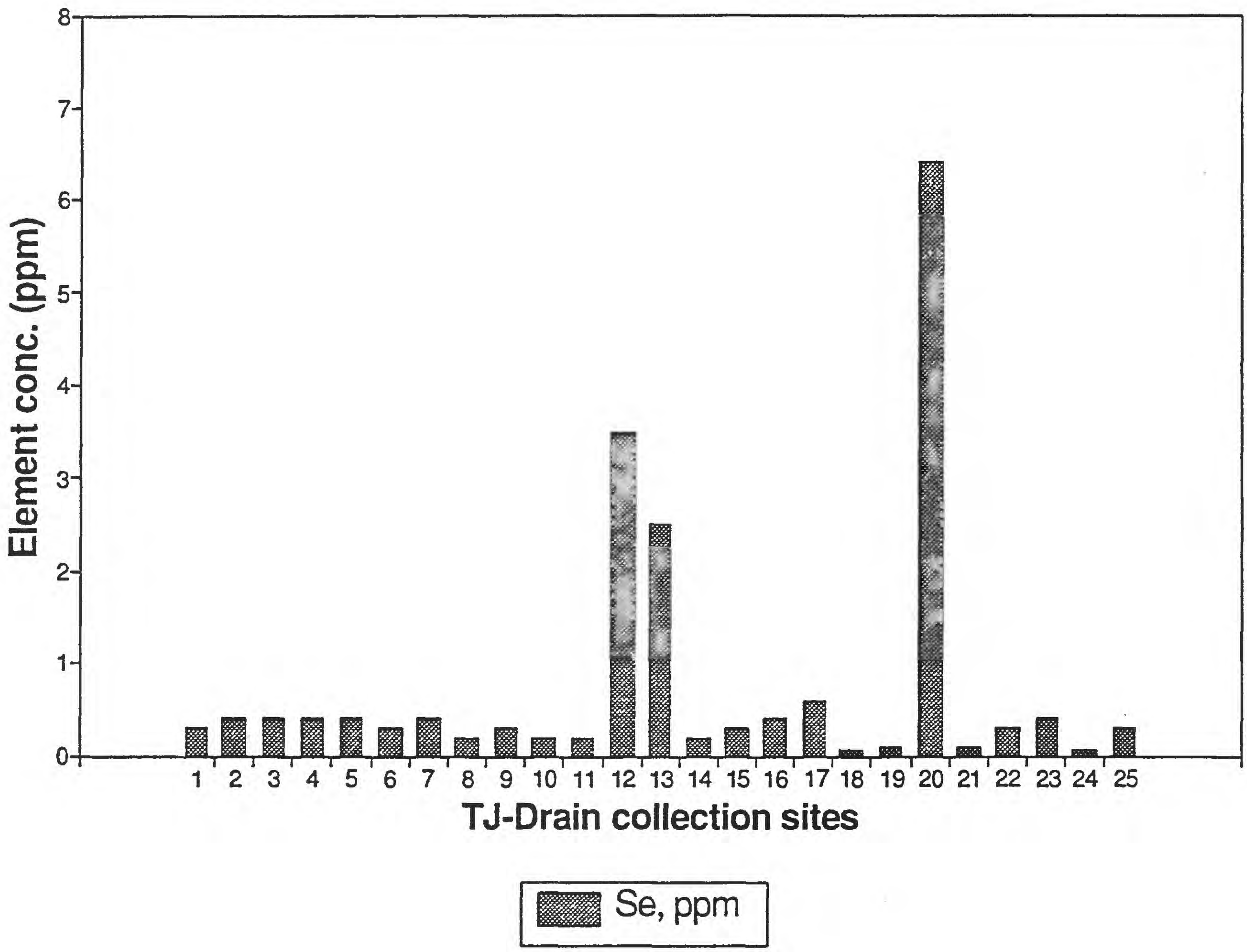


Figure 12. Total concentration of Se in TJ-Drain sediments

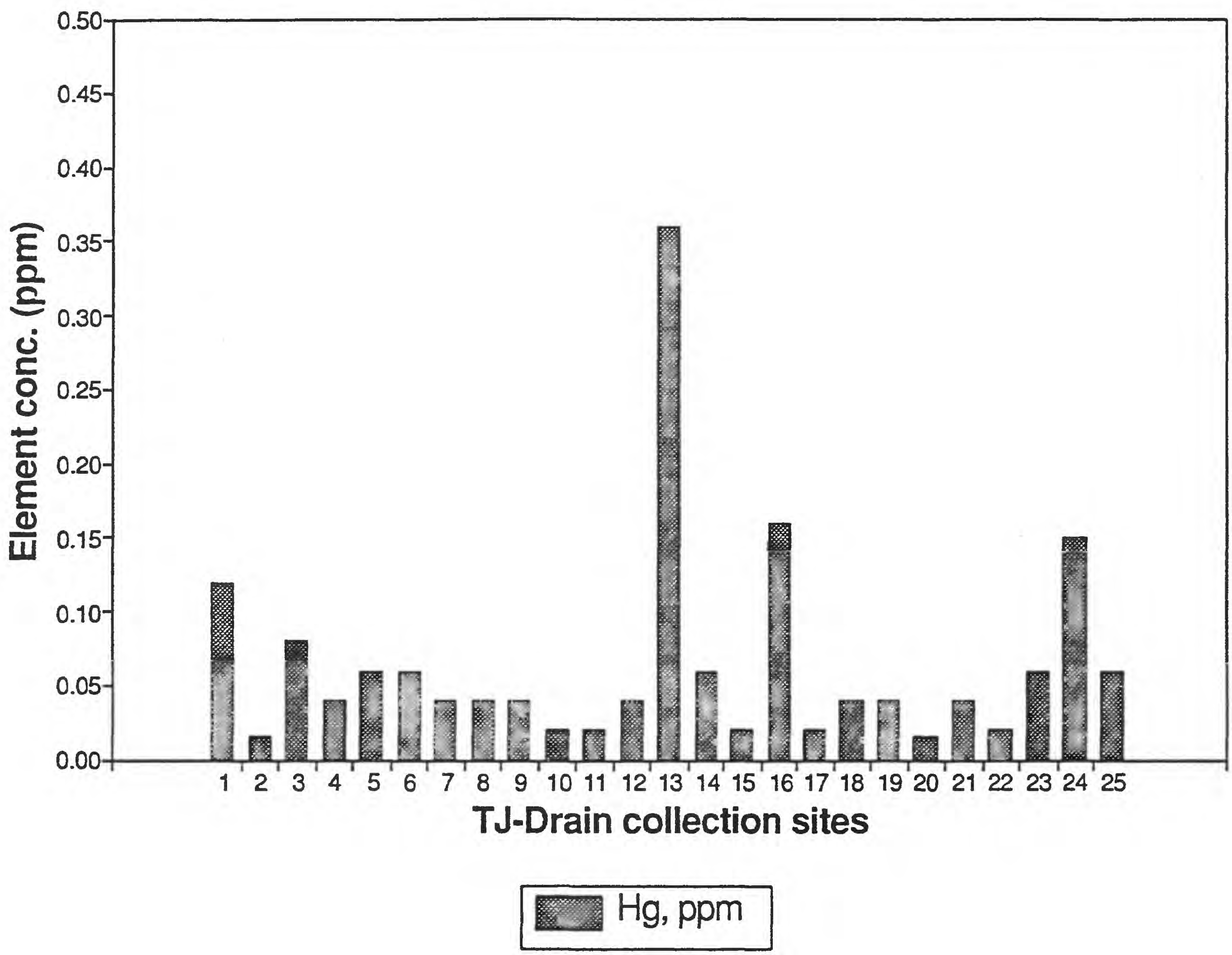


Figure 13. Total concentration of Hg in TJ-Drain sediments

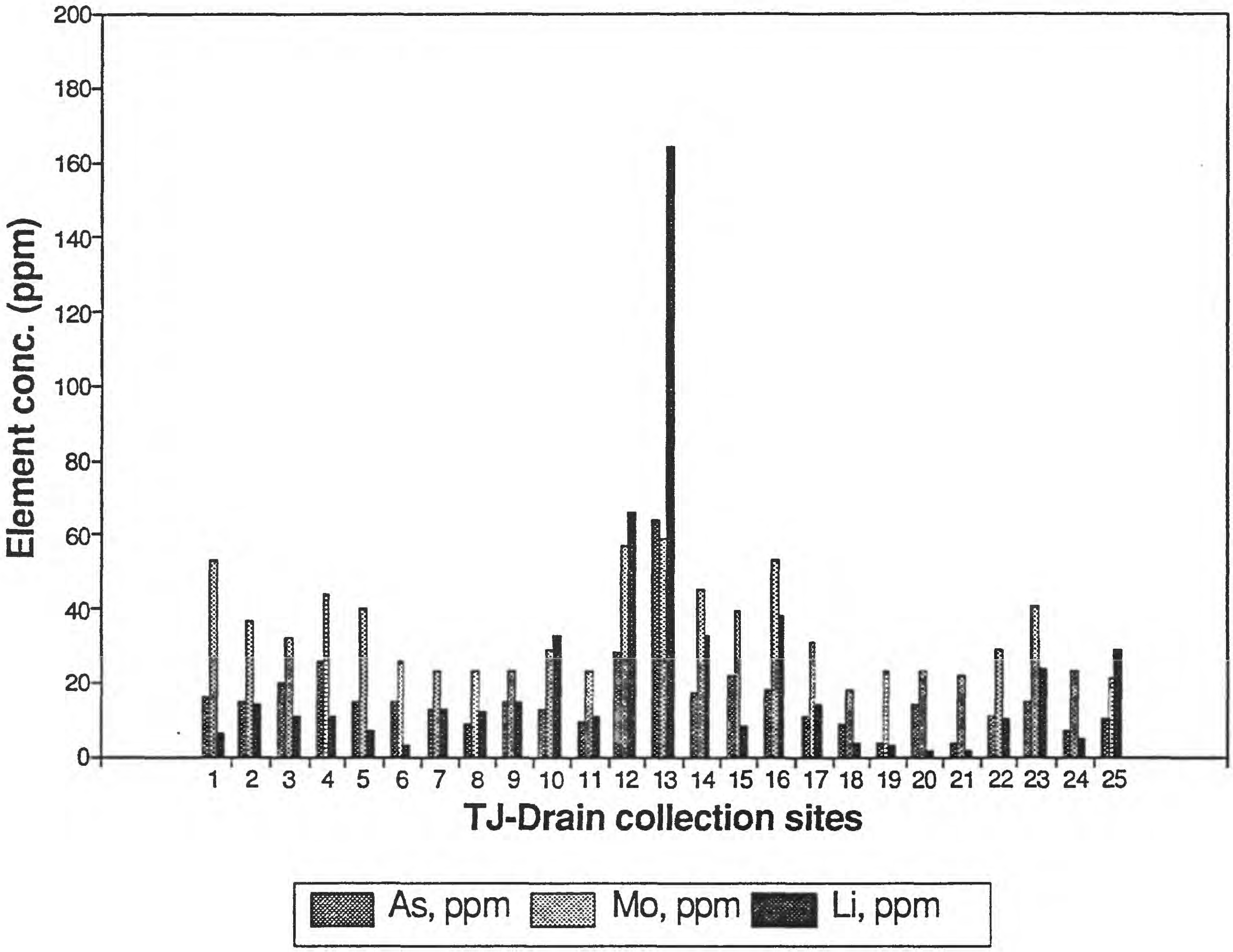


Figure 14. Total concentration of As, Mo,and Li in TJ-Drain sediments

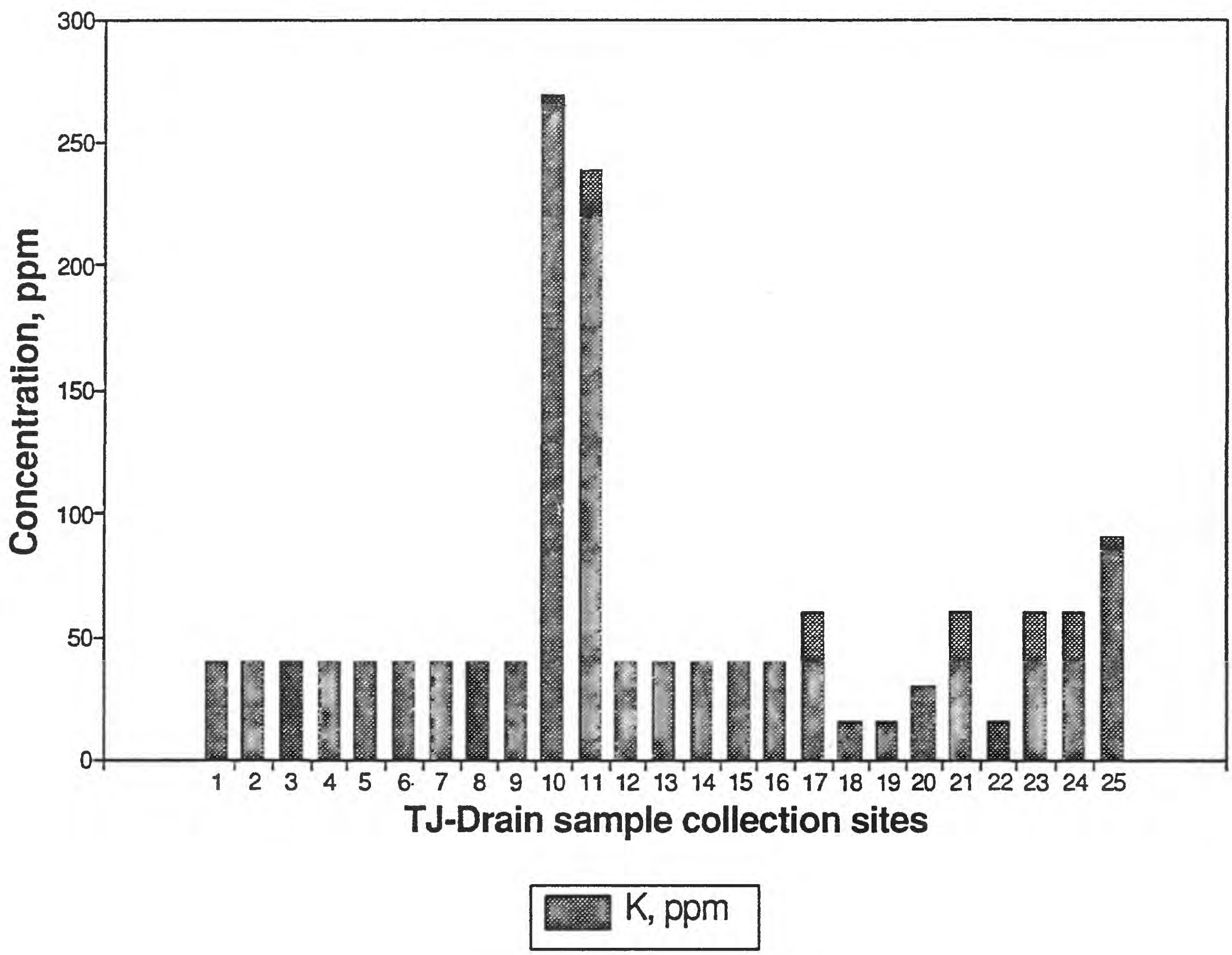


Figure 15. Total concentration of K in TJ-Drain sediments

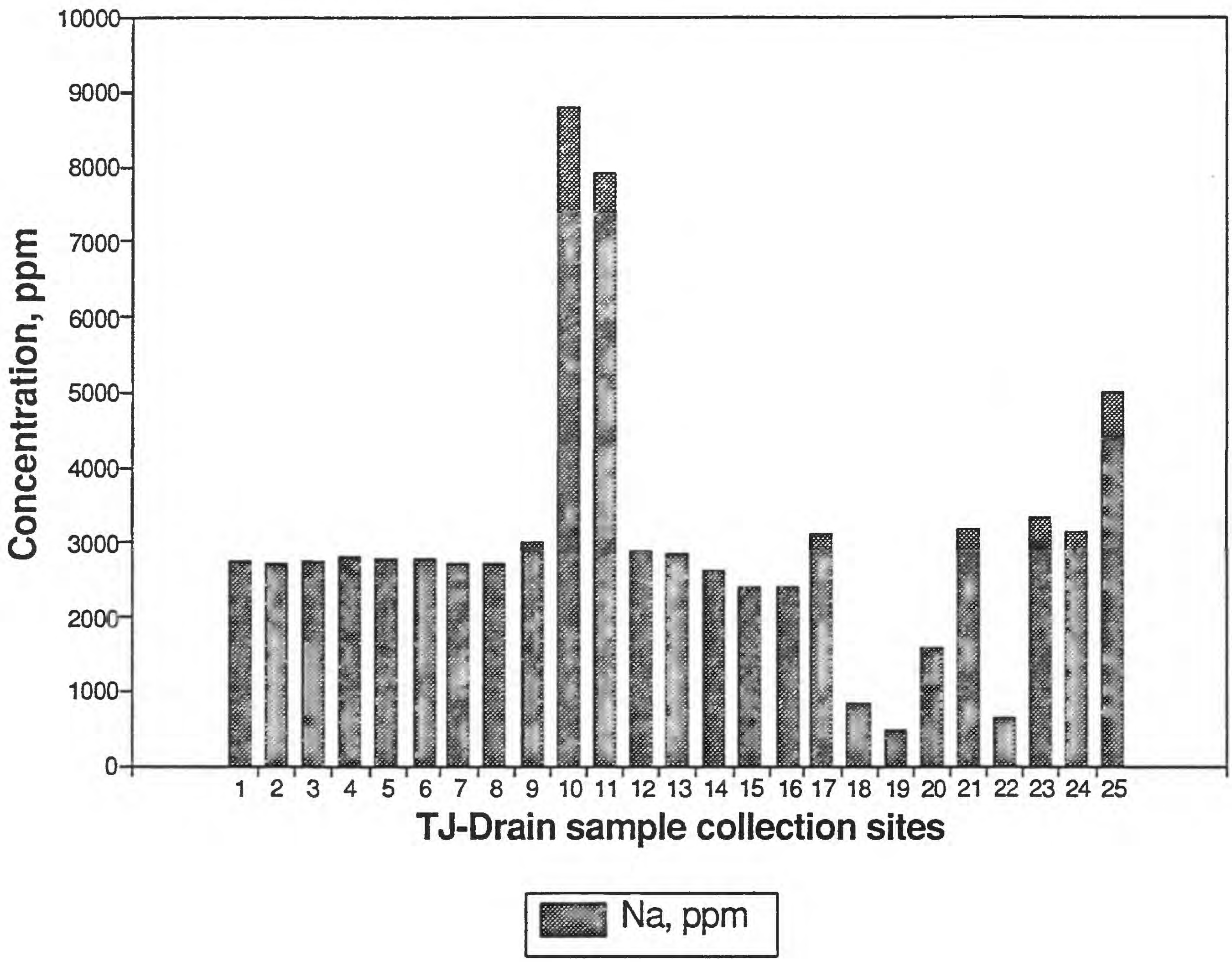


Figure 16. Total concentration of Na in TJ-Drain sediments

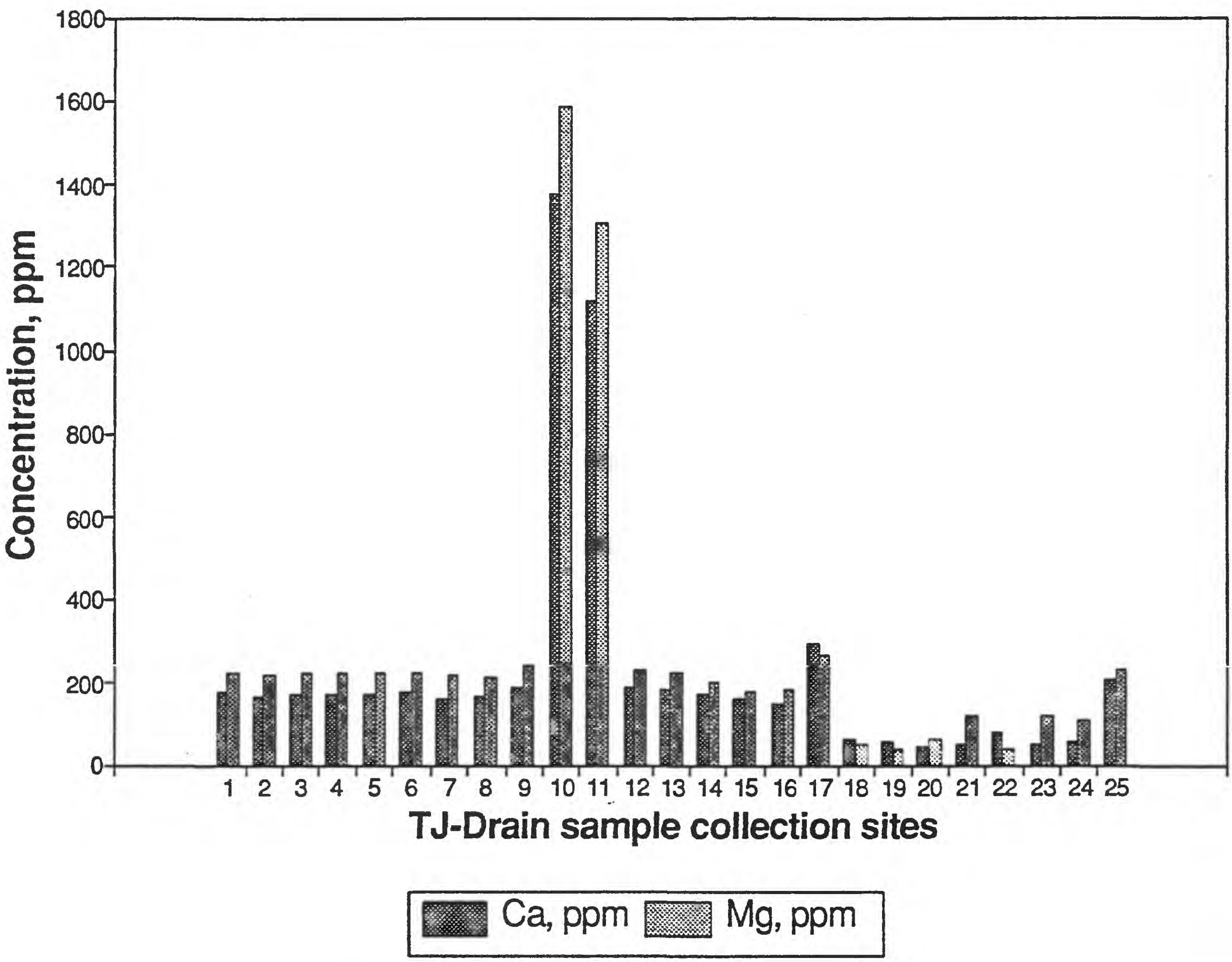


Figure 17. Total concentration of Ca and Mg in TJ-Drain sediments

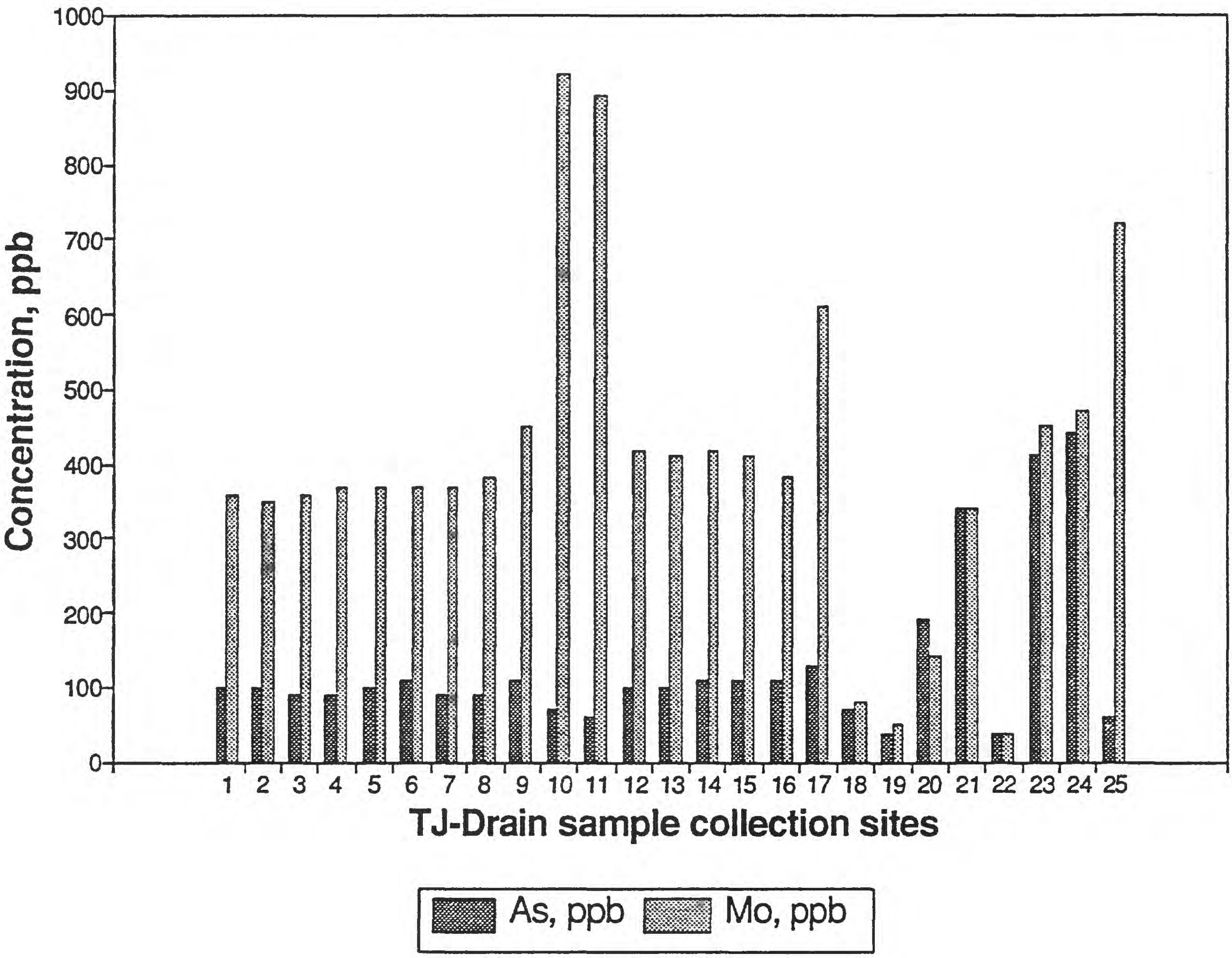


Figure 18. Total concentration of As and Mo in TJ-Drain sediments

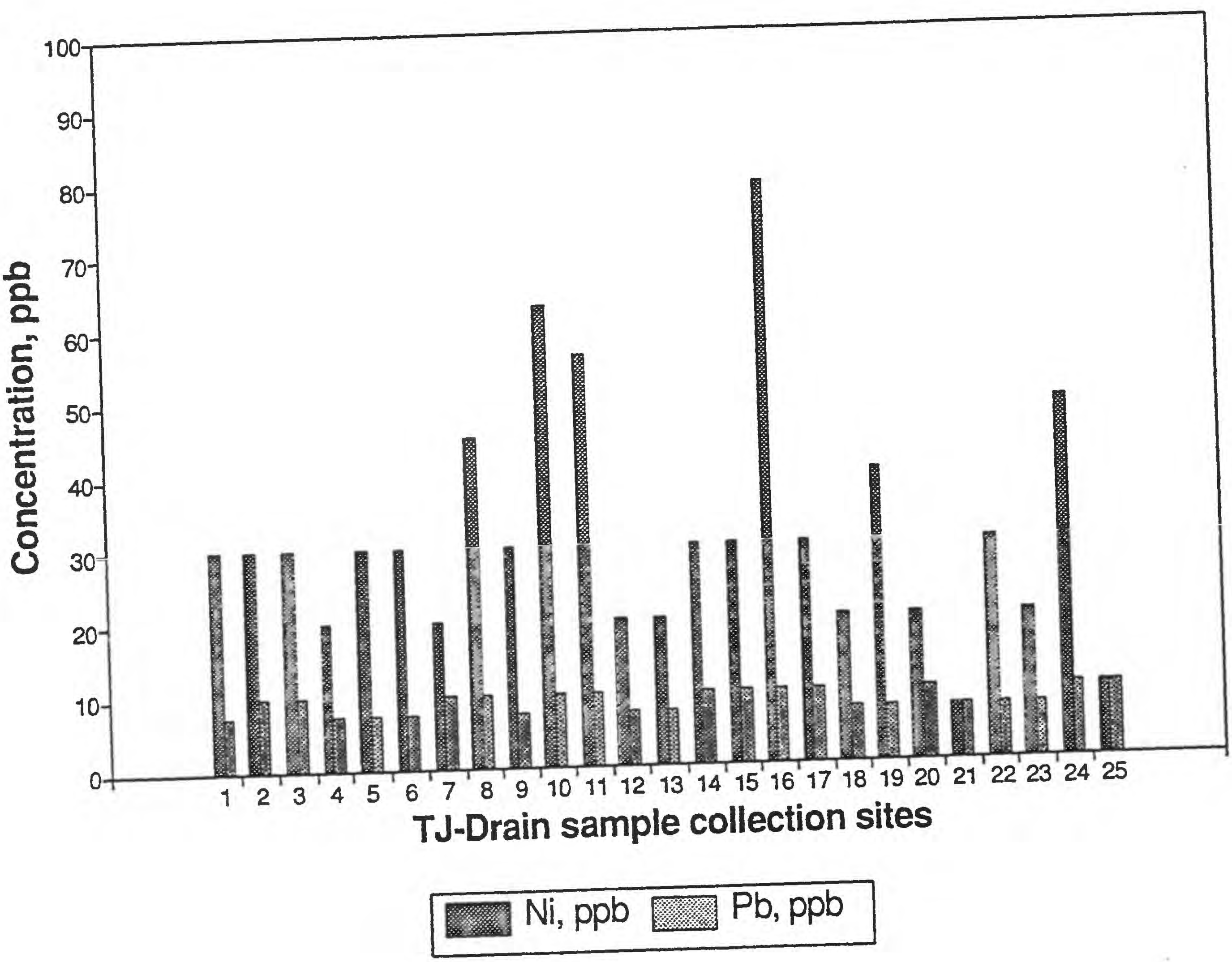


Figure 19. Total concentration of Ni and Pb in TJ-Drain sediments

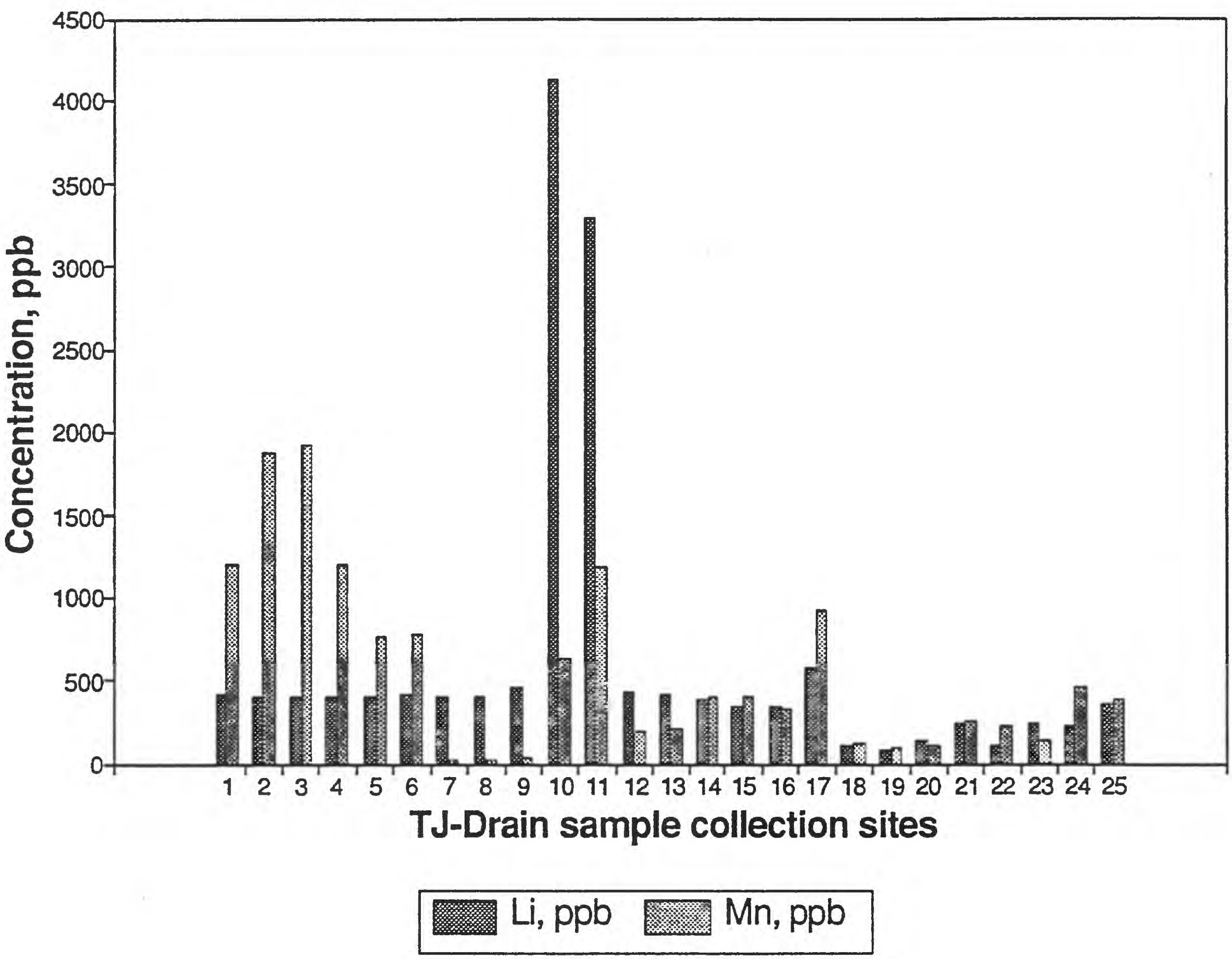


Figure 20. Total concentration of Li and Mn in TJ-Drain sediments

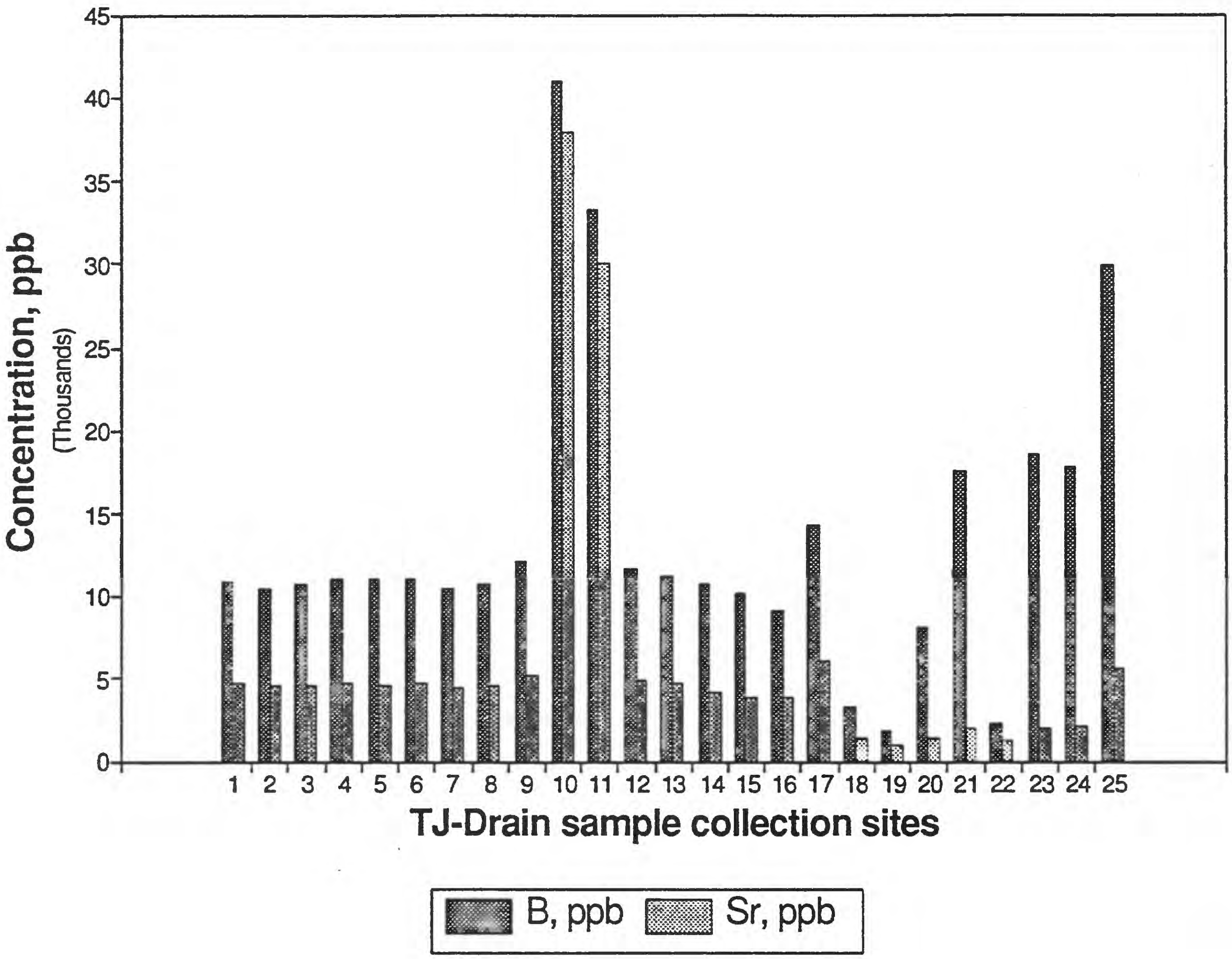


Figure 21. Total concentration of B and Sr in TJ-Drain sediments

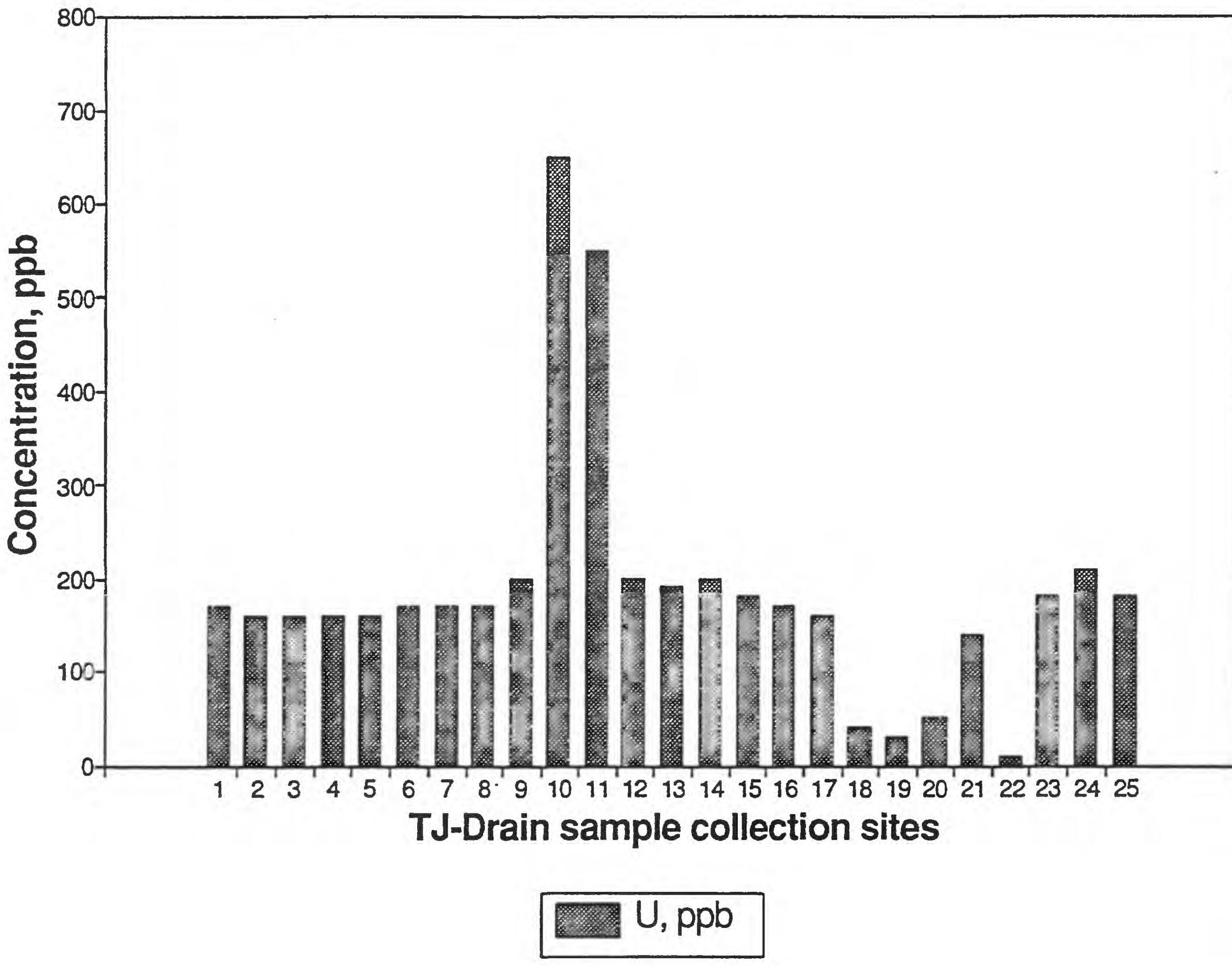


Figure 22. Total concentration of U in TJ-Drain sediments

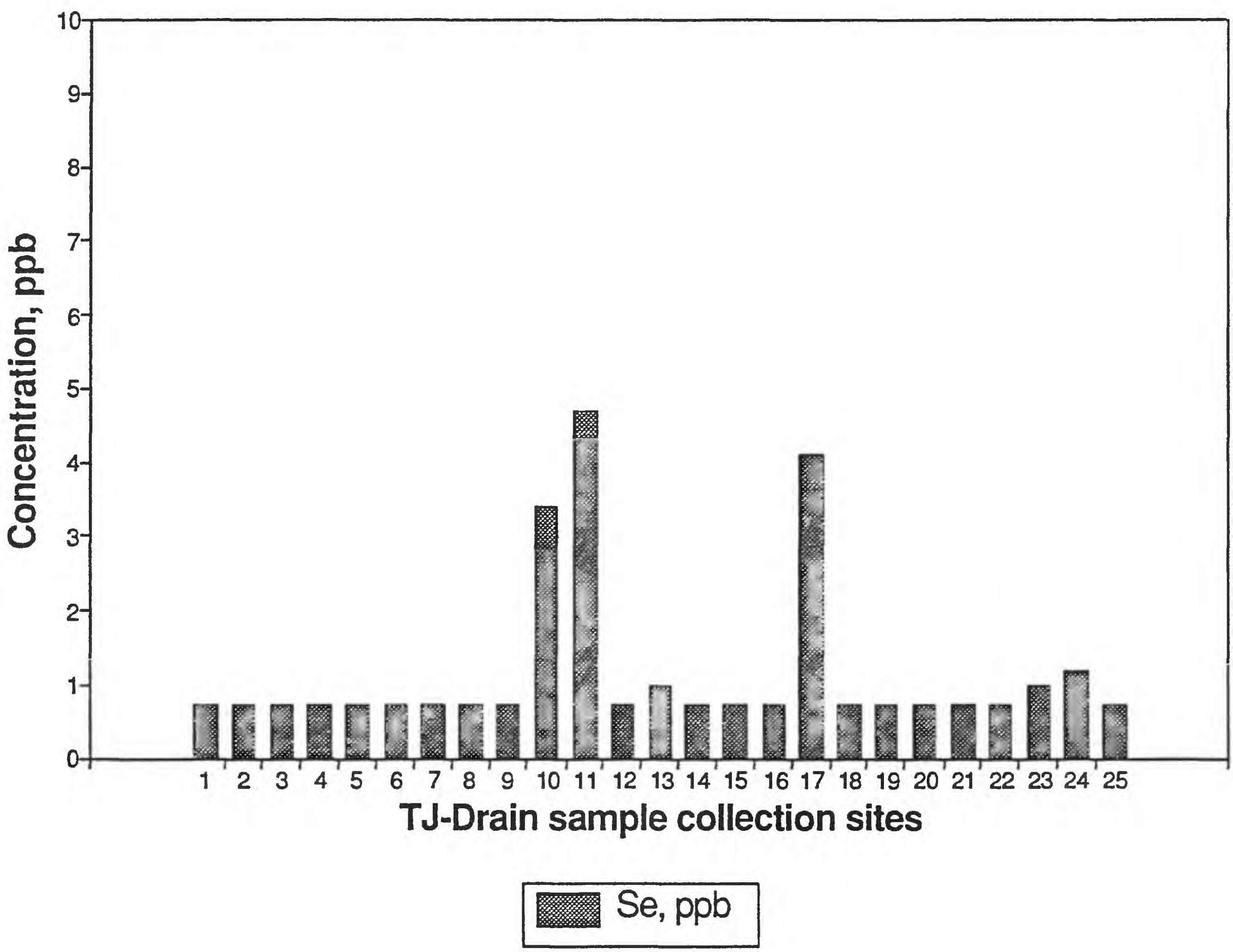


Figure 23. Total concentration of Se in TJ-Drain sediments

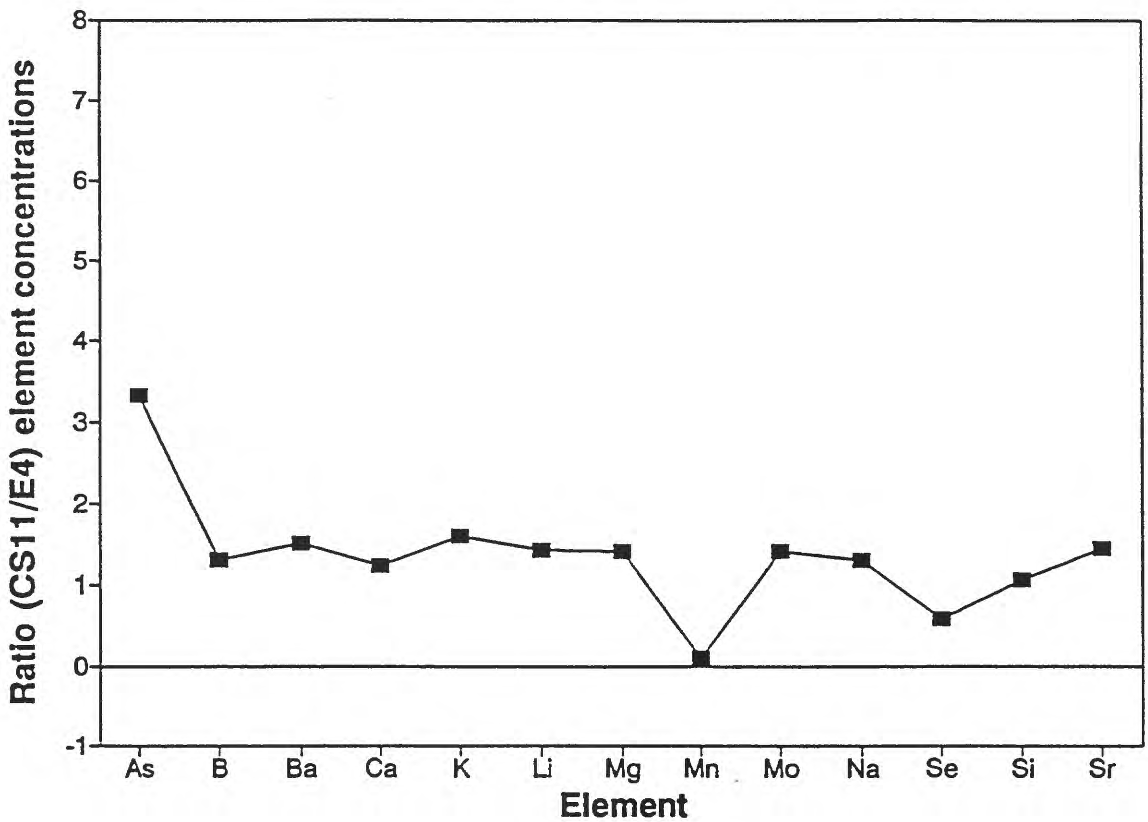
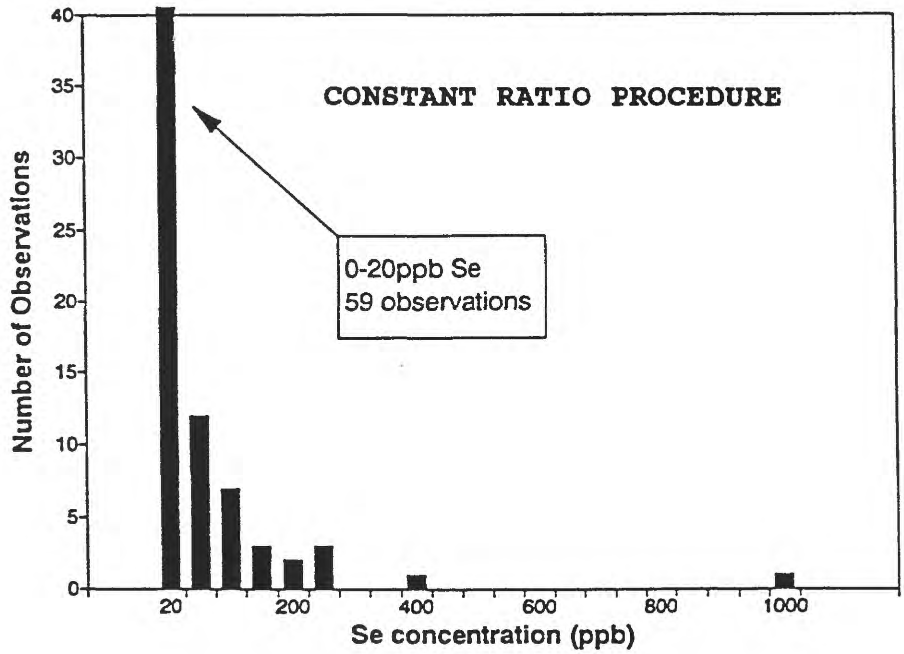


Figure 24. Element concentration ratios for water samples at sample sites CS11 and E4



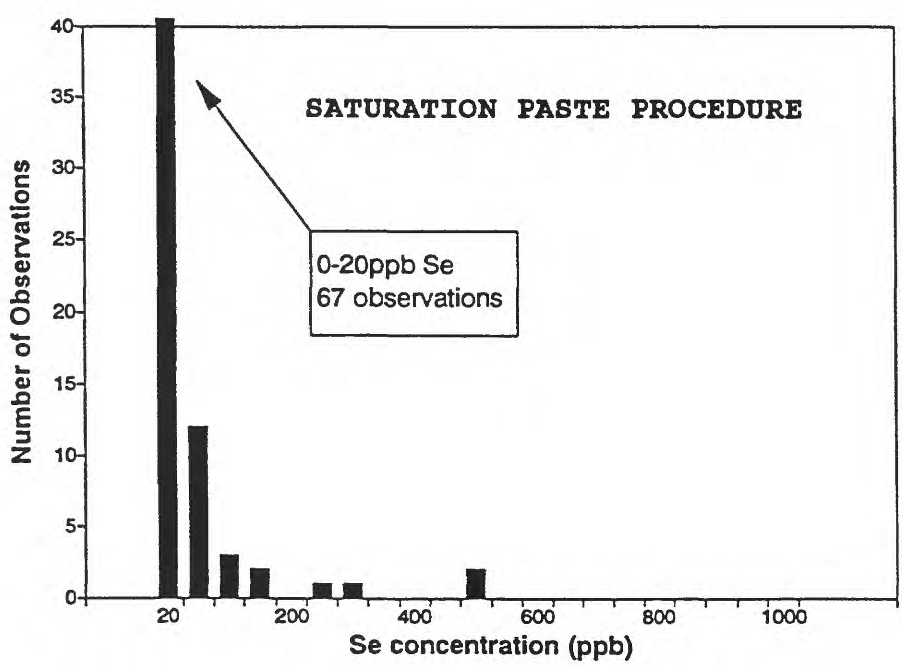
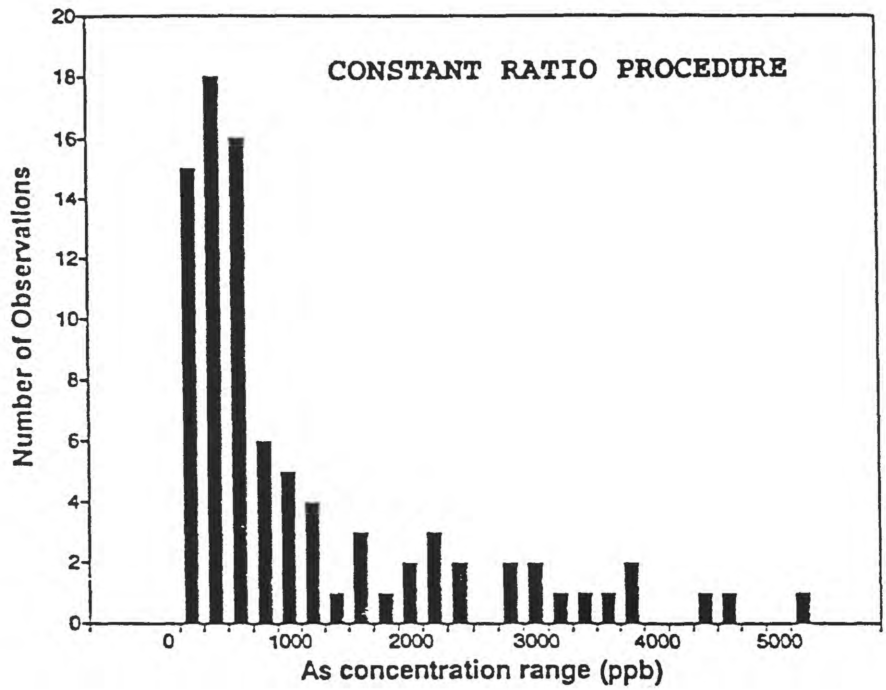


Figure 25. Histogram of water extractable selenium concentrations for constant ratio (1:5) and saturation paste procedures



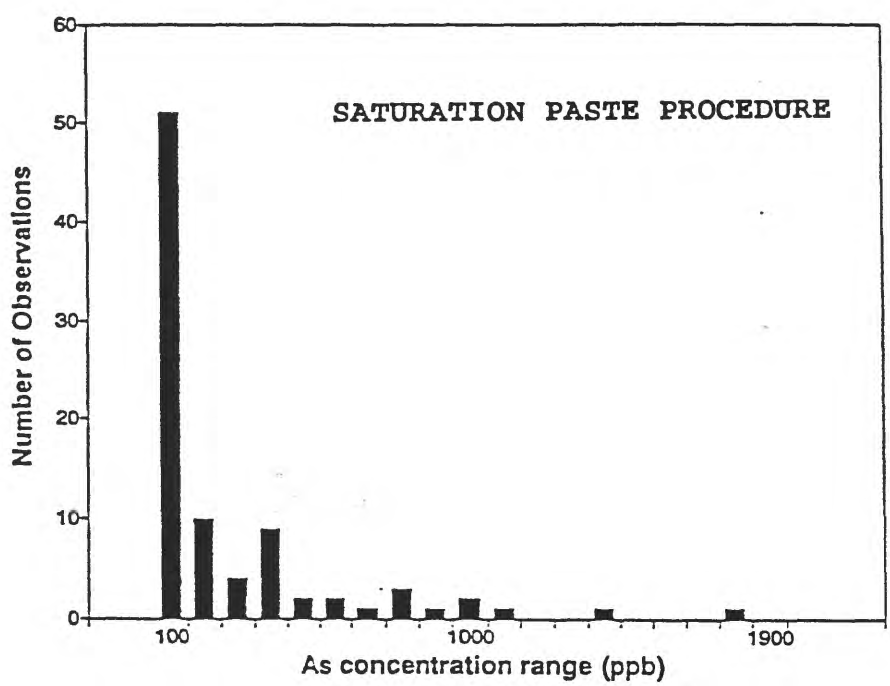


Figure 26. Histograms of water extractable arsenic concentrations for constant ratio (1:5) and saturation paste procedures

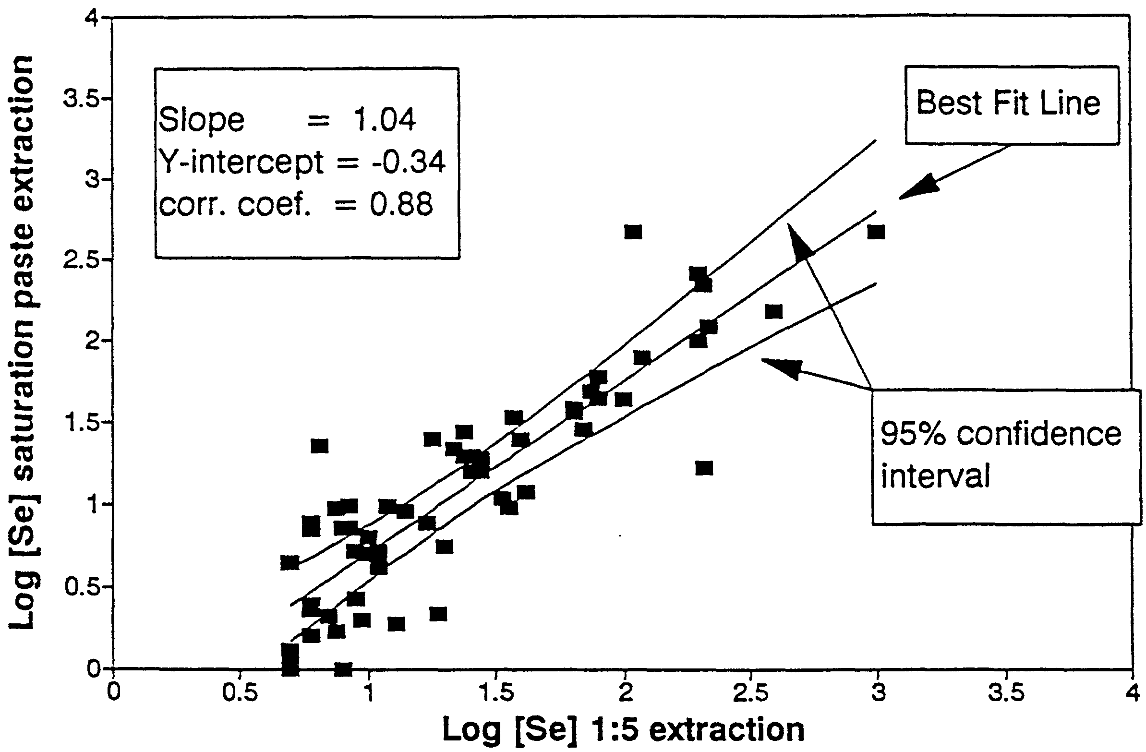


Figure 27. Linear regression analysis of water extractable selenium using saturation paste and constant ratio (1:5) procedures

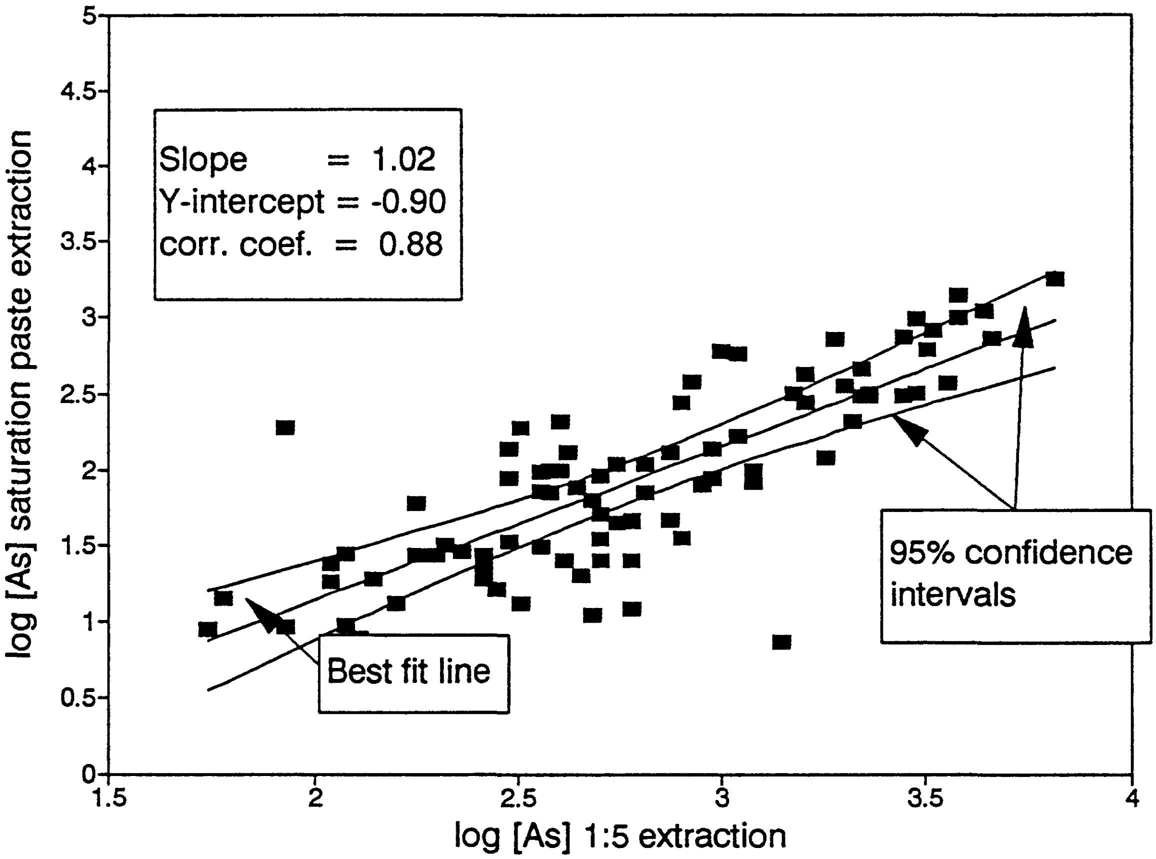


Figure 28. Linear regression analysis of water extractable arsenic using saturation paste and constant ratio (1:5) procedures

Appendix A Listing of analytical data for total element concentrations concentrations in sediment samples collected from TJ-Drain, Nevada

[CS#, TJ-Drain sediment collection site; %, percent; ppm, parts per million; <, less than]

Field No	Latitude	Longitude	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %
CS1	393630	1183315	8.10	5.60	2.67	2.14	1.21	2.62	0.10	0.32
CS2	393605	1183315	8.43	3.24	2.74	2.16	1.05	2.71	0.09	0.34
CS3	393540	1183320	8.33	3.36	2.52	2.14	0.96	2.85	0.09	0.32
CS4	393520	1183330	8.09	2.98	3.40	2.02	1.19	2.39	0.09	0.37
CS5	393450	1183350	8.25	2.74	3.01	2.12	1.11	2.63	0.09	0.35
CS6	393422	1183350	8.43	3.16	2.43	2.19	0.90	2.97	0.09	0.34
CS7	393400	1183400	8.31	3.87	3.52	2.04	1.14	2.95	0.12	0.49
CS8	393332	1183415	8.65	3.45	2.59	2.22	0.89	3.10	0.09	0.37
CS9	393315	1183432	8.41	3.04	2.03	2.17	0.77	2.98	0.08	0.29
CS10	393252	1183455	7.66	6.17	2.41	1.96	0.99	3.05	0.08	0.32
CS11	393229	1183520	8.29	3.22	2.40	2.15	0.90	3.01	0.09	0.35
CS12	393315	1183505	7.57	4.35	3.15	1.79	1.26	2.27	0.07	0.33
CS13	393305	1183539	7.77	3.30	3.59	2.03	1.55	3.08	0.10	0.36
CS14	393302	1183610	8.38	2.66	2.99	2.12	1.09	2.97	0.08	0.33
CS15	393237	1183625	8.33	2.65	3.03	2.05	1.04	2.78	0.09	0.35
CS16	393215	1183640	8.24	2.75	3.64	2.03	1.35	2.69	0.10	0.40
CS17	393137	1183637	8.60	3.49	2.49	2.27	0.93	3.00	0.09	0.32
CS18	393202	1183707	8.58	3.17	2.60	2.34	0.90	3.19	0.09	0.37
CS19	393147	1183725	8.62	3.05	2.13	2.39	0.81	3.27	0.09	0.31
CS20	393259	1183745	8.48	2.75	1.82	2.45	0.72	3.03	0.07	0.23
CS21	393132	1183750	8.54	3.05	2.02	2.31	0.78	2.97	0.09	0.29
CS22	393110	1183750	8.30	3.60	2.21	2.23	0.89	2.93	0.09	0.28
CS23	393135	1183828	8.15	3.14	3.20	2.11	1.18	2.78	0.11	0.37
CS24	393108	1183828	8.53	3.00	2.03	2.38	0.79	3.24	0.09	0.28
CS25	393300	1183800	7.89	4.04	1.92	2.26	0.86	3.10	0.08	0.27

Appendix A continued

Field No	Latitude	Longitude	As ppm	Ba ppm	Be ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm
CS1	393630	1183315	16	966	2	45	13	27	26	18
CS2	393605	1183315	15	860	2	46	12	30	23	18
CS3	393540	1183320	20	857	2	44	11	28	20	18
CS4	393520	1183330	26	818	2	51	15	31	31	19
CS5	393450	1183350	15	818	2	49	13	30	28	19
CS6	393422	1183350	15	883	2	44	11	30	15	19
CS7	393400	1183400	13	808	2	59	12	48	13	19
CS8	393332	1183415	8.6	878	2	45	10	33	13	19
CS9	393315	1183432	15	877	2	38	9	22	12	17
CS10	393252	1183455	13	788	2	41	10	26	16	16
CS11	393229	1183520	9.4	852	2	47	10	32	13	18
CS12	393315	1183505	28	677	2	46	13	28	41	18
CS13	393305	1183539	64	723	2	49	14	31	44	19
CS14	393302	1183610	17	891	2	46	13	29	28	20
CS15	393237	1183625	22	881	2	48	12	29	26	19
CS16	393215	1183640	18	881	2	51	16	32	38	19
CS17	393137	1183637	11	920	2	44	10	28	18	19
CS18	393202	1183707	9	910	2	53	10	38	10	18
CS19	393147	1183725	3.8	936	2	43	9	28	12	17
CS20	393259	1183745	14	941	2	35	8	19	12	17
CS21	393132	1183750	3.8	926	2	41	9	24	13	17
CS22	393110	1183750	11	894	2	38	10	24	18	18
CS23	393135	1183828	15	866	2	47	13	30	27	18
CS24	393108	1183828	6.7	934	2	41	9	24	13	18
CS25	393300	1183800	10	895	2	40	9	27	9	16

Appendix A continued

Field No	Latitude	Longitude	Hg ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm	Nd ppm	Ni ppm	Pb ppm
CS1	393630	1183315	0.12	26	53	572	6	4	21	14	17
CS2	393605	1183315	<0.02	27	37	490	14	5	21	14	18
CS3	393540	1183320	0.08	25	32	531	11	4	21	12	16
CS4	393520	1183330	0.04	28	44	606	11	6	23	16	18
CS5	393450	1183350	0.06	28	40	586	7	6	24	15	17
CS6	393422	1183350	0.06	26	26	547	3	4	22	12	14
CS7	393400	1183400	0.04	33	23	636	13	9	31	15	18
CS8	393332	1183415	0.04	26	23	478	12	7	22	11	17
CS9	393315	1183432	0.04	22	23	377	15	5	17	9	16
CS10	393252	1183455	0.02	24	29	1160	33	6	18	11	14
CS11	393229	1183520	0.02	27	23	479	11	5	23	10	17
CS12	393315	1183505	0.04	27	57	682	66	6	22	18	19
CS13	393305	1183539	0.36	28	59	532	164	6	24	20	18
CS14	393302	1183610	0.06	27	45	508	33	6	21	14	20
CS15	393237	1183625	0.02	28	39	490	8	8	23	14	17
CS16	393215	1183640	0.16	29	53	789	38	6	25	18	17
CS17	393137	1183637	0.02	25	31	567	14	<4	21	12	15
CS18	393202	1183707	0.04	29	18	443	4	5	25	11	18
CS19	393147	1183725	0.04	25	23	353	3	<4	19	10	15
CS20	393259	1183745	<0.02	21	23	358	< 2	<4	16	10	16
CS21	393132	1183750	0.04	23	22	401	< 2	6	19	10	18
CS22	393110	1183750	0.02	22	29	598	10	4	17	10	17
CS23	393135	1183828	0.06	27	41	594	24	6	25	15	19
CS24	393108	1183828	<0.02	25	23	368	5	<4	18	9	17
CS25	393300	1183800	0.06	24	21	444	29	5	20	11	15

Appendix A continued

Field No	Latitude	Longitude	Sc ppm	Se ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
CS1	393630	1183315	9	0.3	730	10	85	13	1	66
CS2	393605	1183315	10	0.4	644	8	89	14	2	59
CS3	393540	1183320	9	0.4	663	8	77	12	1	53
CS4	393520	1183330	11	0.4	592	11	105	15	2	75
CS5	393450	1183350	10	0.4	582	9	93	15	2	68
CS6	393422	1183350	9	0.3	652	8	76	13	1	49
CS7	393400	1183400	11	0.4	687	23	117	18	2	54
CS8	393332	1183415	8	0.2	704	10	81	12	1	45
CS9	393315	1183432	7	0.3	674	6	63	11	1	39
CS10	393252	1183455	8	0.2	1070	9	80	11	1	44
CS11	393229	1183520	9	0.2	650	8	79	13	1	43
CS12	393315	1183505	11	3.5	941	12	112	14	2	76
CS13	393305	1183539	12	2.5	647	13	146	14	2	87
CS14	393302	1183610	10	0.2	575	9	97	13	2	73
CS15	393237	1183625	10	0.3	573	10	99	13	2	65
CS16	393215	1183640	12	0.4	577	11	116	15	2	89
CS17	393137	1183637	9	0.6	679	9	80	12	1	51
CS18	393202	1183707	9	< 0.1	640	11	82	15	2	46
CS19	393147	1183725	7	0.1	659	8	64	11	1	40
CS20	393259	1183745	6	6.4	632	6	51	10	1	38
CS21	393132	1183750	7	0.1	650	7	60	11	1	41
CS22	393110	1183750	8	0.3	714	8	70	11	1	48
CS23	393135	1183828	10	0.4	671	11	101	14	2	71
CS24	393108	1183828	7	< 0.1	642	8	62	12	1	42
CS25	393300	1183800	7	0.3	809	9	74	11	1	34

Appendix B Analytical results for total element concentrations in surface waters collected along TJ-Drain

[CS# designates collection sites; ppm, parts per million; ppb, parts per billion; Lat., latitude; Long, longitude; <, less than]

Field No.	Lat.	Long.	Al ppm	Ca ppm	K ppm	Mg ppm	Na ppm	Si ppm
CS1	393630	1183315	< 2	178	40	223	2750	< 0.2
CS2	393607	1183315	< 2	171	40	221	2710	< 0.2
CS3	393508	1183317	< 2	172	40	224	2750	< 0.2
CS4	393515	1183330	< 2	175	40	227	2800	< 0.2
CS5	393445	1183340	< 2	172	40	225	2780	< 0.2
CS6	393422	1183345	< 2	178	40	227	2780	< 0.2
CS7	393355	1183400	< 2	164	40	220	2730	< 0.2
CS8	393335	1183410	< 2	170	40	216	2710	< 0.2
CS9	393315	1183430	< 2	190	40	246	3000	< 0.2
CS10	393253	1183500	5	1380	270	1590	8790	16
CS11	393232	1183522	4	1120	240	1310	7900	24.9
CS12	393310	1183507	< 2	189	40	231	2890	1.4
CS13	393307	1183545	< 2	186	40	226	2830	4.2
CS14	393301	1183615	< 2	172	40	199	2620	7.1
CS15	393236	1183630	< 2	159	40	181	2400	7.2
CS16	393215	1183640	< 2	151	40	183	2370	5.8
CS17	393135	1183637	< 2	298	60	268	3100	25.9
CS18	393202	1183702	< 2	62.2	< 20	52.4	822	4.6
CS19	393145	1183725	< 2	57	< 20	37.5	491	6.4
CS20	393200	1183745	< 2	44.4	30	61.9	1560	< 0.2
CS21	393135	1183752	< 2	46.4	60	119	3190	< 0.2
CS22	393115	1183752	< 2	80.4	< 20	39.8	657	20.7
CS23	393138	1183825	< 2	47.7	60	119	3330	< 0.2
CS24	393107	1183825	< 2	53	60	112	3150	5.4
CS25	393101	1183855	< 2	205	90	229	4990	< 0.2

Appendix B continued

Field No.	Lat.	Long.	Ag ppb	As ppb	B ppb	Cr ppb	Li ppb	Mn ppb
CS1	393630	1183315	< 2	100	10900	< 50	420	1210
CS2	393607	1183315	< 2	100	10500	< 50	400	1880
CS3	393508	1183317	< 2	90	10700	< 50	400	1930
CS4	393515	1183330	< 2	90	11100	< 50	410	1210
CS5	393445	1183340	< 2	100	11000	< 50	410	760
CS6	393422	1183345	< 2	110	11100	< 50	420	780
CS7	393355	1183400	< 2	90	10500	< 50	400	30
CS8	393335	1183410	2	90	10700	< 50	400	30
CS9	393315	1183430	< 2	110	12000	< 50	470	40
CS10	393253	1183500	< 2	70	41000	< 50	4130	630
CS11	393232	1183522	< 2	60	33300	< 50	3300	1190
CS12	393310	1183507	< 2	100	11600	< 50	430	190
CS13	393307	1183545	< 2	100	11200	< 50	420	220
CS14	393301	1183615	< 2	110	10700	< 50	380	410
CS15	393236	1183630	< 2	110	10100	< 50	350	400
CS16	393215	1183640	< 2	110	9200	< 50	350	330
CS17	393135	1183637	< 2	130	14300	< 50	580	930
CS18	393202	1183702	< 2	70	3300	< 50	110	120
CS19	393145	1183725	< 2	< 50	1800	< 50	90	100
CS20	393200	1183745	2	190	8100	< 50	140	110
CS21	393135	1183752	< 2	340	17500	< 50	240	260
CS22	393115	1183752	< 2	< 50	2300	< 50	110	230
CS23	393138	1183825	< 2	410	18500	< 50	240	140
CS24	393107	1183825	< 2	440	17700	60	230	470
CS25	393101	1183855	< 2	60	29900	< 50	360	390

Appendix B continued

Field No.	Lat.	Long.	Mo ppb	Ni ppb	Pb ppb	Se ppb	Sr ppb	Ti ppb	U ppb
CS1	393630	1183315	360	30	< 10	<1.0	4720	< 20	170
CS2	393607	1183315	350	30	10	<1.0	4560	< 20	160
CS3	393508	1183317	360	30	10	<1.0	4630	< 20	160
CS4	393515	1183330	370	20	< 10	<1.0	4740	< 20	160
CS5	393445	1183340	370	30	< 10	<1.0	4680	< 20	160
CS6	393422	1183345	370	30	< 10	<1.0	4770	< 20	170
CS7	393355	1183400	370	20	10	<1.0	4520	120	170
CS8	393335	1183410	380	45	10	<1.0	4590	< 20	170
CS9	393315	1183430	450	30	< 10	<1.0	5180	< 20	200
CS10	393253	1183500	920	63	10	3.4	37900	< 20	650
CS11	393232	1183522	890	56	10	4.7	30000	< 20	550
CS12	393310	1183507	420	20	< 10	<1.0	4950	< 20	200
CS13	393307	1183545	410	20	< 10	1.0	4870	< 20	190
CS14	393301	1183615	420	30	10	<1.0	4290	< 20	200
CS15	393236	1183630	410	30	10	<1.0	3910	< 20	180
CS16	393215	1183640	380	79	10	<1.0	3850	< 20	170
CS17	393135	1183637	610	30	< 10	4.1	6080	< 20	160
CS18	393202	1183702	80	20	< 10	<1.0	1330	< 20	40
CS19	393145	1183725	50	40	< 10	<1.0	1020	< 20	30
CS20	393200	1183745	140	20	10	<1.0	1430	< 20	50
CS21	393135	1183752	340	< 10	< 10	<1.0	2000	< 20	140
CS22	393115	1183752	< 50	30	< 10	<1.0	1320	< 20	10
CS23	393138	1183825	450	20	< 10	1.0	2030	< 20	180
CS24	393107	1183825	470	49	10	1.2	2180	< 20	210
CS25	393101	1183855	720	10	10	<1.0	5560	< 20	180

Appendix C Analytical results for total element concentrations in in soil samples, TJ-Drain study area, Nevada

[Sample ID; First character identifies grid row, second character identifies grid column; ##-## identifies collection depth CP = Center Point; ppm, parts per million; %, percent]

Field ID	Lat.	Long.	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %
A1,0-1	393548	1183341	8.07	2.35	3.45	2.16	1.40	2.90	0.09	0.36
A1,2-3	393548	1183341	7.74	3.35	3.11	1.79	1.16	2.64	0.09	0.32
A1,4-5	393548	1183341	6.73	9.74	3.28	1.85	2.00	2.08	0.12	0.31
A2,0-1	393549	1183309	7.60	2.71	3.39	1.93	1.25	2.14	0.08	0.32
A2,2-3	393549	1183309	7.94	2.36	4.18	2.09	1.37	1.84	0.07	0.36
A2,3-4	393549	1183309	8.42	2.98	3.10	2.18	1.21	2.41	0.32	0.34
B1,0-1	393459	1183444	8.24	2.65	2.16	2.35	0.95	3.00	0.08	0.26
B1,2-3	393459	1183444	7.97	3.81	2.64	2.06	1.70	3.11	0.10	0.31
B1,8-9	393459	1183444	8.24	2.69	3.07	2.05	1.22	3.12	0.07	0.35
B2,0-1	393517	1183402	8.28	2.62	1.67	2.42	0.69	3.14	0.07	0.22
B2,2-3	393517	1183402	8.57	2.17	3.72	2.02	1.13	2.46	0.08	0.37
B2,5-6	393517	1183402	7.14	7.63	3.97	1.87	1.77	1.60	0.11	0.33
B3,0-1	393505	1183310	7.69	2.04	3.82	2.10	1.75	2.43	0.10	0.37
B3,2-3	393505	1183310	7.89	2.27	3.60	2.08	1.76	2.34	0.08	0.34
B3,4-5	393505	1183310	8.21	2.06	3.61	2.19	1.47	1.96	0.09	0.38
C1,0-1	393412	1183437	8.59	2.52	3.86	2.21	1.41	2.68	0.11	0.42
C1,2-3	393412	1183437	8.43	3.08	2.90	2.12	1.00	2.80	0.08	0.32
C1,6-8	393412	1183437	8.52	2.35	3.30	2.14	1.27	2.48	0.09	0.38
C2,0-1	393435	1183425	8.08	3.05	2.25	2.26	1.36	3.01	0.10	0.28
C2,2-3	393435	1183425	8.34	3.11	2.43	2.03	1.10	3.09	0.08	0.29
C2,7-8	393435	1183425	8.07	1.98	3.69	2.07	1.32	2.18	0.05	0.35
C3,0-1	393425	1183309	7.13	4.30	3.51	2.25	2.33	3.80	0.11	0.34
C3,2-3	393425	1183309	5.85	9.84	3.02	1.61	2.80	3.57	0.10	0.26
C3,7-8	393425	1183309	8.01	5.10	3.53	2.25	1.72	2.66	0.11	0.37
CP1,0-1	393350	1183310	7.45	2.37	3.70	1.87	1.50	2.41	0.09	0.36
CP1,2-3	393350	1183310	7.94	1.82	3.73	1.88	1.49	2.48	0.05	0.36
CP1,4-5	393350	1183310	8.15	4.50	4.01	1.98	1.48	2.19	0.09	0.43
CP2,0-1	393301	1183429	8.62	2.47	3.82	2.05	1.25	2.49	0.10	0.36
CP2,2-3	393301	1183429	7.58	2.11	1.59	2.37	0.53	2.64	0.06	0.19
CP2,12-13	393301	1183429	8.73	2.19	3.28	2.20	1.18	2.16	0.11	0.36
CP3,0-1	393127	1183301	10.20	2.53	5.01	2.36	1.68	2.21	0.11	0.48
CP3,2-3	393127	1183301	8.63	2.20	4.16	2.13	1.40	2.19	0.09	0.42
CP3,7-8	393127	1183301	8.98	1.44	5.16	1.92	1.67	1.48	0.06	0.40
CP4,0-1	393115	1183641	8.64	2.90	2.61	2.18	0.99	3.23	0.09	0.31
CP4,2-3	393115	1183641	8.77	2.69	2.61	2.17	0.94	3.28	0.08	0.30
CP4,7-8	393115	1183641	8.61	2.97	2.34	2.25	0.91	3.22	0.08	0.29
CP5,0-1	393203	1183642	8.35	2.71	1.89	2.41	0.74	2.93	0.08	0.22
CP5,2-3	393203	1183642	8.31	3.02	2.22	2.31	0.77	2.92	0.08	0.26
CP5,9-10	393203	1183642	8.60	1.71	4.39	1.77	1.31	2.03	0.07	0.38
CP6,0-1	393107	1183860	8.18	4.46	2.98	2.03	1.13	2.63	0.10	0.37
CP6,2-3	393107	1183860	8.83	3.12	2.51	2.19	0.93	2.95	0.09	0.30
CP6,10-11	393107	1183860	8.16	3.48	1.96	2.43	0.78	3.07	0.08	0.25

Appendix C cont.

I.D.	Lat.	Long.	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %
D1,0-1	393321	1183607	8.03	2.39	1.70	2.49	0.61	2.89	0.06	0.21
D1,2-3	393321	1183607	8.12	2.86	2.88	2.13	1.02	2.36	0.08	0.29
D1,7-8	393321	1183607	8.72	1.96	4.34	1.97	1.51	2.08	0.08	0.39
D2,0-1	393323	1183501	8.20	3.10	2.41	2.34	0.90	2.83	0.08	0.31
D2,2-3	393323	1183501	8.01	2.84	1.85	2.32	0.59	2.81	0.06	0.22
D2,7-8	393323	1183501	8.56	2.95	2.12	2.24	0.84	3.11	0.08	0.27
D3,0-1	393323	1183357	8.26	3.04	2.72	2.10	1.03	3.05	0.09	0.35
D3,2-3	393323	1183357	8.71	3.18	3.05	1.89	1.03	2.58	0.09	0.35
D3,5-6	393323	1183357	8.79	2.63	3.97	1.97	1.33	2.24	0.11	0.44
D4,0-1	393328	1183322	8.43	3.03	2.50	2.11	0.87	2.88	0.08	0.33
D4,2-3	393328	1183322	8.47	2.75	2.78	1.97	0.86	3.19	0.08	0.34
D4,12-13	393328	1183322	8.55	2.26	5.01	2.06	1.57	1.84	0.08	0.43
E1,0-1	393230	1183857	7.82	2.53	1.78	2.54	0.65	2.88	0.07	0.22
E1,2-3	393230	1183857	7.86	3.08	1.49	2.40	0.56	2.93	0.06	0.17
E1,10-11	393230	1183857	8.65	2.61	2.95	2.39	1.03	2.69	0.09	0.34
E2,0-1	393234	1183716	8.09	2.45	2.20	2.35	0.84	3.40	0.07	0.25
E2,2-3	393234	1183716	8.09	2.28	2.10	2.29	0.69	2.92	0.06	0.25
E2,8-9	393234	1183716	8.96	1.63	4.20	2.09	1.38	2.46	0.10	0.43
E3,0-1	393228	1183603	8.25	2.45	1.99	2.29	0.70	2.84	0.06	0.25
E3,2-3	393228	1183603	8.36	2.57	2.84	2.09	0.92	2.51	0.08	0.32
E3,8-9	393228	1183603	8.89	1.67	4.28	1.99	1.39	1.98	0.07	0.40
E4,0-1	393229	1183531	8.44	3.17	2.63	2.20	0.92	2.91	0.08	0.32
E4,2-3	393229	1183531	8.37	2.88	4.42	1.90	0.95	2.85	0.10	0.49
E4,10-11	393229	1183531	8.62	2.65	2.93	2.07	0.93	2.96	0.10	0.38
E5,0-1	393241	1183352	8.37	2.39	3.63	2.14	1.26	2.06	0.09	0.37
E5,2-3	393241	1183352	8.41	2.16	4.24	1.89	1.23	1.94	0.09	0.38
E5,3-4	393241	1183352	8.77	2.66	3.46	2.05	1.11	2.49	0.10	0.40
E6,0-1	393241	1183216	8.52	2.11	4.19	2.19	1.45	1.77	0.10	0.41
E6,2-3	393241	1183216	8.80	1.74	5.14	2.03	1.64	1.49	0.10	0.44
E6,4-5	393241	1183216	8.57	2.44	4.08	2.13	1.41	1.79	0.09	0.38
F1,0-1	393138	1183953	8.46	2.69	2.81	2.17	0.99	2.86	0.09	0.35
F1,2-3	393138	1183953	8.28	2.37	1.79	2.27	0.57	3.03	0.06	0.22
F1,9-10	393138	1183953	8.04	2.64	1.62	2.67	0.55	3.31	0.06	0.20
F2,0-1	393135	1183832	8.47	3.32	3.60	2.18	1.36	2.46	0.10	0.41
F2,2-3	393135	1183832	7.91	3.05	1.76	2.24	0.58	2.94	0.07	0.21
F2,9-10	393135	1183832	8.84	2.17	4.15	2.07	1.35	3.08	0.12	0.44
F3,0-1	393136	1183719	8.08	2.55	1.72	2.56	0.62	2.95	0.07	0.22
F3,2-3	393136	1183719	8.50	2.63	2.97	2.06	0.97	2.86	0.09	0.34
F3,7-8	393136	1183719	8.50	2.67	1.90	2.41	0.67	3.10	0.07	0.24
F4,0-1	393135	1183606	8.17	3.09	2.28	2.23	0.88	2.73	0.09	0.29
F4,2-3	393135	1183606	8.72	2.32	3.26	2.06	1.02	2.60	0.09	0.34
F4,4-5	393135	1183606	8.90	2.05	3.92	2.07	1.25	2.30	0.08	0.40
F5,0-1	393136	1183503	8.41	2.66	3.11	2.24	1.09	2.80	0.09	0.35
F5,16-17	393136	1183503	8.53	2.38	5.00	1.99	1.76	1.76	0.11	0.40
F7,0-1	393139	1183245	8.00	2.07	3.62	2.19	1.25	1.84	0.11	0.38
F7,2-3	393139	1183245	8.53	2.16	4.21	2.02	1.47	1.93	0.10	0.39
F7,6-7	393139	1183245	8.80	2.18	4.85	2.01	1.51	1.22	0.05	0.38

Appendix C cont.

Field ID	Lat.	Long.	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %
G1,0-1	393100	1183932	8.27	2.76	3.20	2.24	1.12	3.02	0.08	0.34
G1,2-3	393100	1183932	8.46	2.39	2.98	2.05	0.93	3.01	0.09	0.34
G1,10-11	393100	1183932	8.11	2.33	3.45	2.07	1.23	2.89	0.10	0.39
G2,0-1	393043	1183823	8.06	2.49	2.31	2.33	0.85	2.86	0.08	0.28
G2,2-3	393043	1183823	8.15	3.14	2.46	2.22	0.87	2.82	0.08	0.27
G2,7-8	393043	1183823	8.92	2.02	3.96	2.23	1.42	2.69	0.09	0.42
G3,0-1	393055	1183717	8.09	2.46	2.33	2.25	0.81	2.69	0.07	0.28
G3,2-3	393055	1183717	8.68	2.43	3.76	1.90	1.17	2.50	0.10	0.39
G4,0-1	393056	1183608	8.21	2.67	2.63	2.19	0.88	2.64	0.09	0.33
G4,2-3	393056	1183608	8.86	2.14	4.39	1.96	1.23	2.04	0.10	0.45
G4,10-11	393056	1183608	8.99	2.16	4.05	2.19	1.29	2.32	0.10	0.43
G5,0-1	393054	1183502	8.52	2.56	2.97	2.19	1.08	2.75	0.08	0.35
G5,2-3	393054	1183502	8.57	2.16	3.63	2.02	1.22	2.58	0.07	0.34
G5,7-8	393054	1183502	8.94	2.43	3.96	2.16	1.48	2.15	0.10	0.41
G6,2-3	393051	1183336	9.00	2.52	3.60	1.91	1.15	2.38	0.09	0.43
G6,3-4	393051	1183336	8.90	3.10	2.40	2.08	0.89	3.02	0.10	0.36
G7,0-1	393043	1183248	8.45	2.01	4.30	2.40	1.56	1.84	0.10	0.39
G7,2-3	393043	1183248	8.99	2.23	4.84	2.02	1.68	1.74	0.06	0.38
G7,6-7	393043	1183248	7.84	5.75	4.23	2.17	1.80	1.90	0.12	0.41

Appendix C cont.

Field ID	Lat.	Long.	Ag ppm	As ppm	Ba ppm	Be ppm	Ce ppm	Co ppm	Cr ppm
A1,0-1	393548	1183341	<2	19	372	2	50	13	32
A1,2-3	393548	1183341	<2	15	810	2	50	12	32
A1,4-5	393548	1183341	<2	16	948	2	48	19	32
A2,0-1	393549	1183309	<2	12	503	2	52	12	32
A2,2-3	393549	1183309	<2	11	970	2	52	17	39
A2,3-4	393549	1183309	<2	12	1090	2	58	15	33
B1,0-1	393459	1183444	<2	12	927	2	39	9	23
B1,2-3	393459	1183444	<2	33	891	2	44	11	28
B1,8-9	393459	1183444	<2	24	850	2	52	13	32
B2,0-1	393517	1183402	<2	6	955	2	34	7	18
B2,2-3	393517	1183402	<2	18	904	2	51	14	33
B2,5-6	393517	1183402	<2	14	893	2	51	20	34
B3,0-1	393505	1183310	<2	21	415	2	56	14	35
B3,2-3	393505	1183310	<2	18	864	2	51	15	35
B3,4-5	393505	1183310	<2	16	861	2	63	14	36
C1,0-1	393412	1183437	<2	40	771	2	55	17	34
C1,2-3	393412	1183437	<2	22	912	2	45	12	28
C1,6-8	393412	1183437	<2	18	904	2	52	15	33
C2,0-1	393435	1183425	<2	22	867	2	40	10	25
C2,2-3	393435	1183425	<2	11	906	2	37	10	25
C2,7-8	393435	1183425	<2	19	791	2	50	15	35
C3,0-1	393425	1183309	<2	27	310	2	48	14	33
C3,2-3	393425	1183309	<2	19	463	2	41	15	29
C3,7-8	393425	1183309	<2	20	919	2	57	16	25
CP1,0-1	393350	1183310	<2	27	670	2	52	14	33
CP1,2-3	393350	1183310	<2	24	735	2	58	16	35
CP1,4-5	393350	1183310	<2	21	843	2	62	17	35
CP2,0-1	393301	1183429	<2	26	840	2	55	16	33
CP2,2-3	393301	1183429	<2	6	955	2	34	7	17
CP2,12-13	393301	1183429	<2	12	959	2	58	14	35
CP3,0-1	393127	1183301	<2	24	975	2	68	21	42
CP3,2-3	393127	1183301	<2	18	871	2	59	17	36
CP3,7-8	393127	1183301	<2	45	710	2	71	21	40
CP4,0-1	393115	1183641	<2	11	827	2	44	11	29
CP4,2-3	393115	1183641	<2	9	919	2	43	11	28
CP4,7-8	393115	1183641	<2	11	930	2	42	10	28
CP5,0-1	393203	1183642	<2	8	969	2	38	8	23
CP5,2-3	393203	1183642	<2	9	958	2	43	9	27
CP5,9-10	393203	1183642	<2	30	714	2	62	16	35
CP6,0-1	393107	1183860	<2	7	898	2	50	12	32
CP6,2-3	393107	1183860	<2	7	960	2	45	12	27
CP6,10-11	393107	1183860	<2	6	986	2	39	8	21
D1,0-1	393321	1183607	<2	4	972	2	35	7	19
D1,2-3	393321	1183607	<2	13	514	2	45	11	24
D1,7-8	393321	1183607	<2	32	750	2	60	18	36
D2,0-1	393323	1183501	<2	5	917	2	44	10	23
D2,2-3	393323	1183501	<2	7	981	2	34	8	18
D2,7-8	393323	1183501	<2	11	935	2	40	10	21

Appendix C cont.

Field ID	Lat.	Long.	Ag ppm	As ppm	Ba ppm	Be ppm	Ce ppm	Co ppm	Cr ppm
D3,0-1	393323	1183357	<2	6	422	2	46	11	29
D3,2-3	393323	1183357	<2	9	964	2	43	12	26
D3,5-6	393323	1183357	<2	23	1010	2	55	18	35
D4,0-1	393328	1183322	<2	10	901	2	44	10	27
D4,2-3	393328	1183322	<2	5	898	2	45	11	29
D4,12-13	393328	1183322	<2	10	843	2	71	20	36
E1,0-1	393230	1183857	<2	5	983	2	37	7	20
E1,2-3	393230	1183857	<2	5	941	2	31	6	8
E1,10-11	393230	1183857	<2	8	1020	2	50	15	28
E2,0-1	393234	1183716	<2	8	929	2	39	9	22
E2,2-3	393234	1183716	<2	7	983	2	36	10	20
E2,8-9	393234	1183716	<2	15	907	2	65	19	36
E3,0-1	393228	1183603	<2	4	959	2	37	9	18
E3,2-3	393228	1183603	<2	8	937	2	45	12	26
E3,8-9	393228	1183603	<2	21	869	2	62	18	36
E4,0-1	393229	1183531	<2	11	946	2	43	11	27
E4,2-3	393229	1183531	<2	8	882	2	61	13	51
E4,10-11	393229	1183531	<2	15	925	2	49	13	35
E5,0-1	393241	1183352	<2	12	851	2	55	14	33
E5,2-3	393241	1183352	<2	15	882	2	55	18	37
E5,3-4	393241	1183352	<2	8	953	2	52	15	36
E6,0-1	393241	1183216	2	12	856	2	61	17	35
E6,2-3	393241	1183216	<2	20	841	2	65	20	39
E6,4-5	393241	1183216	<2	14	872	2	59	18	32
F1,0-1	393138	1183953	<2	8	933	2	50	11	30
F1,2-3	393138	1183953	<2	6	942	2	35	8	18
F1,9-10	393138	1183953	<2	5	1040	2	35	8	15
F2,0-1	393135	1183832	<2	13	989	2	54	15	35
F2,2-3	393135	1183832	<2	4	938	2	38	7	17
F2,9-10	393135	1183832	<2	47	953	2	58	18	35
F3,0-1	393136	1183719	<2	4	1020	2	36	7	22
F3,2-3	393136	1183719	<2	7	958	2	47	12	28
F3,7-8	393136	1183719	<2	5	975	2	40	8	20
F4,0-1	393135	1183606	<2	6	932	2	43	10	24
F4,2-3	393135	1183606	<2	19	920	2	50	14	30
F4,4-5	393135	1183606	<2	19	898	2	58	17	34
F5,0-1	393136	1183503	<2	10	895	2	47	13	30
F5,16-17	393136	1183503	<2	23	807	2	69	21	36
F7,0-1	393139	1183245	4	10	816	2	53	14	32
F7,2-3	393139	1183245	<2	18	874	2	58	17	36
F7,6-7	393139	1183245	<2	17	749	2	63	17	37
G1,0-1	393100	1183932	<2	18	924	2	52	13	31
G1,2-3	393100	1183932	<2	7	945	2	47	13	24
G1,10-11	393100	1183932	<2	12	916	2	54	16	32
G2,0-1	393043	1183823	<2	8	961	2	41	9	23
G2,2-3	393043	1183823	<2	7	965	2	44	10	24
G2,7-8	393043	1183823	<2	16	952	2	60	17	33

Appendix C cont.

Field ID	Lat.	Long.	Ag ppm	As ppm	Ba ppm	Be ppm	Ce ppm	Co ppm	Cr ppm
G3,0-1	393055	1183717	<2	7	927	2	43	10	27
G3,2-3	393055	1183717	<2	10	957	2	55	15	30
G4,0-1	393056	1183608	<2	8	946	2	43	11	28
G4,2-3	393056	1183608	<2	23	934	2	61	17	40
G4,10-11	393056	1183608	<2	16	957	2	63	17	35
G5,0-1	393054	1183502	<2	12	933	2	46	14	28
G5,2-3	393054	1183502	<2	34	849	2	52	14	31
G5,7-8	393054	1183502	<2	20	918	2	59	17	33
G6,2-3	393051	1183336	<2	12	938	2	55	15	36
G6,3-4	393051	1183336	<2	7	897	2	48	12	34
G7,0-1	393043	1183248	<2	20	774	2	60	17	34
G7,2-3	393043	1183248	<2	24	698	2	60	17	38
G7,6-7	393043	1183248	<2	14	922	2	55	18	31

Appendix C cont.

Field ID	Lat.	Long.	Cu ppm	Ga ppm	Hg ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
A1,0-1	393548	1183341	31	19	0.04	28	52	484	4	7
A1,2-3	393548	1183341	38	19	0.04	27	53	579	4	8
A1,4-5	393548	1183341	42	19	0.06	27	85	1090	4	5
A2,0-1	393549	1183309	40	18	0.18	29	48	384	<2	6
A2,2-3	393549	1183309	44	20	0.04	28	66	575	<2	9
A2,3-4	393549	1183309	46	19	0.02	33	54	481	<2	7
B1,0-1	393459	1183444	16	17	0.02	22	33	423	<2	4
B1,2-3	393459	1183444	21	19	0.02	24	68	558	<2	6
B1,8-9	393459	1183444	39	19	0.02	29	60	389	<2	7
B2,0-1	393517	1183402	9	16	<0.02	21	23	304	<2	4
B2,2-3	393517	1183402	32	20	0.04	28	44	522	<2	9
B2,5-6	393517	1183402	36	18	0.06	30	85	784	<2	6
B3,0-1	393505	1183310	48	18	0.04	31	64	523	13	5
B3,2-3	393505	1183310	41	20	0.1	27	84	453	3	8
B3,4-5	393505	1183310	56	20	0.02	33	77	400	<2	6
C1,0-1	393412	1183437	37	20	<0.02	31	54	863	3	6
C1,2-3	393412	1183437	24	20	0.02	25	40	452	<2	7
C1,6-8	393412	1183437	36	20	0.04	29	53	401	<2	6
C2,0-1	393435	1183425	19	17	<0.02	24	55	420	<2	<4
C2,2-3	393435	1183425	15	19	0.02	22	46	367	<2	6
C2,7-8	393435	1183425	70	18	0.06	28	69	488	<2	7
C3,0-1	393425	1183309	33	16	0.02	28	134	581	3	<4
C3,2-3	393425	1183309	32	16	0.08	23	115	1140	7	6
C3,7-8	393425	1183309	41	20	0.02	32	116	850	3	7
CP1,0-1	393350	1183310	40	19	0.04	29	62	639	3	8
CP1,2-3	393350	1183310	50	21	0.06	32	72	1020	12	8
CP1,4-5	393350	1183310	37	21	0.04	34	76	721	5	11
CP2,0-1	393301	1183429	33	22	0.36	30	44	810	<2	4
CP2,2-3	393301	1183429	11	16	0.02	18	20	238	<2	<4
CP2,12-13	393301	1183429	43	21	0.02	33	49	395	<2	7
CP3,0-1	393127	1183301	51	26	0.92	39	65	822	4	9
CP3,2-3	393127	1183301	40	22	0.02	33	63	700	2	9
CP3,7-8	393127	1183301	63	24	0.04	39	86	752	3	7
CP4,0-1	393115	1183641	21	20	<0.02	26	34	439	<2	4
CP4,2-3	393115	1183641	19	20	<0.02	25	30	369	<2	4
CP4,7-8	393115	1183641	18	20	<0.02	24	30	341	<2	<4
CP5,0-1	393203	1183642	14	18	<0.02	22	24	308	<2	<4
CP5,2-3	393203	1183642	11	19	<0.02	24	23	359	<2	4
CP5,9-10	393203	1183642	55	22	0.04	33	67	644	<2	8
CP6,0-1	393107	1183860	24	20	<0.02	28	40	634	<2	7
CP6,2-3	393107	1183860	17	20	<0.02	25	30	563	<2	5
CP6,10-11	393107	1183860	14	17	<0.02	23	26	438	<2	<4
D1,0-1	393321	1183607	8	16	<0.02	21	20	299	<2	<4
D1,2-3	393321	1183607	23	19	0.02	24	40	434	<2	6
D1,7-8	393321	1183607	56	21	0.06	34	68	762	5	7
D2,0-1	393323	1183501	13	18	<0.02	26	28	454	<2	5
D2,2-3	393323	1183501	12	18	0.02	20	19	365	<2	5
D2,7-8	393323	1183501	15	18	<0.02	23	30	358	<2	<4

Appendix C cont.

Field ID	Lat.	Long.	Cu ppm	Ga ppm	Hg ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
D3,0-1	393323	1183357	18	18	<0.02	27	31	548	<2	6
D3,2-3	393323	1183357	24	20	0.06	24	36	739	<2	7
D3,5-6	393323	1183357	38	21	0.02	31	47	906	<2	7
D4,0-1	393328	1183322	16	19	<0.02	25	28	487	<2	5
D4,2-3	393328	1183322	15	20	0.02	25	26	475	2	6
D4,12-13	393328	1183322	52	21	0.06	39	72	621	<2	6
E1,0-1	393230	1183857	8	16	<0.02	21	21	321	<2	<4
E1,2-3	393230	1183857	12	17	0.02	19	20	318	<2	5
E1,10-11	393230	1183857	25	20	0.02	28	38	613	<2	5
E2,0-1	393234	1183716	16	17	<0.02	25	27	371	<2	<4
E2,2-3	393234	1183716	15	18	0.06	20	25	467	<2	6
E2,8-9	393234	1183716	55	22	0.06	36	53	609	2	7
E3,0-1	393228	1183603	12	17	0.06	22	24	278	<2	<4
E3,2-3	393228	1183603	21	19	0.04	24	33	438	<2	8
E3,8-9	393228	1183603	49	22	0.08	35	61	693	<2	8
E4,0-1	393229	1183531	21	19	0.08	25	32	487	<2	<4
E4,2-3	393229	1183531	18	20	0.02	31	25	580	<2	9
E4,10-11	393229	1183531	19	19	<0.02	28	29	981	2	5
E5,0-1	393241	1183352	38	19	6	30	47	572	<2	6
E5,2-3	393241	1183352	40	21	0.08	29	48	706	<2	9
E5,3-4	393241	1183352	27	20	0.1	30	38	532	<2	6
E6,0-1	393241	1183216	55	21	18	33	59	697	<2	7
E6,2-3	393241	1183216	57	24	3.6	35	73	754	<2	10
E6,4-5	393241	1183216	47	22	0.36	33	61	801	<2	10
F1,0-1	393138	1183953	19	19	<0.02	28	33	570	<2	5
F1,2-3	393138	1183953	11	19	<0.02	20	18	268	<2	4
F1,9-10	393138	1183953	12	16	0.02	19	21	327	<2	<4
F2,0-1	393135	1183832	34	20	<0.02	30	52	735	<2	5
F2,2-3	393135	1183832	13	18	<0.02	21	18	308	<2	4
F2,9-10	393135	1183832	40	21	0.04	33	56	758	4	6
F3,0-1	393136	1183719	8	16	<0.02	21	19	310	<2	<4
F3,2-3	393136	1183719	22	19	0.02	25	37	513	<2	6
F3,7-8	393136	1183719	12	19	<0.02	22	24	325	<2	<4
F4,0-1	393135	1183606	15	17	0.06	25	28	457	<2	6
F4,2-3	393135	1183606	27	21	0.04	27	38	1060	3	9
F4,4-5	393135	1183606	42	21	<0.02	32	51	1260	5	7
F5,0-1	393136	1183503	23	18	<0.02	27	39	530	<2	6
F5,16-17	393136	1183503	59	22	0.02	39	78	893	7	7
F7,0-1	393139	1183245	63	19	32	30	50	627	<2	7
F7,2-3	393139	1183245	44	22	1.5	30	63	611	<2	9
F7,6-7	393139	1183245	65	23	0.28	37	78	1040	5	8
G1,0-1	393100	1183932	32	19	0.06	29	40	682	<2	5
G1,2-3	393100	1183932	22	19	0.02	25	32	768	<2	8
G1,10-11	393100	1183932	35	19	<0.02	30	45	865	<2	6
G2,0-1	393043	1183823	15	17	0.02	25	27	439	<2	4
G2,2-3	393043	1183823	21	19	0.02	23	31	413	<2	6
G2,7-8	393043	1183823	38	22	0.04	34	58	756	<2	6

Appendix C cont.

Field ID	Lat.	Long.	Cu ppm	Ga ppm	Hg ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
G3,0-1	393055	1183717	15	17	<0.02	25	26	440	<2	5
G3,2-3	393055	1183717	34	22	0.04	29	44	954	<2	9
G4,0-1	393056	1183608	17	18	0.18	25	28	511	<2	9
G4,2-3	393056	1183608	38	22	0.08	32	46	608	<2	5
G4,10-11	393056	1183608	44	22	0.02	35	54	628	<2	10
G5,0-1	393054	1183502	23	19	0.06	27	38	693	3	6
G5,2-3	393054	1183502	30	21	0.02	28	46	490	<2	6
G5,7-8	393054	1183502	41	21	0.06	33	58	645	<2	8
G6,2-3	393051	1183336	34	22	0.06	29	40	449	<2	6
G6,3-4	393051	1183336	15	19	<0.02	27	23	385	<2	10
G7,0-1	393043	1183248	45	21	0.48	34	72	760	<2	5
G7,2-3	393043	1183248	51	24	0.06	33	115	1080	<2	7
G7,6-7	393043	1183248	42	20	0.02	33	109	992	3	13

Appendix C cont.

Field ID	Lat.	Long.	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Se ppm	Sr ppm	Th ppm	V ppm
A1,0-1	393548	1183341	25	19	17	10	0.2	506	12	102
A1,2-3	393548	1183341	24	17	16	10	0.1	524	12	81
A1,4-5	393548	1183341	26	25	16	10	<0.1	887	11	113
A2,0-1	393549	1183309	25	19	18	11	<0.1	459	12	103
A2,2-3	393549	1183309	26	26	18	12	<0.1	469	12	117
A2,3-4	393549	1183309	28	20	18	11	<0.1	600	11	100
B1,0-1	393459	1183444	19	11	16	7	<0.1	592	9	62
B1,2-3	393459	1183444	20	13	18	8	<0.1	787	9	73
B1,8-9	393459	1183444	26	18	15	11	<0.1	538	10	97
B2,0-1	393517	1183402	15	8	17	6	<0.1	594	6	48
B2,2-3	393517	1183402	26	18	19	11	<0.1	567	11	96
B2,5-6	393517	1183402	27	28	18	11	<0.1	654	11	127
B3,0-1	393505	1183310	27	22	16	12	1.1	443	14	115
B3,2-3	393505	1183310	24	20	18	11	0.1	571	13	92
B3,4-5	393505	1183310	28	23	17	12	<0.1	514	14	104
C1,0-1	393412	1183437	25	19	19	11	<0.1	557	12	114
C1,2-3	393412	1183437	22	15	18	9	<0.1	635	9	77
C1,6-8	393412	1183437	26	19	18	11	<0.1	573	11	99
C2,0-1	393435	1183425	19	13	16	7	<0.1	646	8	101
C2,2-3	393435	1183425	18	12	16	8	<0.1	707	8	71
C2,7-8	393435	1183425	24	28	18	12	0.3	474	12	117
C3,0-1	393425	1183309	24	22	14	10	<0.1	499	12	104
C3,2-3	393425	1183309	24	23	15	9	0.3	1030	9	101
C3,7-8	393425	1183309	27	21	18	12	0.3	751	13	109
CP1,0-1	393350	1183310	25	19	17	12	1.2	477	13	108
CP1,2-3	393350	1183310	29	24	18	13	0.2	455	15	119
CP1,4-5	393350	1183310	31	23	20	13	<0.1	496	13	121
CP2,0-1	393301	1183429	26	19	15	11	<0.1	533	14	100
CP2,2-3	393301	1183429	15	7	16	5	<0.1	533	5	44
CP2,12-13	393301	1183429	27	21	18	11	0.3	512	13	102
CP3,0-1	393127	1183301	32	25	23	15	0.7	557	16	139
CP3,2-3	393127	1183301	29	22	20	13	0.3	497	15	121
CP3,7-8	393127	1183301	33	28	19	16	0.3	360	18	154
CP4,0-1	393115	1183641	20	13	17	8	<0.1	608	10	71
CP4,2-3	393115	1183641	20	11	17	8	<0.1	619	7	69
CP4,7-8	393115	1183641	20	11	16	7	<0.1	621	8	69
CP5,0-1	393203	1183642	17	12	16	6	<0.1	587	10	61
CP5,2-3	393203	1183642	20	11	16	7	<0.1	611	9	62
CP5,9-10	393203	1183642	31	23	18	14	<0.1	370	15	129
CP6,0-1	393107	1183860	25	13	16	9	<0.1	649	11	81
CP6,2-3	393107	1183860	21	14	17	8	<0.1	635	10	69
CP6,10-11	393107	1183860	20	9	19	6	<0.1	647	7	55
D1,0-1	393321	1183607	16	9	19	5	<0.1	554	8	46
D1,2-3	393321	1183607	22	15	18	9	<0.1	568	9	77
D1,7-8	393321	1183607	28	24	20	16	<0.1	427	15	143
D2,0-1	393323	1183501	20	13	17	7	<0.1	608	9	69
D2,2-3	393323	1183501	15	12	19	5	<0.1	618	6	51
D2,7-8	393323	1183501	18	10	17	7	<0.1	674	7	62

Appendix C cont.

Field ID	Lat.	Long.	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Se ppm	Sr ppm	Th ppm	V ppm
D3,0-1	393323	1183357	21	14	17	8	0.3	626	10	78
D3,2-3	393323	1183357	22	14	17	9	<0.1	713	9	81
D3,5-6	393323	1183357	26	20	20	12	<0.1	633	10	110
D4,0-1	393328	1183322	21	12	16	8	<0.1	624	10	79
D4,2-3	393328	1183322	21	18	16	8	<0.1	669	10	77
D4,12-13	393328	1183322	32	25	21	15	<0.1	375	18	137
E1,0-1	393230	1183857	16	9	16	5	<0.1	542	7	48
E1,2-3	393230	1183857	13	7	17	5	<0.1	595	6	36
E1,10-11	393230	1183857	23	15	19	9	<0.1	608	8	84
E2,0-1	393234	1183716	18	11	15	7	<0.1	557	10	68
E2,2-3	393234	1183716	16	10	16	6	<0.1	594	7	56
E2,8-9	393234	1183716	31	22	22	14	<0.1	438	13	115
E3,0-1	393228	1183603	17	15	15	6	<0.1	579	7	56
E3,2-3	393228	1183603	21	16	19	8	<0.1	601	8	74
E3,8-9	393228	1183603	29	23	20	15	<0.1	413	14	136
E4,0-1	393229	1183531	20	14	17	8	<0.1	606	8	78
E4,2-3	393229	1183531	31	13	17	9	<0.1	646	23	128
E4,10-11	393229	1183531	25	15	18	9	0.2	639	11	89
E5,0-1	393241	1183352	26	18	23	11	0.2	502	12	103
E5,2-3	393241	1183352	28	22	17	12	0.1	526	12	102
E5,3-4	393241	1183352	25	17	19	11	<0.1	612	10	99
E6,0-1	393241	1183216	28	21	33	12	0.2	451	15	117
E6,2-3	393241	1183216	31	24	23	15	0.2	430	16	133
E6,4-5	393241	1183216	28	22	21	13	<0.1	495	14	113
F1,0-1	393138	1183953	23	13	17	9	<0.1	582	10	100
F1,2-3	393138	1183953	14	8	16	6	<0.1	608	5	50
F1,9-10	393138	1183953	15	7	18	5	<0.1	591	7	44
F2,0-1	393135	1183832	27	17	18	10	<0.1	562	13	108
F2,2-3	393135	1183832	18	7	15	5	<0.1	607	6	51
F2,9-10	393135	1183832	28	20	21	13	<0.1	528	12	119
F3,0-1	393136	1183719	16	9	18	5	<0.1	564	6	47
F3,2-3	393136	1183719	22	15	18	9	<0.1	615	10	79
F3,7-8	393136	1183719	19	10	18	6	<0.1	627	7	52
F4,0-1	393135	1183606	21	11	19	7	<0.1	603	7	64
F4,2-3	393135	1183606	23	17	19	10	<0.1	596	11	89
F4,4-5	393135	1183606	27	21	20	13	<0.1	526	11	109
F5,0-1	393136	1183503	22	16	16	9	0.2	561	9	93
F5,16-17	393136	1183503	33	27	20	16	0.3	389	18	146
F7,0-1	393139	1183245	25	19	41	11	0.3	453	14	102
F7,2-3	393139	1183245	29	23	20	12	0.2	525	14	115
F7,6-7	393139	1183245	32	25	19	17	<0.1	368	17	155
G1,0-1	393100	1183932	23	18	18	10	0.2	509	12	114
G1,2-3	393100	1183932	22	14	18	9	<0.1	588	10	81
G1,10-11	393100	1183932	26	18	19	11	<0.1	524	11	98
G2,0-1	393043	1183823	19	15	17	7	<0.1	547	9	64
G2,2-3	393043	1183823	20	13	19	8	0.3	607	7	70
G2,7-8	393043	1183823	27	20	19	13	<0.1	492	13	117

Appendix C cont.

Field ID	Lat.	Long.	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Se ppm	Sr ppm	Th ppm	V ppm
G3,0-1	393055	1183717	19	15	17	7	<0.1	549	15	66
G3,2-3	393055	1183717	26	18	16	11	<0.1	577	12	98
G4,0-1	393056	1183608	20	12	18	8	<0.1	589	7	77
G4,2-3	393056	1183608	30	19	19	13	0.1	547	15	120
G4,10-11	393056	1183608	31	20	21	13	<0.1	527	15	111
G5,0-1	393054	1183502	22	16	19	9	0.3	573	9	84
G5,2-3	393054	1183502	26	19	21	11	<0.1	543	11	98
G5,7-8	393054	1183502	28	20	19	12	<0.1	559	13	123
G6,2-3	393051	1183336	28	18	19	12	<0.1	642	13	106
G6,3-4	393051	1183336	24	13	17	9	<0.1	683	10	81
G7,0-1	393043	1183248	27	22	19	13	<0.1	424	16	127
G7,2-3	393043	1183248	31	24	22	16	0.2	413	16	141
G7,6-7	393043	1183248	28	24	18	12	0.2	515	13	118

Appendix C cont.

Field ID	Lat.	Long.	Y ppm	Yb ppm	Zn ppm
A1,0-1	393548	1183341	14	2	75
A1,2-3	393548	1183341	14	2	60
A1,4-5	393548	1183341	14	2	85
A2,0-1	393549	1183309	14	2	81
A2,2-3	393549	1183309	15	2	84
A2,3-4	393549	1183309	17	2	73
B1,0-1	393459	1183444	11	1	42
B1,2-3	393459	1183444	12	1	56
B1,8-9	393459	1183444	15	2	64
B2,0-1	393517	1183402	9	1	31
B2,2-3	393517	1183402	14	2	75
B2,5-6	393517	1183402	15	2	87
B3,0-1	393505	1183310	16	2	92
B3,2-3	393505	1183310	14	2	69
B3,4-5	393505	1183310	15	2	73
C1,0-1	393412	1183437	15	2	85
C1,2-3	393412	1183437	12	1	61
C1,6-8	393412	1183437	15	2	76
C2,0-1	393435	1183425	11	1	47
C2,2-3	393435	1183425	10	1	49
C2,7-8	393435	1183425	13	2	70
C3,0-1	393425	1183309	14	2	79
C3,2-3	393425	1183309	12	1	75
C3,7-8	393425	1183309	16	2	87
CP1,0-1	393350	1183310	14	1	79
CP1,2-3	393350	1183310	16	2	83
CP1,4-5	393350	1183310	16	2	96
CP2,0-1	393301	1183429	15	2	79
CP2,2-3	393301	1183429	8	<1	33
CP2,12-13	393301	1183429	17	2	84
CP3,0-1	393127	1183301	19	2	122
CP3,2-3	393127	1183301	16	2	94
CP3,7-8	393127	1183301	18	2	122
CP4,0-1	393115	1183641	12	1	56
CP4,2-3	393115	1183641	11	1	52
CP4,7-8	393115	1183641	11	1	51
CP5,0-1	393203	1183642	10	1	36
CP5,2-3	393203	1183642	11	1	38
CP5,9-10	393203	1183642	17	2	93
CP6,0-1	393107	1183860	13	1	64
CP6,2-3	393107	1183860	12	1	52
CP6,10-11	393107	1183860	10	1	39
D1,0-1	393321	1183607	9	<1	30
D1,2-3	393321	1183607	12	1	61
D1,7-8	393321	1183607	16	2	102
D2,0-1	393323	1183501	12	1	43
D2,2-3	393323	1183501	9	1	34
D2,7-8	393323	1183501	10	1	43

Appendix C cont.

Field ID	Lat.	Long.	Y ppm	Yb ppm	Zn ppm
D3,0-1	393323	1183357	12	1	55
D3,2-3	393323	1183357	12	2	68
D3,5-6	393323	1183357	16	2	89
D4,0-1	393328	1183322	12	1	49
D4,2-3	393328	1183322	12	1	51
D4,12-13	393328	1183322	18	2	112
E1,0-1	393230	1183857	10	1	31
E1,2-3	393230	1183857	8	<1	29
E1,10-11	393230	1183857	13	1	67
E2,0-1	393234	1183716	10	1	41
E2,2-3	393234	1183716	10	1	44
E2,8-9	393234	1183716	17	2	101
E3,0-1	393228	1183603	10	<1	40
E3,2-3	393228	1183603	12	1	57
E3,8-9	393228	1183603	17	2	103
E4,0-1	393229	1183531	11	1	56
E4,2-3	393229	1183531	15	2	64
E4,10-11	393229	1183531	14	2	56
E5,0-1	393241	1183352	14	2	84
E5,2-3	393241	1183352	15	2	85
E5,3-4	393241	1183352	15	2	69
E6,0-1	393241	1183216	15	2	109
E6,2-3	393241	1183216	17	2	119
E6,4-5	393241	1183216	16	2	94
F1,0-1	393138	1183953	13	1	56
F1,2-3	393138	1183953	9	<1	34
F1,9-10	393138	1183953	8	<1	33
F2,0-1	393135	1183832	14	2	79
F2,2-3	393135	1183832	9	<1	30
F2,9-10	393135	1183832	16	2	93
F3,0-1	393136	1183719	9	<1	29
F3,2-3	393136	1183719	13	1	62
F3,7-8	393136	1183719	10	1	37
F4,0-1	393135	1183606	11	1	50
F4,2-3	393135	1183606	14	2	67
F4,4-5	393135	1183606	16	2	85
F5,0-1	393136	1183503	13	1	67
F5,16-17	393136	1183503	18	2	112
F7,0-1	393139	1183245	14	2	115
F7,2-3	393139	1183245	16	2	95
F7,6-7	393139	1183245	17	2	105
G1,0-1	393100	1183932	13	1	68
G1,2-3	393100	1183932	13	1	58
G1,10-11	393100	1183932	14	2	75
G2,0-1	393043	1183823	11	1	48
G2,2-3	393043	1183823	11	1	51
G2,7-8	393043	1183823	16	2	91

Appendix C cont.

Field ID	Lat.	Long.	Y ppm	Yb ppm	Zn ppm
G3,0-1	393055	1183717	11	1	45
G3,2-3	393055	1183717	15	2	79
G4,0-1	393056	1183608	12	1	56
G4,2-3	393056	1183608	17	2	93
G4,10-11	393056	1183608	17	2	91
G5,0-1	393054	1183502	12	1	65
G5,2-3	393054	1183502	14	2	74
G5,7-8	393054	1183502	16	2	90
G6,2-3	393051	1183336	15	2	83
G6,3-4	393051	1183336	14	2	48
G7,0-1	393043	1183248	16	2	109
G7,2-3	393043	1183248	16	2	105
G7,6-7	393043	1183248	15	2	95

Appendix D Analytical results for total element concentrations in soil samples collected at center point locations, TJ-Drain study area

[CP#, designates collection site; ##-## designates sample collection depth in feet; %, percent concentrations; ppm, parts per million, mg/Kg]

Field ID	Latitude	Longitude	Al %	Ca%	Fe %	K %	Mg %	Na %	P %	Ti %
CP1,0-1	393350	1183310	7.45	2.37	3.70	1.87	1.50	2.41	0.09	0.36
CP1,1-2	393350	1183310	8.58	2.06	4.49	2.02	1.69	2.43	0.08	0.41
CP1,2-3	393350	1183310	7.94	1.82	3.73	1.88	1.49	2.48	0.05	0.36
CP1,3-4	393350	1183310	8.40	1.93	4.14	2.05	1.50	2.45	0.07	0.42
CP1,4-5	393350	1183310	8.15	4.50	4.01	1.98	1.48	2.19	0.09	0.43
CP2,0-1	393301	1183429	8.62	2.47	3.82	2.05	1.25	2.49	0.10	0.36
CP2,1-2	393301	1183429	8.21	2.31	1.81	2.40	0.62	2.80	0.06	0.22
CP2,2-3	393301	1183429	7.58	2.11	1.59	2.37	0.53	2.64	0.06	0.19
CP2,3-4	393301	1183429	8.79	2.85	3.86	1.89	1.33	2.57	0.11	0.44
CP2,4-5	393301	1183429	8.51	2.58	3.86	2.00	1.33	2.32	0.09	0.38
CP2,5-6	393301	1183429	8.71	2.47	4.15	1.94	1.41	1.98	0.08	0.38
CP2,6-7	393301	1183429	8.62	2.22	4.18	1.89	1.38	1.78	0.07	0.37
CP2,7-8	393301	1183429	8.60	1.93	4.41	1.93	1.33	1.82	0.07	0.39
CP2,8-9	393301	1183429	8.74	1.89	4.61	1.94	1.44	1.64	0.09	0.40
CP2,9-10	393301	1183429	8.82	2.00	4.73	1.98	1.46	1.65	0.10	0.41
CP2,10-11	393301	1183429	8.79	1.87	4.56	2.04	1.42	1.75	0.09	0.41
CP2,11-12	393301	1183429	8.59	1.81	3.88	2.04	1.25	1.79	0.06	0.38
CP2,12-13	393301	1183429	8.73	2.19	3.28	2.20	1.18	2.16	0.11	0.36
CP3,0-1	393127	1183301	10.20	2.53	5.01	2.36	1.68	2.21	0.11	0.48
CP3,1-2	393127	1183301	8.61	2.10	4.27	2.06	1.30	2.19	0.09	0.43
CP3,2-3	393127	1183301	8.63	2.20	4.16	2.13	1.40	2.19	0.09	0.42
CP3,3-4	393127	1183301	8.76	2.01	4.82	2.16	1.74	1.78	0.09	0.43
CP3,4-5	393127	1183301	8.90	1.98	4.90	2.04	1.73	1.80	0.09	0.41
CP3,5-6	393127	1183301	8.96	1.89	5.08	2.08	1.73	1.71	0.08	0.41
CP3,6-7	393127	1183301	8.62	1.62	5.09	2.02	1.61	1.61	0.07	0.42
CP3,7-8	393127	1183301	8.98	1.44	5.16	1.92	1.67	1.48	0.06	0.40
CP4,0-1	393115	1183641	8.64	2.90	2.61	2.18	0.99	3.23	0.09	0.31
CP4,1-2	393115	1183641	8.30	2.71	2.52	2.27	0.91	3.03	0.08	0.28
CP4,2-3	393115	1183641	8.77	2.69	2.61	2.17	0.94	3.28	0.08	0.30
CP4,3-4	393115	1183641	8.94	2.34	3.59	2.04	1.21	3.28	0.09	0.39
CP4,4-5	393115	1183641	8.84	2.32	3.21	2.08	1.11	3.18	0.09	0.35
CP4,5-6	393115	1183641	8.33	3.04	2.84	2.12	1.11	3.12	0.08	0.35
CP4,6-7	393115	1183641	8.77	3.09	2.43	2.23	0.92	3.26	0.08	0.29
CP4,7-8	393115	1183641	8.61	2.97	2.34	2.25	0.91	3.22	0.08	0.29
CP5,0-1	393203	1183642	8.35	2.71	1.89	2.41	0.74	2.93	0.08	0.22
CP5,1-2	393203	1183642	8.55	2.56	2.49	2.23	0.89	2.95	0.07	0.30
CP5,2-3	393203	1183642	8.31	3.02	2.22	2.31	0.77	2.92	0.08	0.26
CP5,3-4	393203	1183642	8.22	3.14	2.06	2.26	0.73	2.96	0.08	0.27
CP5,4-5	393203	1183642	8.50	3.36	2.64	2.08	0.98	2.84	0.09	0.34
CP5,5-6	393203	1183642	8.94	2.45	4.28	1.99	1.53	2.36	0.11	0.46
CP5,6-7	393203	1183642	8.87	1.90	4.61	1.96	1.62	2.09	0.10	0.45
CP5,7-8	393203	1183642	9.06	1.99	4.40	2.01	1.51	2.28	0.10	0.46
CP5,8-9	393203	1183642	9.02	1.63	4.58	1.96	1.46	2.02	0.07	0.42
CP5,9-10	393203	1183642	8.60	1.71	4.39	1.77	1.31	2.03	0.07	0.38

Appendix D cont.

Field ID	Latitude	Longitude	Al %	Ca%	Fe %	K %	Mg %	Na %	P %	Ti %
CP6,0-1	393107	1183860	8.18	4.46	2.98	2.03	1.13	2.63	0.10	0.37
CP6,1-2	393107	1183860	8.71	4.01	2.95	2.09	1.13	2.76	0.09	0.33
CP6,2-3	393107	1183860	8.83	3.12	2.51	2.19	0.93	2.95	0.09	0.30
CP6,3-4	393107	1183860	7.54	2.28	1.62	2.82	0.51	2.67	0.06	0.20
CP6,4-5	393107	1183860	7.94	2.34	1.62	2.66	0.55	2.72	0.07	0.19
CP6,5-6	393107	1183860	7.50	2.08	1.44	2.83	0.46	2.58	0.06	0.17
CP6,6-7	393107	1183860	7.02	1.94	1.21	3.07	0.32	2.52	0.05	0.14
CP6,7-8	393107	1183860	7.22	2.04	1.33	2.78	0.42	2.53	0.05	0.16
CP6,8-9	393107	1183860	7.13	2.20	1.34	2.92	0.41	2.48	0.05	0.16
CP6,9-10	393107	1183860	7.85	3.38	1.56	2.48	0.60	2.98	0.07	0.21
CP6,10-11	393107	1183860	8.16	3.48	1.96	2.43	0.78	3.07	0.08	0.25

Appendix D cont.

Field ID	Latitude	Longitude	As ppm	Ba ppm	Be ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm
CP1,0-1	393350	1183310	27	670	2	52	14	33	40	19
CP1,1-2	393350	1183310	27	548	2	59	17	38	42	23
CP1,2-3	393350	1183310	24	735	2	58	16	35	50	21
CP1,3-4	393350	1183310	21	848	2	61	17	34	41	21
CP1,4-5	393350	1183310	21	843	2	62	17	35	37	21
CP2,0-1	393301	1183429	26	840	2	55	16	33	33	22
CP2,1-2	393301	1183429	7.6	1000	2	36	9	19	15	18
CP2,2-3	393301	1183429	6.3	955	2	34	7	17	11	16
CP2,3-4	393301	1183429	14	861	2	55	17	38	34	22
CP2,4-5	393301	1183429	18	795	2	55	15	34	41	21
CP2,5-6	393301	1183429	20	750	2	58	16	38	44	22
CP2,6-7	393301	1183429	22	735	2	59	17	36	50	22
CP2,7-8	393301	1183429	23	746	2	62	16	35	52	21
CP2,8-9	393301	1183429	22	723	2	62	18	36	50	22
CP2,9-10	393301	1183429	21	743	2	66	19	37	52	23
CP2,10-11	393301	1183429	20	776	2	63	18	36	45	22
CP2,11-12	393301	1183429	17	783	2	60	14	35	55	21
CP2,12-13	393301	1183429	12	959	2	58	14	35	43	21
CP3,0-1	393127	1183301	24	975	2	68	21	42	51	26
CP3,1-2	393127	1183301	26	881	2	60	17	36	40	22
CP3,2-3	393127	1183301	18	871	2	59	17	36	40	22
CP3,3-4	393127	1183301	24	783	2	65	20	37	49	24
CP3,4-5	393127	1183301	21	760	2	64	20	38	51	24
CP3,5-6	393127	1183301	24	786	2	67	21	39	55	24
CP3,6-7	393127	1183301	33	741	2	67	19	39	57	22
CP3,7-8	393127	1183301	45	710	2	71	21	40	63	24
CP4,0-1	393115	1183641	11	827	2	44	11	29	21	20
CP4,1-2	393115	1183641	10	959	2	43	11	26	19	19
CP4,2-3	393115	1183641	9.2	919	2	43	11	28	19	20
CP4,3-4	393115	1183641	17	969	2	50	17	34	30	21
CP4,4-5	393115	1183641	17	963	2	50	15	31	27	21
CP4,5-6	393115	1183641	14	885	2	45	12	30	26	19
CP4,6-7	393115	1183641	9.5	994	2	43	11	26	18	20
CP4,7-8	393115	1183641	11	930	2	42	10	28	18	20
CP5,0-1	393203	1183642	8.4	969	2	38	8	23	14	18
CP5,1-2	393203	1183642	14	988	2	48	11	31	17	20
CP5,2-3	393203	1183642	8.8	958	2	43	9	27	11	19
CP5,3-4	393203	1183642	6.9	959	2	40	9	24	12	18
CP5,4-5	393203	1183642	8.2	957	2	43	12	25	21	19
CP5,5-6	393203	1183642	19	968	2	63	19	39	44	23
CP5,6-7	393203	1183642	30	880	2	66	20	39	52	23
CP5,7-8	393203	1183642	27	942	2	64	19	38	44	23
CP5,8-9	393203	1183642	30	800	2	62	18	38	55	24
CP5,9-10	393203	1183642	30	714	2	62	16	35	55	22

Appendix D cont.

Field ID	Latitude	Longitude	As ppm	Ba ppm	Be ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm
CP6,0-1	393107	1183860	6.5	898	2	50	12	32	24	20
CP6,1-2	393107	1183860	7.8	964	2	49	13	32	21	21
CP6,2-3	393107	1183860	7.4	960	2	45	12	27	17	20
CP6,3-4	393107	1183860	7.6	1130	2	35	8	17	12	16
CP6,4-5	393107	1183860	8.2	1100	2	34	8	18	11	17
CP6,5-6	393107	1183860	8.5	1120	2	33	7	15	10	16
CP6,6-7	393107	1183860	8.8	1210	2	29	6	9	8	14
CP6,7-8	393107	1183860	8.9	1090	2	32	7	16	9	16
CP6,8-9	393107	1183860	6.5	1150	2	34	7	12	7	15
CP6,9-10	393107	1183860	5.5	984	2	39	7	16	11	17
CP6,10-11	393107	1183860	6.4	986	2	39	8	21	14	17

Appendix D cont.

Field ID	Latitude	Longitude	Hg ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm	Nd ppm	Ni ppm
CP1,0-1	393350	1183310	0.04	29	62	639	3	8	25	19
CP1,1-2	393350	1183310	0.04	33	72	712	7	6	30	22
CP1,2-3	393350	1183310	0.06	32	72	1020	12	8	29	24
CP1,3-4	393350	1183310	0.02	34	79	825	8	9	31	24
CP1,4-5	393350	1183310	0.04	34	76	721	5	11	31	23
CP2,0-1	393301	1183429	0.36	30	44	810	<2	4	26	19
CP2,1-2	393301	1183429	0.08	21	24	297	<2	<4	17	9
CP2,2-3	393301	1183429	0.02	18	20	238	<2	<4	15	7
CP2,3-4	393301	1183429	0.04	30	44	586	<2	6	26	18
CP2,4-5	393301	1183429	0.04	31	52	652	<2	8	29	20
CP2,5-6	393301	1183429	0.02	32	54	597	2	6	27	21
CP2,6-7	393301	1183429	0.02	33	56	551	<2	7	29	23
CP2,7-8	393301	1183429	0.04	34	58	493	3	9	30	23
CP2,8-9	393301	1183429	0.02	36	60	492	2	7	29	25
CP2,9-10	393301	1183429	0.02	37	62	521	3	7	31	25
CP2,10-11	393301	1183429	0.04	35	59	518	2	6	31	24
CP2,11-12	393301	1183429	0.04	34	56	442	<2	9	30	22
CP2,12-13	393301	1183429	0.02	33	49	395	<2	7	27	21
CP3,0-1	393127	1183301	0.92	39	65	822	4	9	32	25
CP3,1-2	393127	1183301	0.08	33	55	665	3	9	30	22
CP3,2-3	393127	1183301	0.02	33	63	700	2	9	29	22
CP3,3-4	393127	1183301	0.06	37	77	802	2	7	32	26
CP3,4-5	393127	1183301	0.02	37	83	713	<2	6	31	25
CP3,5-6	393127	1183301	0.04	38	86	678	2	6	32	27
CP3,6-7	393127	1183301	0.06	37	85	710	3	8	34	26
CP3,7-8	393127	1183301	0.04	39	86	752	3	7	33	28
CP4,0-1	393115	1183641	<0.02	26	34	439	<2	4	20	13
CP4,1-2	393115	1183641	<0.02	23	31	502	<2	<4	20	12
CP4,2-3	393115	1183641	<0.02	25	30	369	<2	4	20	11
CP4,3-4	393115	1183641	<0.02	28	45	548	3	5	25	17
CP4,4-5	393115	1183641	<0.02	28	41	623	4	5	24	17
CP4,5-6	393115	1183641	0.02	25	43	443	2	7	22	14
CP4,6-7	393115	1183641	<0.02	24	33	329	<2	<4	20	12
CP4,7-8	393115	1183641	<0.02	24	30	341	<2	<4	20	11
CP5,0-1	393203	1183642	<0.02	22	24	308	<2	<4	17	12
CP5,1-2	393203	1183642	<0.02	27	28	359	<2	4	23	12
CP5,2-3	393203	1183642	<0.02	24	23	359	<2	4	20	11
CP5,3-4	393203	1183642	<0.02	22	25	376	<2	6	18	11
CP5,4-5	393203	1183642	<0.02	25	35	520	<2	6	22	14
CP5,5-6	393203	1183642	0.16	34	58	983	<2	6	29	24
CP5,6-7	393203	1183642	0.04	36	66	1030	3	7	30	24
CP5,7-8	393203	1183642	0.04	35	62	791	<2	6	29	22
CP5,8-9	393203	1183642	0.04	35	62	752	2	9	31	24
CP5,9-10	393203	1183642	0.04	33	67	644	<2	8	31	23

Appendix D cont.

Field ID	Latitude	Longitude	Hg ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm	Nd ppm	Ni ppm
CP6,0-1	393107	1183860	<0.02	28	40	634	<2	7	25	13
CP6,1-2	393107	1183860	<0.02	28	39	639	<2	4	23	14
CP6,2-3	393107	1183860	<0.02	25	30	563	<2	5	21	14
CP6,3-4	393107	1183860	<0.02	20	20	584	<2	4	17	10
CP6,4-5	393107	1183860	<0.02	19	19	795	<2	<4	14	10
CP6,5-6	393107	1183860	<0.02	18	17	336	<2	<4	14	10
CP6,6-7	393107	1183860	<0.02	16	15	220	<2	<4	13	7
CP6,7-8	393107	1183860	<0.02	17	15	224	<2	<4	14	9
CP6,8-9	393107	1183860	0.02	20	15	230	<2	<4	15	8
CP6,9-10	393107	1183860	<0.02	22	20	390	<2	<4	17	9
CP6,10-11	393107	1183860	<0.02	23	26	438	<2	<4	20	9

Appendix D cont.

Field ID	Latitude	Longitude	Pb ppm	Sc ppm	Se ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm
CP1,0-1	393350	1183310	17	12	1.2	477	13	108	14	1
CP1,1-2	393350	1183310	17	13	0.3	449	15	123	16	2
CP1,2-3	393350	1183310	18	13	0.2	455	15	119	16	2
CP1,3-4	393350	1183310	19	13	<0.2	493	13	121	17	2
CP1,4-5	393350	1183310	20	13	<0.2	496	13	121	16	2
CP2,0-1	393301	1183429	15	11	<0.2	533	14	100	15	2
CP2,1-2	393301	1183429	18	6	<0.2	566	6	51	9	1
CP2,2-3	393301	1183429	16	5	<0.2	533	5	44	8	1
CP2,3-4	393301	1183429	19	11	<0.2	637	11	108	15	2
CP2,4-5	393301	1183429	17	13	<0.2	508	13	115	15	2
CP2,5-6	393301	1183429	16	13	0.2	448	16	121	16	1
CP2,6-7	393301	1183429	16	13	0.3	438	13	124	16	2
CP2,7-8	393301	1183429	21	14	0.3	447	15	127	16	2
CP2,8-9	393301	1183429	18	14	0.4	413	17	127	17	2
CP2,9-10	393301	1183429	18	14	0.4	420	17	127	18	2
CP2,10-11	393301	1183429	20	13	0.2	431	16	120	16	2
CP2,11-12	393301	1183429	19	14	0.3	443	17	125	15	2
CP2,12-13	393301	1183429	18	11	0.3	512	13	102	17	2
CP3,0-1	393127	1183301	23	15	0.7	557	16	139	19	2
CP3,1-2	393127	1183301	21	13	0.5	512	13	122	16	2
CP3,2-3	393127	1183301	20	13	0.3	497	15	121	16	2
CP3,3-4	393127	1183301	19	15	0.9	401	18	131	17	2
CP3,4-5	393127	1183301	19	15	0.6	402	17	132	17	2
CP3,5-6	393127	1183301	18	15	0.4	389	18	138	18	2
CP3,6-7	393127	1183301	19	16	0.3	375	16	149	17	2
CP3,7-8	393127	1183301	19	16	0.3	360	18	154	18	2
CP4,0-1	393115	1183641	17	8	<0.2	608	10	71	12	1
CP4,1-2	393115	1183641	17	7	<0.2	572	9	71	11	1
CP4,2-3	393115	1183641	17	8	<0.2	619	7	69	11	1
CP4,3-4	393115	1183641	18	10	<0.2	595	10	94	14	2
CP4,4-5	393115	1183641	17	9	<0.2	586	12	90	14	2
CP4,5-6	393115	1183641	17	9	<0.2	605	10	86	12	1
CP4,6-7	393115	1183641	16	7	<0.2	648	8	70	11	1
CP4,7-8	393115	1183641	16	7	<0.2	621	8	69	11	1
CP5,0-1	393203	1183642	16	6	<0.2	587	10	61	10	1
CP5,1-2	393203	1183642	17	7	<0.2	592	13	71	13	1
CP5,2-3	393203	1183642	16	7	<0.2	611	9	62	11	1
CP5,3-4	393203	1183642	17	7	<0.2	642	6	58	10	1
CP5,4-5	393203	1183642	16	8	<0.2	666	9	72	12	1
CP5,5-6	393203	1183642	19	12	<0.2	541	14	113	17	2
CP5,6-7	393203	1183642	19	14	<0.2	435	15	118	18	2
CP5,7-8	393203	1183642	18	14	<0.2	473	15	118	17	2
CP5,8-9	393203	1183642	19	15	<0.2	408	16	126	17	2
CP5,9-10	393203	1183642	18	14	<0.2	370	15	129	17	2

Appendix D cont.

Field ID	Latitude	Longitude	Pb ppm	Sc ppm	Se ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm
CP6,0-1	393107	1183860	13	9	<0.2	649	11	81	13	1
CP6,1-2	393107	1183860	14	9	<0.2	647	10	79	13	2
CP6,2-3	393107	1183860	14	8	<0.2	635	10	69	12	1
CP6,3-4	393107	1183860	10	5	<0.2	529	6	45	9	1
CP6,4-5	393107	1183860	10	5	<0.2	542	8	43	9	1
CP6,5-6	393107	1183860	10	4	<0.2	502	5	38	8	1
CP6,6-7	393107	1183860	7	3	<0.2	486	4	32	7	1
CP6,7-8	393107	1183860	9	3	<0.2	488	6	35	8	1
CP6,8-9	393107	1183860	8	3	<0.2	489	5	35	8	1
CP6,9-10	393107	1183860	9	5	<0.2	621	7	43	9	1
CP6,10-11	393107	1183860	9	6	<0.2	647	7	55	10	1

Appendix D cont.

Field ID	Latitude	Longitude	Zn ppm
CP1,0-1	393350	1183310	79
CP1,1-2	393350	1183310	95
CP1,2-3	393350	1183310	83
CP1,3-4	393350	1183310	94
CP1,4-5	393350	1183310	96
CP2,0-1	393301	1183429	79
CP2,1-2	393301	1183429	39
CP2,2-3	393301	1183429	33
CP2,3-4	393301	1183429	102
CP2,4-5	393301	1183429	87
CP2,5-6	393301	1183429	91
CP2,6-7	393301	1183429	91
CP2,7-8	393301	1183429	97
CP2,8-9	393301	1183429	100
CP2,9-10	393301	1183429	104
CP2,10-11	393301	1183429	100
CP2,11-12	393301	1183429	89
CP2,12-13	393301	1183429	84
CP3,0-1	393127	1183301	122
CP3,1-2	393127	1183301	94
CP3,2-3	393127	1183301	94
CP3,3-4	393127	1183301	119
CP3,4-5	393127	1183301	113
CP3,5-6	393127	1183301	116
CP3,6-7	393127	1183301	113
CP3,7-8	393127	1183301	122
CP4,0-1	393115	1183641	56
CP4,1-2	393115	1183641	51
CP4,2-3	393115	1183641	52
CP4,3-4	393115	1183641	82
CP4,4-5	393115	1183641	71
CP4,5-6	393115	1183641	62
CP4,6-7	393115	1183641	52
CP4,7-8	393115	1183641	51
CP5,0-1	393203	1183642	36
CP5,1-2	393203	1183642	46
CP5,2-3	393203	1183642	38
CP5,3-4	393203	1183642	40
CP5,4-5	393203	1183642	57
CP5,5-6	393203	1183642	94
CP5,6-7	393203	1183642	106
CP5,7-8	393203	1183642	106
CP5,8-9	393203	1183642	105
CP5,9-10	393203	1183642	93

Appendix D cont.

Field ID	Latitude	Longitude	Zn ppm
CP6,0-1	393107	1183860	64
CP6,1-2	393107	1183860	65
CP6,2-3	393107	1183860	52
CP6,3-4	393107	1183860	32
CP6,4-5	393107	1183860	32
CP6,5-6	393107	1183860	26
CP6,6-7	393107	1183860	20
CP6,7-8	393107	1183860	20
CP6,8-9	393107	1183860	21
CP6,9-10	393107	1183860	30
CP6,10-11	393107	1183860	39

Appendix E Water extractable As and Se concentrations in TJ-Drain study area soils using a water saturation paste procedure

[Field ID, (ex. B3-2-3) First character identifies grid row, second character identifies grid column, ##-##, identifies sample collection depth; % Sat., Percent saturation; ppb, parts per billion]

Field ID	Latitude	Longitude	As ppb	Se ppb	% Sat.
A1-0-1	393548	1183341	110	29	44.0
A1-2-3	393548	1183341	170	19	53.4
A1-4-5	393548	1183341	73	16	66.1
A2-0-1	393549	1183309	27	2.7	40.7
A2-2-3	393549	1183309	24	1.7	56.6
A2-3-4	393549	1183309	29	<1	66.7
B1-0-1	393459	1183444	7.3	<1	36.4
B1-2-3	393459	1183444	430	7.7	55.0
B1-8-9	393459	1183444	320	2.4	79.8
B2-0-1	393517	1183402	580	2.5	36.1
B2-2-3	393517	1183402	370	2.5	55.7
B2-5-6	393517	1183402	460	<1	69.1
B3-0-1	393505	1183310	93	470	46.6
B3-2-3	393505	1183310	380	34	59.0
B3-4-5	393505	1183310	750	6.4	78.4
C1-0-1	393412	1183437	310	49	49.3
C1-2-3	393412	1183437	1800	9.5	68.0
C1-6-8	393412	1183437	1400	5.2	78.3
C2-0-1	393435	1183425	320	25	32.4
C2-2-3	393435	1183425	88	20	38.4
C2-7-8	393435	1183425	820	9.7	74.4
C3-0-1	393425	1183309	360	44	40.5
C3-2-3	393425	1183309	97	120	64.8
C3-7-8	393425	1183309	130	5	82.7
D1-0-1	393321	1183607	13	1.2	32.1
D1-2-3	393321	1183607	190	1.8	51.6
D1-7-8	393321	1183607	110	4.2	73.0
D2-0-1	393323	1183501	18	<1	28.2
D2-2-3	393323	1183501	7.8	9.9	31.0
D2-7-8	393323	1183501	28	7.1	39.5
D3-0-1	393323	1183357	14	17	41.1
D3-2-3	393323	1183357	47	2.8	47.3
D3-5-6	393323	1183357	84	1.3	60.3
E1-0-1	392330	1183857	210	2.2	27.1
E1-2-3	392330	1183857	88	2.1	34.0
E1-10-11	392330	1183857	130	1.4	50.3

Appendix E continued

Field ID	Latitude	Longitude	As ppb	Se ppb	% Sat.
E2-0-1	393234	1183716	100	39	32.7
E2-2-3	393234	1183716	45	22	45.1
E2-8-9	393234	1183716	78	7.8	78.2
E3-0-1	393228	1183603	1.4	<1	32.0
E3-2-3	393228	1183603	31	7.2	39.9
E3-8-9	393228	1183603	1100	12	81.8
E4-0-1	393229	1183531	12	1.9	35.2
E4-2-3	393229	1183531	8.8	25	48.7
E4-10-11	393229	1183531	9.3	11	77.4
E5-0-1	393241	1183352	16	<1	45.2
E5-2-3	393241	1183352	19	1.6	58.6
E5-3-4	393241	1183352	22	<1	64.0
E6-0-1	393241	1183216	32	1	46.7
E6-2-3	393241	1183216	25	2	59.2
E6-4-5	393241	1183216	72	2.3	74.3
F1-0-1	393138	1183953	280	2.3	45.5
F1-2-3	393138	1183953	46	3.2	32.8
F1-9-10	393138	1183953	9.2	7.2	32.9
F2-0-1	393135	1183832	25	<1	38.6
F2-2-3	393135	1183832	27	1.6	45.9
F2-9-10	393135	1183832	320	<1	71.3
F3-0-1	393136	1183719	190	6.7	55.6
F3-2-3	393136	1183719	36	23	40.6
F3-7-8	393136	1183719	60	3.4	76.6
F4-0-1	393135	1183606	27	1.1	38.9
F4-2-3	393135	1183606	1000	2.1	55.0
F4-4-5	393135	1183606	620	5.6	74.3
F5-0-1	393136	1183503	100	150	45.4
F5-2-3	393136	1183503	81	470	67.6
F5-16-17	393136	1183503	100	100	80.4
F7-0-1	393139	1183245	13	<1	39.2
F7-2-3	393139	1183245	47	1.7	69.7
F7-6-7	393139	1183245	72	9.9	76.1
G1-0-1	393100	1183932	210	220	47.2
G1-2-3	393100	1183932	35	28	48.6
G1-10-11	393100	1183932	64	4.4	83.8
G2-0-1	393043	1183823	720	20	38.1
G2-2-3	393043	1183823	600	260	49.6
G2-7-8	393043	1183823	980	5.2	75.6
G3-0-1	393055	1183717	11	<1	29.5
G3-2-3	393055	1183717	140	1.9	42.3
G3-7-8	393055	1183717	140	<1	62.2
G4-0-1	393056	1183608	19	1	47.3
G4-2-3	393056	1183608	52	<1	67.2
G4-10-11	393056	1183608	310	16	78.4

Appendix E continued

Field ID	Latitude	Longitude	As ppb	Se ppb	% Sat.
G5-0-1	393054	1183502	34	45	51.1
G5-2-3	393054	1183502	730	9.2	66.1
G5-7-8	393054	1183502	280	37	74.6
G6-0-1	393051	1183336	14	<1	39.4
G6-2-3	393051	1183336	25	<1	50.9
G6-3-4	393051	1183336	20	1.1	52.3
G7-0-1	393043	1183248	120	2.2	55.2
G7-2-3	393043	1183248	140	79	65.8
G7-6-7	393043	1183248	310	60	74.7

Appendix F Analytical results for water extractable element concentrations in TJ-Drain soils using constant ratio (1:5) extraction procedure

[Sample ID, first character identifes grid row, second character character identifies grid column, ##-## identifies collection depth CP=center point sites; ppm, parts per million; ppb, parts per billion]

Field No	Latitude	Longitude	Al ppm	Ca ppm	Cl ppm	Fe ppm	K ppm	Mg ppm	Na ppm	SO4 ppm
A1,0-1	393548	1183341	<10	1890	5700	<5	290	492	6760	15000
A1,2-3	393548	1183341	<10	475	4300	<5	130	280	5190	8600
A1,4-5	393548	1183341	<10	468	2880	<5	170	136	4360	6800
A2,0-1	393549	1183309	<10	3170	8500	<5	380	781	4120	11000
A2,2-3	393549	1183309	<10	1650	1800	<5	250	371	1760	6800
A2,3-4	393549	1183309	<10	333	1580	<5	100	104	1190	1300
B1,0-1	393459	1183444	<10	45	2400	<5	90	6	1840	750
B1,2-3	393459	1183444	<10	225	7400	<5	190	87	5060	3600
B1,8-9	393459	1183444	<10	170	9000	<5	220	118	6920	4600
B2,0-1	393517	1183402	50	33	450	59	90	41	940	450
B2,2-3	393517	1183402	140	26	400	199	50	48	670	380
B2,5-6	393517	1183402	30	24	110	55	40	20	630	240
B3,0-1	393505	1183310	<10	2030	9800	<5	560	1060	7050	12500
B3,2-3	393505	1183310	<10	831	2000	<5	230	339	2680	6800
B3,4-5	393505	1183310	40	24	420	42	80	22	520	440
C1,0-1	393412	1183455	<10	427	3400	<5	110	69	3570	4800
C1,2-3	393412	1183437	150	21	1100	170	50	44	1360	500
C1,6-8	393412	1183437	120	21	300	146	50	50	760	250
C2,0-1	393435	1183425	<10	308	3000	<5	170	35	2700	2900
C2,2-3	393435	1183425	<10	38	3800	<5	80	19	2660	950
C2,7-8	393435	1183425	120	27	490	140	60	44	1110	250
C3,0-1	393425	1183309	<10	2260	5400	<5	550	51	14400	14000
C3,2-3	393425	1183309	<10	2660	19500	<5	610	216	16700	24000
C3,7-8	393425	1183309	<10	1410	4620	7	340	240	6180	12800
D1,0-1	393321	1183607	<10	39	90	12	90	8	240	150
D1,2-3	393321	1183607	<10	2690	150	<5	150	277	780	9200
D1,7-8	393321	1183607	<10	634	6000	<5	170	329	4720	5400
D2,0-1	393323	1183501	20	30	30	25	60	10	140	20
D2,2-3	393323	1183501	<10	203	1100	<5	60	60	400	70
D2,7-8	393323	1183501	<10	766	5500	<5	160	424	2170	1600
D3,0-1	393323	1183357	<10	2040	5800	<5	280	415	3590	7400
D3,2-3	393323	1183357	<10	33	50	7	<20	14	260	80
D3,5-6	393323	1183357	<10	50	120	<5	20	18	240	140
D4,0-1	393328	1183322	<10	135	60	<5	30	7	640	1400
D4,2-3	393328	1183322	<10	472	1600	<5	40	102	3460	7000
D4,12-13	393328	1183322	<10	2330	580	<5	240	386	3440	14500
E1,0-1	393230	1183857	60	34	120	72	80	38	550	160
E1,2-3	393230	1183857	40	19	260	45	30	25	840	410
E1,10-11	393230	1183857	60	25	90	96	30	31	470	120
E2,0-1	393234	1183716	<10	141	8100	<5	80	33	5350	1500
E2,2-3	393234	1183716	<10	39	1200	7	20	10	1850	2200
E2,8-9	393234	1183716	<10	85	1100	<5	70	26	3330	6100

Appendix F continued

Field No	Latitude	Longitude	Al ppm	Ca ppm	Cl ppm	Fe ppm	K ppm	Mg ppm	Na ppm	SO4 ppm
E3,0-1	393228	1183603	20	52	60	24	60	21	100	160
E3,2-4	393228	1183603	<10	72	40	11	40	16	90	80
E3,8-9	393228	1183603	740	62	66	695	80	165	840	260
E4,0-1	393229	1183531	<10	123	2600	<5	90	18	1660	270
E4,2-3	393229	1183531	<10	305	2700	<5	60	95	1160	200
E4,10-11	393229	1183531	<10	28	1940	<5	60	32	1530	760
E5,0-1	393241	1183352	<10	194	270	<5	130	50	220	100
E5,2-3	393241	1183352	<10	48	70	12	40	16	190	150
E5,3-4	393241	1183352	60	33	45	70	40	22	130	110
E6,0-1	393241	1183216	<10	154	60	<5	120	39	170	80
E6,2-3	393241	1183216	30	33	30	38	30	17	110	100
E6,4-5	393241	1183216	<10	82	48	<5	80	30	190	150
F1,0-1	393138	1183953	50	22	440	58	20	21	730	100
F1,2-3	393138	1183953	30	10	430	43	<20	11	470	240
F1,9-10	393138	1183953	<10	99	4120	<5	100	24	3610	3100
F2,0-1	393135	1183832	20	25	1000	27	30	11	800	120
F2,2-3	393135	1183832	<10	33	820	7	30	5	830	450
F2,9-10	393135	1183832	<10	45	6880	<5	90	25	5640	2900
F3,0-1	393136	1183719	<10	47	20	14	70	12	60	40
F3,2-3	393136	1183719	160	21	70	171	30	50	1000	1000
F3,7-8	393136	1183719	60	16	36	84	<20	23	320	90
F4,0-1	393135	1183606	<10	89	20	<5	30	19	110	50
F4,2-3	393135	1183606	150	24	30	182	40	44	460	80
F4,4-5	393135	1183606	750	72	36	848	70	187	670	220
F5,0-1	393136	1183503	<10	956	8500	<5	100	287	5180	6500
F5,2-3	393136	1183503	<10	82	2500	<5	50	10	2280	370
F5,16-17	393136	1183503	<10	1160	3150	<5	230	496	4310	9500
F7,0-1	393139	1183245	<10	195	100	7	170	50	160	140
F7,2-3	393139	1183245	<10	70	80	8	60	25	370	260
F7,6-7	393139	1183245	<10	57	100	<5	70	16	440	280
G1,0-1	393100	1183932	<10	115	7000	<5	70	12	4760	1400
G1,2-3	393100	1183932	10	15	3400	12	30	6	2270	350
G1,10-11	393100	1183932	<10	65	5880	<5	100	23	4800	3100
G2,0-1	393043	1183823	90	40	220	114	50	73	840	270
G2,2-3	393043	1183823	230	33	2000	260	50	87	830	160
G2,7-8	393043	1183823	50	11	1060	48	40	19	1480	4600
G3,0-1	393055	1183717	20	79	120	15	30	21	290	130
G3,2-3	393055	1183717	<10	153	2000	<5	30	28	1650	1100
G4,0-1	393056	1183608	<10	147	50	<5	50	29	190	80
G5,0-1	393054	1183502	<10	453	2400	<5	100	138	2080	3000
G4,2-3	393056	1183608	<10	54	40	9	30	20	250	110
G4,10-11	393056	1183608	40	16	140	48	30	15	720	600

Appendix F continued

Field No	Latitude	Longitude	Al ppm	Ca ppm	Cl ppm	Fe ppm	K ppm	Mg ppm	Na ppm	SO4 ppm
G5,2-3	393054	1183502	<10	41	1700	7	50	47	2380	2800
G5,7-8	393054	1183502	<10	38	110	7	50	24	420	420
G6,2-3	393051	1183336	50	25	60	57	<20	19	150	90
G6,3-4	393051	1183336	60	27	56	75	20	21	140	130
G7,0-1	393043	1183248	<10	75	950	7	60	13	970	550
G7,2-3	393043	1183248	<10	162	2100	<5	130	75	2990	2000
G7,6-7	393043	1183248	20	17	400	28	40	10	820	360
CP1,0-1	393350	1183310	<10	3090	76200	<5	480	1130	6370	1600
CP1,2-3	393350	1183310	<10	1930	25000	<5	420	1210	6000	87500
CP1,4-5	393350	1183310	<10	752	9000	<5	240	367	3790	49000
CP2,0-1	393301	1183429	<10	2070	8000	<5	300	604	3320	2800
CP2,2-3	393301	1183429	<10	428	1600	<5	70	134	990	1200
CP2,12-13	393301	1183429	<10	103	340	<5	150	46	550	1100
CP3,0-1	393127	1183301	<10	107	200	<5	60	26	690	820
CP3,2-3	393127	1183301	<10	1070	5400	<5	160	244	2080	33000
CP3,7-8	393127	1183301	<10	125	2600	<5	110	52	2000	950
CP4,0-1	393115	1183641	<10	2330	4200	<5	180	153	4470	11000
CP4,2-3	393115	1183641	<10	348	4000	<5	120	94	3720	6000
CP4,7-8	393115	1183641	<10	79	3500	<5	70	29	3060	2200
CP5,0-1	393203	1183642	100	23	40	130	60	50	590	130
CP5,2-3	393203	1183642	130	51	10	258	40	79	390	60
CP5,9-10	393203	1183642	100	27	800	94	40	31	1200	5500
CP6,0-1	393107	1183860	50	18	100	48	<20	19	450	180
CP6,2-3	393107	1183860	70	21	280	95	<20	30	460	100
CP6,10-11	393107	1183860	90	16	3400	94	50	46	820	1800

Appendix F continued

Field No	Latitude	Longitude	As ppb	B ppb	Ba ppb	Cd ppb	Co ppb	Cr ppb	Cu ppb	Hg ppb
A1,0-1	393548	1183341	650	44700	200	<50	<100	200	90	0.70
A1,2-3	393548	1183341	1100	35700	<200	<50	<100	200	<80	1.2
A1,4-5	393548	1183341	360	26000	<200	<50	<100	100	<80	0.70
A2,0-1	393549	1183309	260	24100	400	<50	<100	100	180	0.70
A2,2-3	393549	1183309	110	9800	200	<50	<100	100	<80	<0.70
A2,3-4	393549	1183309	230	7000	300	<50	<100	100	<80	<0.70
B1,0-1	393459	1183444	1400	23500	<200	<50	<100	100	170	<0.70
B1,2-3	393459	1183444	1600	48600	200	<50	<100	100	<80	1.2
B1,8-9	393459	1183444	1500	58100	300	<50	<100	100	<80	<0.70
B2,0-1	393517	1183402	1100	32000	400	<50	<100	200	180	1.5
B2,2-3	393517	1183402	3600	11200	600	<50	<100	200	250	1.7
B2,5-6	393517	1183402	2200	5000	400	<50	<100	100	80	0.70
B3,0-1	393505	1183310	500	21900	300	<50	<100	200	310	1.1
B3,2-3	393505	1183310	850	12800	<200	<50	<100	100	<80	0.65
B3,4-5	393505	1183310	2800	5300	200	<50	<100	200	80	0.70
C1,0-1	393412	1183455	2800	33600	<200	<50	<100	100	170	0.70
C1,2-3	393412	1183437	6500	15800	400	<50	<100	200	240	1.5
C1,6-8	393412	1183437	3800	10800	500	<50	<100	200	330	2.1
C2,0-1	393435	1183425	2300	30100	<200	<50	<100	100	170	0.70
C2,2-3	393435	1183425	950	20300	<200	<50	<100	<100	<80	0.70
C2,7-8	393435	1183425	3300	18900	700	<50	<100	200	540	2.2
C3,0-1	393425	1183309	2000	75600	<200	<50	<100	200	90	0.70
C3,2-3	393425	1183309	360	81700	<200	<50	<100	200	90	0.70
C3,7-8	393425	1183309	420	32600	<200	<50	<100	100	<80	0.70
D1,0-1	393321	1183607	160	3000	<200	<50	<100	100	<80	0.70
D1,2-3	393321	1183607	320	6700	<200	<50	<100	200	<80	0.70
D1,7-8	393321	1183607	550	25400	<200	<50	<100	100	<80	<0.70
D2,0-1	393323	1183501	110	1200	<200	<50	<100	100	<80	1.1
D2,2-3	393323	1183501	130	2700	700	<50	<100	<100	<80	<0.7
D2,7-8	393323	1183501	120	8100	700	<50	<100	<100	<80	0.80
D3,0-1	393323	1183357	60	24100	200	<50	<100	200	170	0.70
D3,2-3	393323	1183357	750	3600	<200	<50	<100	100	<80	<0.7
D3,5-6	393323	1183357	1200	2100	<200	<50	<100	100	<80	0.70
D4,0-1	393328	1183322	850	3300	<200	<50	<100	100	<80	0.70
D4,2-3	393328	1183322	160	30400	<200	<50	<100	100	<80	0.65
D4,12-13	393328	1183322	140	17500	<200	<50	<100	100	<80	<0.70
E1,0-1	393230	1183857	400	5100	600	<50	<100	100	170	1.1
E1,2-3	393230	1183857	300	5200	400	<50	<100	200	80	0.85
E1,10-11	393230	1183857	750	3100	500	<50	<100	100	220	1.75
E2,0-1	393234	1183716	1200	34000	300	<50	<100	100	170	0.70
E2,2-3	393234	1183716	550	12600	<200	<50	<100	100	<80	1.4
E2,8-9	393234	1183716	440	30500	<200	<50	<100	100	<80	0.70

Appendix F continued

Field No	Latitude	Longitude	As ppb	B ppb	Ba ppb	Cd ppb	Co ppb	Cr ppb	Cu ppb	Hg ppb
E3,0-1	393228	1183603	20	1300	500	<50	<100	100	<80	0.90
E3,2-4	393228	1183603	360	1600	<200	<50	<100	<100	<80	0.65
E3,8-9	393228	1183603	4400	11400	2000	80	200	500	590	4.9
E4,0-1	393229	1183531	600	6700	300	<50	<100	100	<80	0.70
E4,2-3	393229	1183531	55	2700	500	<50	<100	<100	<80	0.80
E4,10-11	393229	1183531	120	6700	<200	<50	<100	100	<80	1.05
E5,0-1	393241	1183352	280	3000	300	<50	<100	100	170	1.8
E5,2-3	393241	1183352	260	2900	<200	<50	<100	100	<80	1.2
E5,3-4	393241	1183352	260	1600	400	<50	<100	100	<80	1.05
E6,0-1	393241	1183216	210	3500	300	<50	<100	100	170	3.3
E6,2-3	393241	1183216	410	3800	200	<50	<100	100	160	10.3
E6,4-5	393241	1183216	380	2100	200	<50	<100	100	<80	0.70
F1,0-1	393138	1183953	800	4800	400	<50	<100	100	260	1.1
F1,2-3	393138	1183953	600	3900	500	<50	<100	200	<80	<0.7
F1,9-10	393138	1183953	85	14200	<200	<50	<100	100	<80	<0.70
F2,0-1	393135	1183832	500	3100	<200	<50	<100	100	80	0.70
F2,2-3	393135	1183832	180	2800	<200	<50	<100	100	<80	<0.7
F2,9-10	393135	1183832	3000	42200	<200	<50	<100	100	<80	1.4
F3,0-1	393136	1183719	85	< 1000	<200	<50	<100	100	<80	0.80
F3,2-3	393136	1183719	800	16800	800	<50	<100	200	320	0.85
F3,7-8	393136	1183719	180	2000	600	<50	<100	100	170	1.4
F4,0-1	393135	1183606	200	2100	<200	<50	<100	100	<80	1.3
F4,2-3	393135	1183606	3800	4200	500	<50	<100	200	360	2.1
F4,4-5	393135	1183606	3200	9400	1100	80	200	600	470	2.9
F5,0-1	393136	1183503	380	14400	<200	<50	<100	100	<80	0.70
F5,2-3	393136	1183503	900	15900	<200	<50	<100	100	340	0.70
F5,16-17	393136	1183503	400	17500	<200	<50	<100	100	<80	0.80
F7,0-1	393139	1183245	320	2900	600	<50	<100	100	330	32
F7,2-3	393139	1183245	600	4800	<200	<50	<100	100	90	0.70
F7,6-7	393139	1183245	650	4000	<200	<50	<100	100	<80	<0.70
G1,0-1	393100	1183932	2100	12500	<200	<50	<100	100	170	0.70
G1,2-3	393100	1183932	500	3300	<200	<50	<100	100	170	0.65
G1,10-11	393100	1183932	480	21800	<200	<50	<100	100	<80	1.05
G2,0-1	393043	1183823	1900	20300	900	<50	<100	100	350	2.2
G2,2-3	393043	1183823	1000	8800	1200	<50	<100	200	420	2.1
G2,7-8	393043	1183823	3000	30300	200	<50	<100	100	200	0.70
G3,0-1	393055	1183717	480	3200	300	<50	<100	100	<80	1.1
G3,2-3	393055	1183717	300	9400	<200	<50	<100	100	<80	<0.7
G4,0-1	393056	1183608	140	1800	200	<50	<100	200	<80	1.1
G5,0-1	393054	1183502	300	10300	200	<50	<100	100	90	0.70
G4,2-3	393056	1183608	500	2700	<200	<50	<100	100	80	<0.7
G4,10-11	393056	1183608	2200	9300	<200	<50	<100	100	80	0.70

Appendix F continued

Field No	Latitude	Longitude	As ppb	B ppb	Ba ppb	Cd ppb	Co ppb	Cr ppb	Cu ppb	Hg ppb
G5,2-3	393054	1183502	4600	15300	<200	<50	<100	100	<80	<0.7
G5,7-8	393054	1183502	1600	3500	<200	<50	<100	100	<80	<0.70
G6,2-3	393051	1183336	600	2600	200	<50	<100	200	250	1.4
G6,3-4	393051	1183336	450	1900	300	<50	<100	100	80	0.70
G7,0-1	393043	1183248	1800	9100	200	<50	<100	100	170	1.3
G7,2-3	393043	1183248	950	14600	<200	<50	<100	100	<80	0.65
G7,6-7	393043	1183248	2300	8200	<200	<50	<100	100	<80	1.05
CP1,0-1	393350	1183310	650	22900	300	<50	<100	<100	170	0.30
CP1,2-3	393350	1183310	240	35800	150	<50	<100	<100	160	0.55
CP1,4-5	393350	1183310	370	22300	150	<50	<100	<100	<80	0.55
CP2,0-1	393301	1183429	130	8600	700	<50	<100	<100	<80	0.75
CP2,2-3	393301	1183429	140	4600	300	<50	<100	<100	<80	0.80
CP2,12-13	393301	1183429	260	5500	200	<50	<100	<100	<80	0.80
CP3,0-1	393127	1183301	550	6700	200	<50	<100	<100	200	1.35
CP3,2-3	393127	1183301	200	11900	150	<50	<100	<100	<80	0.30
CP3,7-8	393127	1183301	2900	14600	200	<50	<100	<100	110	0.75
CP4,0-1	393115	1183641	370	27200	150	<50	<100	<100	160	0.86
CP4,2-3	393115	1183641	300	24500	150	<50	<100	<100	<80	0.70
CP4,7-8	393115	1183641	700	17500	150	<50	<100	<100	<80	0.60
CP5,0-1	393203	1183642	1500	10200	700	<50	<100	<100	150	1.3
CP5,2-3	393203	1183642	1100	4600	1500	<50	<100	100	110	1.3
CP5,9-10	393203	1183642	5500	30400	300	<50	<100	<100	150	1.4
CP6,0-1	393107	1183860	210	2600	150	<50	<100	<100	160	0.85
CP6,2-3	393107	1183860	650	4500	400	<50	<100	<100	<80	0.80
CP6,10-11	393107	1183860	350	7200	400	<50	<100	<100	110	0.55

Appendix F continued

Field No	Latitude	Longitude	Li ppb	Mn ppb	Mo ppb	Ni ppb	Se ppb	Sr ppb	Ti ppb	V ppb
A1,0-1	393548	1183341	1000	100	1400	<100	70	23500	<100	400
A1,2-3	393548	1183341	1100	<100	1700	100	28	7860	<100	500
A1,4-5	393548	1183341	800	<100	1800	<100	28	10500	200	300
A2,0-1	393549	1183309	1200	600	500	100	9.0	32600	<100	<300
A2,2-3	393549	1183309	800	200	400	100	<5.0	14700	<100	<300
A2,3-4	393549	1183309	300	200	200	<100	<5.0	3820	<100	<300
B1,0-1	393459	1183444	200	<100	<100	100	6.0	830	300	2400
B1,2-3	393459	1183444	800	<100	300	<100	6.0	6670	<100	1000
B1,8-9	393459	1183444	1000	<100	700	<100	<5.0	4670	200	600
B2,0-1	393517	1183402	300	1200	<100	300	6.0	500	600	1800
B2,2-3	393517	1183402	300	900	300	200	6.0	480	4900	3000
B2,5-6	393517	1183402	300	300	100	<100	<5.0	360	1500	2200
B3,0-1	393505	1183310	1600	500	7200	<100	1000	30300	<100	<300
B3,2-3	393505	1183310	1600	<100	1200	100	38	15500	200	<300
B3,4-5	393505	1183310	500	200	200	100	10	490	1900	1000
C1,0-1	393412	1183455	500	<100	900	100	75	5460	<100	1300
C1,2-3	393412	1183437	300	600	200	100	7.5	491	6200	4800
C1,6-8	393412	1183437	400	700	<100	300	9.0	550	4300	4600
C2,0-1	393435	1183425	500	<100	<100	300	40	6660	<100	10000
C2,2-3	393435	1183425	400	<100	100	100	26	1180	<100	2400
C2,7-8	393435	1183425	400	600	<100	200	36	790	5200	3000
C3,0-1	393425	1183309	1000	<100	1600	<100	100	20700	<100	1200
C3,2-3	393425	1183309	1700	<100	3700	<100	220	40200	200	400
C3,7-8	393425	1183309	1700	<100	1900	200	10	22100	600	300
D1,0-1	393321	1183607	200	100	<100	100	<5.0	430	200	600
D1,2-3	393321	1183607	900	<100	200	100	<5.0	19900	200	500
D1,7-8	393321	1183607	1000	200	1700	100	11	9760	300	300
D2,0-1	393323	1183501	200	300	<100	100	<5.0	360	400	700
D2,2-3	393323	1183501	200	<100	<100	<100	12	2730	200	<300
D2,7-8	393323	1183501	800	200	200	<100	6.0	11700	200	<300
D3,0-1	393323	1183357	700	300	200	<100	210	21500	200	<300
D3,2-3	393323	1183357	200	<100	<100	<100	<5.0	518	200	800
D3,5-6	393323	1183357	200	<100	200	<100	5.0	650	300	400
D4,0-1	393328	1183322	200	<100	<100	100	6.0	1340	400	1800
D4,2-3	393328	1183322	400	<100	900	<100	20	6250	200	<300
D4,12-13	393328	1183322	800	200	400	<100	6.0	10700	200	<300
E1,0-1	393230	1183857	200	1700	<100	100	<5.0	400	800	600
E1,2-3	393230	1183857	200	800	<100	100	<5.0	242	700	700
E1,10-11	393230	1183857	200	900	<100	100	<5.0	340	1900	1900
E2,0-1	393234	1183716	200	<100	200	200	65	3150	<100	3000
E2,2-3	393234	1183716	100	<100	400	<100	22	633	300	900
E2,8-9	393234	1183716	300	<100	1000	<100	17	1010	300	300

Appendix F continued

Field No	Latitude	Longitude	Li ppb	Mn ppb	Mo ppb	Ni ppb	Se ppb	Sr ppb	Ti ppb	V ppb
E3,0-1	393228	1183603	300	200	<100	<100	<5.0	600	600	<300
E3,2-4	393228	1183603	200	<100	<100	<100	8.0	616	200	500
E3,8-9	393228	1183603	700	3400	200	300	42	1110	17700	7000
E4,0-1	393229	1183531	200	<100	<100	<100	13	1580	<100	1500
E4,2-3	393229	1183531	300	200	<100	<100	18	3330	<100	<300
E4,10-11	393229	1183531	400	200	700	<100	34	820	200	<300
E5,0-1	393241	1183352	300	100	100	200	9.0	2210	300	400
E5,2-3	393241	1183352	300	<100	300	100	6.0	571	300	300
E5,3-4	393241	1183352	200	400	200	<100	<5.0	410	2900	600
E6,0-1	393241	1183216	400	200	100	<100	8.0	1600	300	400
E6,2-3	393241	1183216	200	300	300	<100	9.5	388	1000	600
E6,4-5	393241	1183216	400	<100	500	<100	6.0	1000	300	400
F1,0-1	393138	1183953	100	600	<100	100	<5.0	300	700	10000
F1,2-3	393138	1183953	100	300	<100	200	<5.0	199	900	900
F1,9-10	393138	1183953	200	<100	200	100	8.5	1590	300	<300
F2,0-1	393135	1183832	200	200	<100	<100	<5.0	290	700	2800
F2,2-3	393135	1183832	100	<100	<100	100	<5.0	349	300	1200
F2,9-10	393135	1183832	300	<100	1500	200	<5.0	1070	300	1200
F3,0-1	393136	1183719	100	200	<100	200	<5.0	530	200	<300
F3,2-3	393136	1183719	300	1000	300	200	6.5	490	5900	4000
F3,7-8	393136	1183719	100	700	<100	100	<5.0	260	2700	500
F4,0-1	393135	1183606	100	<100	<100	200	5.0	970	400	400
F4,2-3	393135	1183606	300	1000	700	<100	7.0	483	4200	3900
F4,4-5	393135	1183606	700	3300	1600	500	20	1340	19400	4100
F5,0-1	393136	1183503	500	<100	1100	200	400	9810	200	<300
F5,2-3	393136	1183503	200	<100	200	200	110	990	300	3300
F5,16-17	393136	1183503	1100	200	2200	200	200	14300	200	<300
F7,0-1	393139	1183245	300	2400	200	200	130	2180	1300	400
F7,2-3	393139	1183245	600	<100	200	100	7.5	911	200	1000
F7,6-7	393139	1183245	500	<100	1000	100	8.5	670	400	800
G1,0-1	393100	1183932	200	<100	200	<100	210	1600	<100	6500
G1,2-3	393100	1183932	100	200	<100	100	24	240	400	1300
G1,10-11	393100	1183932	200	<100	800	100	5.0	1340	200	700
G2,0-1	393043	1183823	300	2300	200	400	24	650	1300	3600
G2,2-3	393043	1183823	400	1400	<100	300	200	550	5700	8000
G2,7-8	393043	1183823	200	400	600	100	11	230	1600	5500
G3,0-1	393055	1183717	200	200	<100	200	<5.0	840	1300	600
G3,2-3	393055	1183717	300	<100	400	<100	<5.0	1550	<100	400
G4,0-1	393056	1183608	200	100	100	200	5.0	1460	200	<300
G5,0-1	393054	1183502	300	100	400	<100	80	5360	<100	<300
G4,2-3	393056	1183608	300	<100	200	100	5.0	636	800	600
G4,10-11	393056	1183608	200	200	1100	100	26	210	1500	1700

Appendix F continued

Field No	Latitude	Longitude	Li ppb	Mn ppb	Mo ppb	Ni ppb	Se ppb	Sr ppb	Ti ppb	V ppb
G5,2-3	393054	1183502	400	<100	500	<100	14	1240	200	1600
G5,7-8	393054	1183502	300	<100	200	<100	65	620	500	1900
G6,2-3	393051	1183336	200	400	<100	100	5.0	315	1400	900
G6,3-4	393051	1183336	200	500	<100	200	<5.0	330	3000	800
G7,0-1	393043	1183248	400	<100	400	200	19	1010	400	1900
G7,2-3	393043	1183248	2000	<100	500	<100	120	2960	<100	500
G7,6-7	393043	1183248	400	200	700	200	80	270	1000	2600
CP1,0-1	393350	1183310	1400	400	700	<100	800	41500	<100	300
CP1,2-3	393350	1183310	3400	1000	3900	<100	110	29800	<100	<300
CP1,4-5	393350	1183310	1900	<100	2100	<100	27	12400	<100	<300
CP2,0-1	393301	1183429	1000	1300	300	<100	19	22100	<100	<300
CP2,2-3	393301	1183429	300	100	100	<100	<5	5340	<100	<300
CP2,12-13	393301	1183429	600	900	200	<100	55	1280	300	500
CP3,0-1	393127	1183301	400	<100	500	<100	130	1090	300	600
CP3,2-3	393127	1183301	900	200	500	<100	230	8900	<100	<300
CP3,7-8	393127	1183301	1000	<100	700	<100	43	2200	800	500
CP4,0-1	393115	1183641	400	<100	800	<100	65	13700	<100	400
CP4,2-3	393115	1183641	300	<100	500	<100	33	4020	<100	300
CP4,7-8	393115	1183641	200	<100	500	<100	8.0	1380	<100	1100
CP5,0-1	393203	1183642	300	1100	<100	200	60	330	3100	9900
CP5,2-3	393203	1183642	400	2000	<100	200	31	820	4700	2500
CP5,9-10	393203	1183642	300	500	700	100	55	480	1200	5000
CP6,0-1	393107	1183860	75	400	<100	<100	<5	210	1300	1400
CP6,2-3	393107	1183860	100	800	<100	<100	<5	240	1800	1800
CP6,10-11	393107	1183860	200	1400	200	200	5.5	300	1200	900

Appendix F continued

Field No	Latitude	Longitude	Zn ppb	Zr ppb	pH	Conduct.
A1,0-1	393548	1183341	<100	<100	7.90	11500
A1,2-3	393548	1183341	<100	<100	7.90	7000
A1,4-5	393548	1183341	<100	<100	8.12	6000
A2,0-1	393549	1183309	<100	<100	8.40	10500
A2,2-3	393549	1183309	<100	<100	8.00	5000
A2,3-4	393549	1183309	<100	<100	7.99	2050
B1,0-1	393459	1183444	<100	<100	8.10	2200
B1,2-3	393459	1183444	<100	<100	8.20	6500
B1,8-9	393459	1183444	<100	<100	8.35	8000
B2,0-1	393517	1183402	200	<100	8.00	1000
B2,2-3	393517	1183402	300	300	8.20	800
B2,5-6	393517	1183402	<100	<100	8.56	600
B3,0-1	393505	1183310	100	<100	7.90	13500
B3,2-3	393505	1183310	<100	<100	8.00	5000
B3,4-5	393505	1183310	<100	100	8.10	650
C1,0-1	393412	1183455	500	<100	8.10	5000
C1,2-3	393412	1183437	300	300	8.80	1600
C1,6-8	393412	1183437	300	200	8.52	680
C2,0-1	393435	1183425	<100	<100	8.00	380
C2,2-3	393435	1183425	<100	<100	8.00	3300
C2,7-8	393435	1183425	300	300	8.83	1100
C3,0-1	393425	1183309	<100	<100	8.20	17000
C3,2-3	393425	1183309	<100	<100	7.80	26000
C3,7-8	393425	1183309	<100	<100	7.89	9500
D1,0-1	393321	1183607	<100	<100	8.20	420
D1,2-3	393321	1183607	<100	<100	7.60	5000
D1,7-8	393321	1183607	<100	<100	8.08	6000
D2,0-1	393323	1183501	<100	<100	8.00	250
D2,2-3	393323	1183501	<100	<100	7.80	950
D2,7-8	393323	1183501	<100	<100	7.80	4250
D3,0-1	393323	1183357	300	<100	7.60	8000
D3,2-3	393323	1183357	<100	<100	7.90	500
D3,5-6	393323	1183357	<100	<100	8.06	320
D4,0-1	393328	1183322	<100	<100	7.90	950
D4,2-3	393328	1183322	<100	<100	7.60	5000
D4,12-13	393328	1183322	<100	<100	8.09	7000
E1,0-1	393230	1183857	300	<100	8.30	650
E1,2-3	393230	1183857	<100	<100	8.80	900
E1,10-11	393230	1183857	300	<100	8.48	400
E2,0-1	393234	1183716	<100	<100	8.10	6500
E2,2-3	393234	1183716	<100	<100	7.90	2200
E2,8-9	393234	1183716	<100	<100	7.86	4000

Appendix F continued

Field No	Latitude	Longitude	Zn ppb	Zr ppb	pH	Conduct.
E3,0-1	393228	1183603	<100	<100	7.00	310
E3,2-4	393228	1183603	<100	<100	8.10	300
E3,8-9	393228	1183603	1300	1200	8.69	600
E4,0-1	393229	1183531	<100	<100	7.80	2200
E4,2-3	393229	1183531	<100	<100	7.30	2000
E4,10-11	393229	1183531	<100	<100	7.25	1950
E5,0-1	393241	1183352	<100	<100	7.90	600
E5,2-3	393241	1183352	<100	<100	8.20	360
E5,3-4	393241	1183352	100	100	7.35	190
E6,0-1	393241	1183216	<100	<100	8.40	490
E6,2-3	393241	1183216	<100	<100	7.50	240
E6,4-5	393241	1183216	<100	<100	8.40	320
F1,0-1	393138	1183953	100	<100	8.40	750
F1,2-3	393138	1183953	<100	<100	7.70	600
F1,9-10	393138	1183953	<100	<100	8.10	4000
F2,0-1	393135	1183832	<100	<100	8.30	1000
F2,2-3	393135	1183832	<100	<100	8.90	1000
F2,9-10	393135	1183832	<100	<100	8.52	5500
F3,0-1	393136	1183719	100	<100	8.10	220
F3,2-3	393136	1183719	300	300	8.60	1100
F3,7-8	393136	1183719	100	100	8.43	300
F4,0-1	393135	1183606	<100	<100	8.20	320
F4,2-3	393135	1183606	300	300	8.40	500
F4,4-5	393135	1183606	1400	1300	8.58	370
F5,0-1	393136	1183503	<100	<100	8.10	8000
F5,2-3	393136	1183503	<100	<100	8.40	2800
F5,16-17	393136	1183503	<100	<100	7.89	7000
F7,0-1	393139	1183245	<100	<100	8.40	600
F7,2-3	393139	1183245	<100	<100	8.20	500
F7,6-7	393139	1183245	<100	<100	8.40	480
G1,0-1	393100	1183932	<100	<100	8.00	6000
G1,2-3	393100	1183932	<100	<100	8.10	2600
G1,10-11	393100	1183932	<100	<100	8.34	5500
G2,0-1	393043	1183823	400	<100	8.60	900
G2,2-3	393043	1183823	500	400	9.40	800
G2,7-8	393043	1183823	100	<100	8.86	1500
G3,0-1	393055	1183717	<100	<100	8.20	450
G3,2-3	393055	1183717	<100	<100	8.30	2100
G4,0-1	393056	1183608	200	<100	8.10	380
G5,0-1	393054	1183502	<100	<100	8.00	3600
G4,2-3	393056	1183608	<100	<100	8.30	370
G4,10-11	393056	1183608	<100	<100	8.71	750

Appendix F continued

Field No	Latitude	Longitude	Zn ppb	Zr ppb	pH	Conduct.
G5,2-3	393054	1183502	<100	<100	8.40	3000
G5,7-8	393054	1183502	<100	<100	8.47	500
G6,2-3	393051	1183336	200	<100	7.80	280
G6,3-4	393051	1183336	200	100	7.05	200
G7,0-1	393043	1183248	<100	<100	8.60	1200
G7,2-3	393043	1183248	<100	<100	8.40	3900
G7,6-7	393043	1183248	<100	<100	8.54	800
CP1,0-1	393350	1183310	<100	<100	7.50	14000
CP1,2-3	393350	1183310	<100	<100	7.90	13000
CP1,4-5	393350	1183310	<100	<100	8.10	6000
CP2,0-1	393301	1183429	<100	<100	8.10	8000
CP2,2-3	393301	1183429	<100	<100	7.80	2000
CP2,12-13	393301	1183429	<100	<100	7.80	900
CP3,0-1	393127	1183301	<100	<100	8.60	900
CP3,2-3	393127	1183301	<100	<100	7.80	4400
CP3,7-8	393127	1183301	<100	<100	8.50	2700
CP4,0-1	393115	1183641	<100	<100	7.90	8500
CP4,2-3	393115	1183641	<100	<100	7.80	5000
CP4,7-8	393115	1183641	<100	<100	7.90	3900
CP5,0-1	393203	1183642	200	200	8.60	600
CP5,2-3	393203	1183642	300	100	8.60	480
CP5,9-10	393203	1183642	<100	100	8.90	1200
CP6,0-1	393107	1183860	<100	<100	8.70	450
CP6,2-3	393107	1183860	<100	<100	8.30	500
CP6,10-11	393107	1183860	100	100	8.60	900

Appendix G Analytical results for dissolved element concentrations in groundwater from the TJ-Drain study area, Nevada

[ppm, part per million; ppb part per billion; <, less than; >, greater than]

Field ID	Latitude	Longitude	Al ppm	Ca ppm	Fe ppm	K ppm	Mg ppm	Na ppm	Si ppm
A1	393548	1183341	<2	666	<1	30	1310	8970	38.8
A2	393549	1183309	<2	1230	<1	50	474	2320	33.9
B1	393459	1183444	4	706	<1	470	1500	9620	22.4
B2	393517	1183402	<2	18.1	<1	<20	10.4	526	31.3
B3	393505	1183310	<2	73.6	<1	<20	27.2	647	48.1
C1	393412	1183437	<2	15.4	<1	<20	21.5	1160	30.1
C2	393435	1183425	<2	14.4	<1	30	15.6	1190	27.4
C3	393425	1183309	<2	522	<1	300	739	6880	24.7
D1	393321	1183607	7	2190	<1	90	2140	>10000	21.8
D2	393323	1183501	7	2240	<1	240	2100	7500	28.9
D3	393323	1183357	<2	53.8	<1	<20	26.3	231	35.9
D4	393328	1183322	<2	99.4	<1	<20	37.5	1070	34.6
E1	393230	1183857	<2	43.2	<1	<20	19	593	27.7
E2	393234	1183716	3	796	<1	330	1240	>10000	22.1
E3	393228	1183603	<2	69.4	<1	<20	38.1	1680	32.6
E4	393229	1183531	<2	905	<1	150	936	6120	23.7
E5	393241	1183352	<2	88.4	<1	260	23.2	127	28.1
E6	393241	1183216	<2	124	<1	<20	53.4	241	41.8
F1	393138	1183953	<2	509	<1	30	696	9670	22.3
F2	393140	1183832	<2	355	<1	230	684	9700	19.1
F3	393136	1183719	<2	26.7	<1	40	20.8	282	44
F4	393135	1183606	<2	15.7	<1	<20	6.8	339	40.5
F5	393136	1183503	8	2470	<1	170	2250	9270	20.9
F7	393139	1183245	<2	161	<1	<20	52.8	579	41.8
G1	393100	1183932	<2	630	<1	250	797	9690	22.6
G2	393043	1183823	<2	62.7	<1	160	130	6200	19
G3	393055	1183717	<2	200	<1	<20	53.6	756	29.8
G4	393056	1183608	<2	141	<1	<20	94.2	1640	23.1
G5	393054	1183502	<2	147	<1	<20	125	699	40.2
G6	393051	1183336	<2	296	<1	20	112	814	26.8
CP1	393350	1183310	4	465	<1	220	1420	6530	39.1
CP2	393301	1183429	<2	543	<1	30	255	1020	40.1
CP3	393127	1183301	<2	916	<1	70	426	4000	40.3
CP4	393115	1183641	<2	728	<1	120	930	9690	27.8
CP5	393203	1183642	<2	47.8	<1	<20	42.9	1590	28.6
CP6	393107	1183900	<2	37.5	<1	50	41.8	2370	16.6

Appendix G continued

Field ID	Latitude	Longitude	As ppb	B ppb	Ba ppb	Li ppb	Mn ppb	Mo ppb	Se ppb
A1	393548	1183341	480	68600	<40	3680	540	1800	40
A2	393549	1183309	94	10700	40	1050	550	<200	<1
B1	393459	1183444	660	102000	<40	3540	400	2100	1.9
B2	393517	1183402	460	3200	<40	220	<20	<200	<1
B3	393505	1183310	1400	3700	40	460	<20	<200	<1
C1	393412	1183437	2000	14700	<40	230	<20	<200	<1
C2	393435	1183425	1200	11700	<40	230	<20	<200	3.1
C3	393425	1183309	480	48900	<40	3590	20	3300	4.1
D1	393321	1183607	180	26100	<40	2240	<20	300	65
D2	393323	1183501	120	38600	100	4570	420	500	28
D3	393323	1183357	99	1100	<40	120	40	<200	<1
D4	393328	1183322	230	6900	<40	200	40	200	<1
E1	393230	1183857	66	3400	<40	100	140	<200	<1
E2	393234	1183716	120	50400	<40	1240	150	500	110
E3	393228	1183603	490	17600	<40	290	120	700	<1
E4	393229	1183531	18	25800	90	2310	11900	500	8.1
E5	393241	1183352	40	800	100	120	<20	<200	1.6
E6	393241	1183216	96	1700	90	230	1160	<200	<1
F1	393138	1183953	81	78600	<40	830	<20	1100	34
F2	393140	1183832	470	65400	<40	870	20	1800	<1
F3	393136	1183719	16	1000	<40	220	<20	<200	<1
F4	393135	1183606	230	1700	<40	240	<20	<200	2.8
F5	393136	1183503	77	21700	130	2920	280	600	1600
F7	393139	1183245	51	3500	60	450	240	<200	<1
G1	393100	1183932	65	69900	<40	690	<20	800	7.5
G2	393043	1183823	720	59300	50	390	<20	2300	1.9
G3	393055	1183717	21	5900	60	150	5930	<200	<1
G4	393056	1183608	78	13600	40	280	80	900	1
G5	393054	1183502	250	4600	<40	340	180	<200	<1
G6	393051	1183336	81	3500	100	430	990	<200	<1
CP1	393350	1183310	540	43000	<40	6910	430	4600	<1
CP2	393301	1183429	120	5400	<40	1040	2270	500	<1
CP3	393127	1183301	450	17900	110	2130	750	<200	40
CP4	393115	1183641	240	58000	<40	1390	<20	2500	18
CP5	393203	1183642	800	22500	90	320	110	1400	<1
CP6	393107	1183900	160	13500	90	210	<20	1400	6.6

Appendix G continued

Field ID	Latitude	Longitude	Sr ppb	V ppb
A1	393548	1183341	18100	<100
A2	393549	1183309	15400	<100
B1	393459	1183444	26300	<100
B2	393517	1183402	380	<100
B3	393505	1183310	1380	<100
C1	393412	1183437	460	300
C2	393435	1183425	470	200
C3	393425	1183309	14000	<100
D1	393321	1183607	61000	<100
D2	393323	1183501	57300	<100
D3	393323	1183357	750	<100
D4	393328	1183322	1070	<100
E1	393230	1183857	580	<100
E2	393234	1183716	25700	<100
E3	393228	1183603	960	<100
E4	393229	1183531	20800	<100
E5	393241	1183352	910	<100
E6	393241	1183216	1820	<100
F1	393138	1183953	17900	<100
F2	393140	1183832	14000	<100
F3	393136	1183719	500	<100
F4	393135	1183606	270	100
F5	393136	1183503	70400	<100
F7	393139	1183245	2030	<100
G1	393100	1183932	22800	<100
G2	393043	1183823	3030	200
G3	393055	1183717	1960	<100
G4	393056	1183608	1860	<100
G5	393054	1183502	2770	<100
G6	393051	1183336	3370	<100
CP1	393350	1183310	16300	<100
CP2	393301	1183429	7360	<100
CP3	393127	1183301	17000	<100
CP4	393115	1183641	20300	100
CP5	393203	1183642	1100	<100
CP6	393107	1183900	1350	<100

Appendix H Total element concentration in alfalfa samples collected in TJ-Drain study area. All data corrected to dry weight

[Field ID, letter designates row and number designates column in grid arrangement; Center point collection site designated as CP##, %, percent; ppm, parts per million; <, less than]

Field ID	Latitude	Longitude	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	% Ash
E5	393241	1183352	0.40	2.23	0.19	1.17	0.31	0.25	0.27	12.2
E6	393241	1183216	0.14	2.72	0.08	1.85	0.38	0.17	0.31	12.6
F3	393136	1183719	0.05	1.50	0.03	2.52	0.41	0.39	0.60	11.0
F4	393135	1183606	0.02	2.02	0.02	2.15	0.43	0.17	0.40	10.4
F5	393136	1183503	0.04	2.26	0.02	1.96	0.51	0.25	0.42	11.2
F7	393139	1183245	0.16	2.48	0.08	1.93	0.33	0.27	0.51	13.4
G2	393043	1183823	0.41	2.43	0.22	1.61	0.36	0.25	0.26	14.8
G3	393055	1183717	0.02	2.44	0.02	2.40	0.42	0.34	0.42	12.3
G4	393056	1183608	0.45	2.50	0.17	1.71	0.64	0.46	0.57	16.0
G5	393054	1183502	0.21	1.88	0.09	1.29	0.41	0.43	0.31	10.8
G6	393051	1183336	0.07	2.18	0.04	1.30	0.29	0.08	0.31	10.1
CP3	393127	1183301	0.04	2.98	0.03	1.56	0.35	0.31	0.47	12.2

Field ID	As ppm	Ba ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	La ppm	Li ppm	Mo ppm	Mn ppm
E5	0.96	59.4	2.2	1.1	2.4	11.8	1.8	6.0	2.1	56
E6	1.50	54.6	<1.0	0.8	1.4	10.6	1.1	5.0	1.6	64
F3	0.37	10.2	<0.9	1.0	12	10.5	0.7	6.1	3.1	33
F4	0.57	12.5	<0.8	0.3	2.3	12.2	0.5	6.9	4.0	43
F5	0.47	35.6	<0.9	0.7	5.2	13.3	0.7	5.9	3.9	40
F7	0.92	36.6	<1.1	0.7	1.3	14.7	1.1	8.3	3.6	51
G2	1.90	73.1	3.0	1.2	2.8	13.6	2.2	9.5	3.7	85
G3	0.44	22.9	<1.0	0.6	9.8	15.5	0.7	7.1	3.6	49
G4	0.86	70.4	2.4	1.1	4.0	16.8	2.1	7.5	4.8	70
G5	0.99	39.2	1.0	0.6	1.4	12.1	1.2	6.4	4.9	62
G6	0.49	31.1	<0.8	0.4	0.9	10.4	0.7	4.3	2.4	33
CP3	0.93	18.3	<1.0	0.6	1.5	15.0	0.7	8.3	5.0	61

Field ID	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Se ppm	Sr ppm	Ti ppm	V ppm	Y ppm	Zn ppm
E5	2.2	1.3	1.2	0.5	0.10	232	170	4.8	0.6	26.8
E6	1.8	0.6	<1.0	<0.5	0.08	263	60	1.9	<0.5	22.6
F3	<0.9	1.5	<0.9	<0.4	0.04	157	20	0.6	<0.4	22.9
F4	<0.8	0.6	<0.8	<0.4	0.14	233	<10	<0.4	<0.4	43.8
F5	1.3	2.0	<0.9	<0.4	0.22	241	20	<0.4	<0.4	38.1
F7	1.7	1.1	<1.0	<0.5	0.10	259	70	2.0	<0.5	35.6
G2	2.2	1.2	1.2	0.7	0.07	293	180	6.2	0.6	24.3
G3	<1.0	1.2	<1.0	<0.5	0.02	242	<10	<0.5	<0.5	36.7
G4	1.9	1.8	1.3	<0.6	0.10	290	190	4.5	<0.6	49.6
G5	1.4	0.9	<0.9	<0.4	0.18	252	90	2.4	<0.4	23.3
G6	1.0	0.6	<0.8	<0.4	0.07	219	30	1.0	<0.4	17.7
CP3	1.1	1.0	<1.0	<0.5	0.48	289	20	0.6	<0.5	33.1

Appendix I Total element concentrations in greasewood samples collected in the TJ-Drain study area, Nevada. All data corrected to dry weight

[Field ID, A1 refers to row A site 1; ppm, parts per million <, less than]

Field ID	Latitude	Longitude	Al ppm	Ca ppm	Fe ppm	K ppm	Mg ppm	Na ppm	P ppm	Ti ppm
A1	393548	1183341	990	6600	520	9190	1440	9700	103	54
A2	393549	1183309	360	6400	240	23600	6100	16700	1110	24
B1	393459	1193444	690	9700	380	13000	1230	25100	1260	36
B2	393517	1183402	210	3400	140	15100	3240	8400	750	20
B3	393505	1183310	280	3500	180	12400	3580	6000	540	17
C1	393412	1183437	540	6000	310	9120	720	11300	640	29
C2	393435	1183425	680	9300	370	10400	970	5100	790	38
C3	393425	1183309	640	6000	390	12000	1610	15200	1130	42
D1	393321	1183607	600	9000	340	6080	930	6800	700	34
D2	393323	1183501	460	7600	300	14100	2240	43800	2040	18
D3	393323	1183357	210	1900	150	10100	2650	3100	360	15
D4	393328	1183322	590	8800	340	8570	1160	18500	1210	37
E1	393230	1183857	710	5600	410	7160	800	8400	680	45
E2	393234	1183716	420	10400	240	16600	1510	30000	2130	28
E4	393229	1183531	900	8100	490	13600	1590	18000	1100	52
F1	393138	1183953	690	9400	390	6520	910	15600	1060	42
F2	393135	1183832	700	9600	390	18700	1730	30200	1680	44
F3	393136	1183719	450	11200	280	18400	1730	33700	2320	31
F4	393135	1183606	250	5800	180	15500	1880	19800	3510	10
F5	393136	1183503	260	6700	170	15400	1890	36100	2820	12
G1	393100	1183932	1160	7900	650	7360	1100	15700	980	68
G2	393043	1183823	620	10100	360	22500	2030	30700	2130	33
G3	393055	1183717	310	11600	200	27900	2340	41100	3760	20
G4	393056	1183608	450	9200	340	17500	2170	36800	2090	32
CP1	393350	1183310	800	10300	420	10100	1990	10300	960	48
CP2	393301	1183429	290	7200	170	5590	890	3700	700	16
CP4	393115	1183641	1120	7200	580	15400	1690	20100	1660	57
CP5	393203	1183642	1150	9600	590	11800	1420	23400	1320	60
CP6	393107	1183900	420	7900	240	10800	1250	20100	1260	22

Appendix I continued

Field ID	Latitude	Longitude	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	La ppm
A1	393548	1183341	0.32	12.6	<0.3	0.7	0.3	0.9	8.8	0.6
A2	393549	1183309	0.14	6.2	0.6	<1.0	0.2	1.4	5.7	<0.5
B1	393459	1193444	0.12	15.4	<0.5	<1.0	0.4	0.8	5.4	0.6
B2	393517	1183402	0.12	7.1	<0.3	<0.5	0.2	0.4	5.2	<0.3
B3	393505	1183310	0.19	7.1	<0.2	0.5	0.2	0.4	4.0	0.3
C1	393412	1183437	0.09	9.9	<0.3	<0.6	0.3	0.9	6.2	0.4
C2	393435	1183425	0.19	14.5	<0.2	<0.5	0.3	0.9	5.6	0.4
C3	393425	1183309	0.22	9.7	<0.3	<0.7	0.3	0.9	13.3	0.5
D1	393321	1183607	0.13	13.9	<0.2	<0.4	0.2	0.8	4.9	0.5
D2	393323	1183501	0.08	10.9	<0.7	<1.0	0.4	0.7	10.7	<0.7
D3	393323	1183357	0.07	5.2	<0.2	<0.3	0.1	0.4	4.1	0.1
D4	393328	1183322	0.11	12.9	<0.4	<0.8	0.3	0.9	7.3	0.6
E1	393230	1183857	0.21	15.7	<0.2	0.6	0.2	1.0	4.1	0.5
E2	393234	1183716	0.07	6.8	<0.6	<1.0	<0.3	5.2	12.7	<0.6
E4	393229	1183531	0.16	12.9	<0.4	<0.8	0.3	1.4	9.4	0.6
F1	393138	1183953	0.18	21.5	<0.3	0.8	0.3	1.1	6.5	0.7
F2	393135	1183832	0.11	11.6	<0.6	<1.0	0.3	2.2	11.6	0.6
F3	393136	1183719	0.10	5.8	<0.6	<1.0	<0.3	6.7	13.9	<0.6
F4	393135	1183606	0.11	6.9	<0.4	<0.8	0.3	0.8	10.9	<0.4
F5	393136	1183503	0.10	5.1	<0.6	<1.0	<0.3	2.9	15.6	<0.6
G1	393100	1183932	0.19	23.5	<0.3	1.4	0.4	1.3	7.8	0.7
G2	393043	1183823	0.20	13.6	<0.7	<1.0	0.5	6.2	16.2	0.7
G3	393055	1183717	0.08	4.5	<0.8	<1.0	<0.4	4.3	16.8	<0.8
G4	393056	1183608	0.12	8.6	<0.6	<1.0	0.3	3.2	13.9	<0.6
CP1	393350	1183310	0.22	14.7	<0.3	0.8	0.3	1.0	7.4	0.6
CP2	393301	1183429	0.07	4.9	<0.2	<0.3	0.2	0.5	8.2	0.3
CP4	393115	1183641	0.22	14.6	<0.5	1.0	0.5	5.8	8.7	0.9
CP5	393203	1183642	0.22	15.7	<0.5	1.2	0.5	6.1	9.5	1.0
CP6	393107	1183900	0.12	13.7	<0.4	<0.9	0.2	0.7	10.9	<0.4

Appendix I continued

Field ID	Latitude	Longitude	Li ppm	Mn ppm	Mo ppm	Ni ppm	Pb ppm	Se ppm	Sr ppm
A1	393548	1183341	4	103	0.9	0.7	0.5	0.10	80.4
A2	393549	1183309	7	36.8	0.7	0.6	<1.0	0.04	110.0
B1	393459	1193444	3	126	0.8	<0.5	<1.0	0.03	114.0
B2	393517	1183402	2	23.4	1.4	0.3	<0.5	0.03	39.6
B3	393505	1183310	2	18.2	0.9	0.7	<0.4	0.41	63.6
C1	393412	1183437	2	141	<0.3	<0.3	<0.6	0.03	73.9
C2	393435	1183425	2	82.2	<0.2	0.4	<0.5	0.18	142.0
C3	393425	1183309	5	105	0.9	0.7	<0.7	0.17	76.3
D1	393321	1183607	1	97.1	0.5	0.3	<0.4	0.05	97.1
D2	393323	1183501	10	172	0.9	<0.7	<1.4	0.20	94.0
D3	393323	1183357	1	13.1	0.3	0.3	0.3	0.21	40.4
D4	393328	1183322	3	169	1.3	<0.4	<0.7	0.09	85.5
E1	393230	1183857	1	100	0.6	0.5	0.7	0.05	109.0
E2	393234	1183716	3	88.0	1.0	<0.6	<1.1	0.14	63.6
E4	393229	1183531	4	104	<0.4	0.6	<0.8	0.33	75.1
F1	393138	1183953	2	145	1.0	0.4	0.8	0.09	88.6
F2	393135	1183832	3	155	0.7	<0.6	<1.2	0.06	77.1
F3	393136	1183719	5	70.5	0.9	<0.6	<1.2	<0.01	70.4
F4	393135	1183606	4	24.6	1.3	<0.4	<0.8	0.62	39.1
F5	393136	1183503	4	83.5	1.7	<0.6	3.2	0.70	51.6
G1	393100	1183932	2	167	0.7	0.6	1.5	0.07	86.5
G2	393043	1183823	2	92.3	5.1	<0.7	<1.3	0.28	135.0
G3	393055	1183717	5	138	<0.8	<0.8	<1.6	0.02	69.8
G4	393056	1183608	3	108	0.8	<0.6	<1.3	1.30	80.2
CP1	393350	1183310	5	117	1.9	0.7	<0.6	0.64	138.0
CP2	393301	1183429	1	155	0.2	0.4	<0.3	0.16	87.1
CP4	393115	1183641	3	58.6	1.7	1.0	<0.9	0.07	51.8
CP5	393203	1183642	3	112	1.7	<0.5	<1.0	0.20	87.2
CP6	393107	1183900	2	141	1.2	0.7	<0.9	0.15	91.0

Appendix I continued

Field ID	Latitude	Longitude	V ppm	Zn ppm	Ash %
A1	393548	1183341	1.4	8.0	6.8
A2	393549	1183309	<0.5	21.8	11.9
B1	393459	1193444	0.8	8.1	11.9
B2	393517	1183402	0.3	8.5	6.8
B3	393505	1183310	0.4	7.7	5.6
C1	393412	1183437	0.7	9.3	7.2
C2	393435	1183425	0.9	4.7	6.3
C3	393425	1183309	0.9	7.0	8.5
D1	393321	1183607	0.8	5.0	5.7
D2	393323	1183501	<0.7	14.3	17.6
D3	393323	1183357	0.3	3.7	3.6
D4	393328	1183322	0.7	13.4	9.3
E1	393230	1183857	1.0	4.4	5.6
E2	393234	1183716	<0.6	14.9	14.1
E4	393229	1183531	1.1	12.4	10.3
F1	393138	1183953	1.0	7.7	8.4
F2	393135	1183832	0.7	16.5	14.5
F3	393136	1183719	<0.6	15.3	15.6
F4	393135	1183606	<0.4	21.1	10.3
F5	393136	1183503	<0.6	19.3	15.1
G1	393100	1183932	1.5	9.0	8.6
G2	393043	1183823	0.8	16.4	16.4
G3	393055	1183717	<0.8	29.4	19.5
G4	393056	1183608	<0.6	24.8	16.2
CP1	393350	1183310	1.0	7.9	8.0
CP2	393301	1183429	0.4	12.2	4.1
CP4	393115	1183641	1.3	17.3	11.4
CP5	393203	1183642	1.4	11.8	12.0
CP6	393107	1183900	0.4	9.8	11.1