Final
Soil, Groundwater, Surface Water, and Sediment Background Investigation Report

U.S. Naval Ammunition Support Detachment
Vieques Island, Puerto Rico

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Executive Summary

A background study was conducted for the western portion of Vieques Island, Puerto Rico. The primary purpose of this study was to develop a set of background values for inorganic constituents that occur commonly in environmental media for comparison with sites investigated within the Former Naval Ammunition Support Detachment (NASD) located in this part of the island. These background inorganic constituent levels from this study will be used for comparison with soil inorganic constituent levels in samples collected during the site investigations at Solid Waste Management Units (SWMUs) and Areas of Concern (AOC). Background data were collected specifically from the western portion of Vieques within the Former NASD to represent soil types similar to those where environmental sites are located during site-specific background comparisons.

A draft background sampling work plan was prepared (CH2M HILL, November 2000) and finalized after regulatory agency review. This approved work plan was used to select the number and locations of background samples. Soil, rock, groundwater, surface water, and sediment samples were proposed. A meeting was conducted on November 9, 2000, at Region II office of the U.S. Environmental Protection Agency (USEPA) in New York to discuss review comments before finalizing the sampling plan for the background study.

Figure 2-1 in Section 2 of this document presents a regional map indicating the location of the Former NASD. The map also identifies geological formations in the western portion of Vieques Island. The island geological formations were based on U.S. Geological Survey (USGS) classification. The geological soil types identified include:

- Coastal beach deposits (Qb)
- Swamp and marsh deposits (Qs)
- Alluvial deposits (Qa)
- Plutonic rock made up mostly of granidiorite and quartz diorite (KTd)

In the southern coastal area, plutonic rocks are at the surface. To show that inorganic constituents (metals) can result from the plutonic rocks occurring in the area, rock samples were collected. Groundwater in this general area occurs as a single aquifer identified as the Resolución Valley aquifer. The valley slopes from Mount Pirata toward the Vieques Passage, with an area of approximately 8 square miles. No perennial streams were identified for sampling within this western portion of the island. Two surface water bodies (saltwater lagoons) that represented background conditions and were located away from the Former NASD operations were sampled: one in the northwest portion and one in the southwest portion of the island.

Three existing groundwater wells used as water supply wells in the past for Navy operations were identified as potential background wells, because of their location away from Former NASD operations and any sites identified for investigation. These wells were previously sampled by the USGS. The analytical data from USGS sampling had high detection limits, and as a result the data were not usable as part of this background study. These wells (Station IDs KTD-NAVY01, KTD-NAVY07, and KTD-NAVY08) were developed and sampled, and analytical data were obtained for this background study. More recent

review comments (Appendix J) suggested that the metal casings present on these former Navy water supply wells might have influenced the metal concentrations in groundwater samples from these wells. Therefore, data from these Navy water supply wells were removed from the representative background data for groundwater. Although these data were included in the appendix of this report, they were not included in the background tables in the body of the report. The data from one upgradient IR well, AOC-K-MW03, was included as part of the final background data set since it is a polyvinyl chloride (PVC) cased well and located upgradient of the former NASD activities.

The technical approach to sampling was discussed with the USEPA after the work plan was submitted and prior to conducting sampling. The sample locations were selected by the review team after review of existing historical Navy operational information about the western portion of the island included in the Environmental Baseline Survey (ERM, April 2000) and review of the photo-identified (PI) anomalies (ERI, 2000). Sample locations were placed in areas with no known or suspected historical activities. The soil samples were also located such that they were away from any roadway influences (e.g., automobile emissions or road runoff). Photos of the sample locations taken during the more recent site visit are included in Appendix J-11.

Surface soil samples were collected from the surface to 6 inches below land surface (bls) at 26 surface soil locations. Subsurface soil samples were collected from 11 of the soil sampling locations at depths ranging from 2 to 6 feet bls, depending on the depth to rock in the sampling area. Additionally, five rock samples were collected from the southwestern end of Vieques Island. Groundwater was sampled from five newly installed background wells. Three existing Navy water supply well samples were not included in the final data set because of possible elevated metals concentrations from the iron well casings. Two surface water bodies identified as Laguna Kiani and Laguna Playa Grande were included for surface water and sediment sampling. Four samples each of sediment and surface water were collected from each surface water body. Except for two surface water and sediment samples from Laguna Kiani, all others were determined by the background review team to not be usable as representing background conditions for future background versus site comparisons (see Appendix J). Appendix K presents a D-size drawing showing sample locations along with other PI anomalies.

Analytical data collected for the samples for each medium (surface soil, subsurface soil, rock, groundwater, surface water, and sediments) were validated using data quality evaluation guidelines from USEPA. Results of the analysis are included in Section 5 of this report.

The validated data were evaluated using statistical methods according to the latest USEPA guidance (USEPA, 1991). The initial step of the statistical evaluation included data evaluations for concentration distributions using parametric methods such as estimation of minimum, maximum, mean, and standard deviation. The arithmetic mean estimates include non-detects at half their detection limit values. Analytical data distributions also were plotted into box plots to identify data graphical distribution ranges as well to identify any extreme (e.g., outlier) values (Appendix F). The data also were analyzed to determine whether different soil types, rock samples, and surface and subsurface soils have significantly different inorganic constituent distributions. The statistical analysis concluded that for most constituents, no significant differences existed between surface and subsurface

soils, whereas rock sample constituent levels appeared to be significantly different from soil levels. Therefore, surface and subsurface soil samples were combined for development of a background soil data set, whereas rock samples were kept as a separate data set.

According to the USEPA guidance, a single data background value is developed for each constituent for soil for future "point" comparisons between site and background, as part of the initial site screening analysis. This "point estimate" background value is the upper 95 percent tolerance limit (UTL95%). The UTL95% values for all the media were included in this report (Section 4). These values are developed for comparisons during site investigations with single sample results. Alternatively, site inorganic concentration ranges for the set of samples can be compared to concentration ranges in the background sample set. When necessary, future comparisons between site and background concentrations may involve additional statistical methods for comparisons to determine whether the site concentrations are significantly different from background. Such comparisons will be limited to constituents and media where it is identified as appropriate or necessary, because of the additional level of effort involved for such comparisons.

The draft background study report was submitted for review by agencies and other interested parties on June 15, 2001. Several sets of comments were received, including comments from the USEPA, Puerto Rico Environmental Quality Board (PREQB), Puerto Rico Commissioner's office, and the Technical Assistance for Public Participation (TAPP). Since comments were received from only the USEPA within the scheduled time, comment-specific responses were submitted to USEPA with the intention of finalizing this background investigation report. Additional comments from other parties were received approximately one year later. Because of the large number of comments received on the draft background study report, the CERCLA Technical Committee (CTC) suggested forming a subcommittee with technical representatives from each of the agencies to review and resolve the comments. This technical subcommittee's objective was to propose a path forward to the CTC to reach closure on this background study report. The subcommittee held a conference call to resolve the issues, and the summary of the response-to-comments was prepared as a technical memorandum. All of the comments (and the technical memorandum summarizing responses based on the technical subcommittee discussion) are included in Appendix J of this report. The action items identified during the subcommittee discussion to finalize the background report were as follows:

1. A visit to the site by agency representatives was suggested by the Background Technical Subcommittee.

2. The review team (primarily TRC and TAPP) expressed the potential need for additional sampling and organic constituents analysis of selected background soil sample locations following the site visit, if any of the previously collected sample locations were identified as having been impacted by Navy operations.

3. It was suggested that better figures should be provided prior to the site visit, and that aerial study photos should be used for better scale/resolution and to overlay Preliminary Assessment/Site Investigation (PA/SI) areas with background sampling locations. These better figures were suggested for insertion as an appendix to the revised report.

4. The UTL95% values should be replaced with updated values that default to the maximum concentration if the estimated value is greater than the maximum. It was also suggested that a set of UCL95% values be added to these tables.
5. The Background Report should be revised accordingly to address the responses submitted to USEPA, as well as the to incorporate changes to address all other comments resulting from discussions with the technical subcommittee team, as presented during the conference call.
6. An appendix should be added to the Background Report to include a complete set of all comments and responses to the comments.

This update to the background study report includes the information listed previously and addresses the action items identified. A field site visit conducted on July 17, 2002, addressed Action Items 1, 2 and 3. The other three action items were incorporated into this report update. The CTC meeting was held to discuss site visit findings. The field visit input was also obtained from the public during the August Technical Review Committee meeting in Vieques to obtain any public input. No additional sampling needs were identified by the technical team. Several issues, however, were recommended to be addressed in this report update. These included the following:

1. Surface water/sediment background data from Laguna Playa Grande may not be usable because of elevated metals levels, and samples might be turbid. Resampling to confirm presence/absence of elevated metals through the use of clean sampling procedures was recommended. Background for each surface water body will be established with future RI/FS site investigations.
2. Background wells with metal casings need to be evaluated for correlation of elevated iron levels to use of metal well casings.
3. The one background soil sample with high lead levels may need to be dropped from the background study.
4. Background concentrations of pesticides will be revisited when pesticides become a contaminant of concern for an individual site.

The current update to this background study report removed the one surface soil sample identified to have an "outlier" value for lead at QA-SS05, as suggested by the team. The surface water samples were dropped from background data set. Wells with metal casings also were dropped from the background data set. Wells located in the upgradient locations of individual sites will be identified for comparisons during individual site evaluations. In the absence of such wells, either background wells or alternative wells will be identified as appropriate on a site-specific basis. The background UTL95% values are updated in each of the tables. A set of 95 percent upper confidence limit values (UCL95%) was also added to these revised tables where numbers of samples were adequate to estimate this value.

List of Acronyms

°F	Fahrenheit
AB	Ambient Blank
AFWTF	Atlantic Fleet Weapons Training Facility
ANOVA	Analysis of variance
AOC	Area of Concern
bls	Below land surface
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Procedures
CTC	CERCLA Technical Committee
DOI	Department of Interior
DQE	Data quality evaluation
EMA	Eastern Maneuver Area
ERB	Equipment Rinsate Blank
FB	Field Blank
FSP	Master Field Sampling Plan
GIS	Geographic Information System
GPS	Global Positioning Satellite
HASP	Master Health and Safety Plan
IDWP	Master Investigation-Derived Waste Plan
IR	Installation Restoration
LCS	Laboratory control sample
MB	Laboratory Method Blank or Method Blank
MDL	Method Detection Limit
MS	Matrix spike
msl	Mean sea level
NASD	Naval Ammunition Support Detachment
NAVFACENGCOM	Naval Facilities Engineering Command

NSRR	Naval Station Roosevelt Roads
PA/SI	Preliminary Assessment/Site Investigation
PI	Photo-identified
PREQB	Puerto Rico Environmental Quality Board
PVC	Polyvinyl chloride
QA/QC	Quality assurance/quality control
QAPP	Master Quality Assurance Project Plan
RI	Remedial Investigation
RL	Reporting Limit
ROTHR	Relocatable Over the Horizon Radar
RPD	Relative percentage differences
SOP	Standard Operating Procedure
SOW	Scope of Work
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TAPP	Technical review representative for public
TRC	TRC, Consultant for PREQB
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WRS	Wilcoxon-Rank Sum

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SECTION 1

Introduction

This background investigation report describes work completed for the background investigation of soils, rock, groundwater, surface water, and sediment at the Former Naval Ammunition Support Detachment (NASD), Vieques Island, Puerto Rico. This report was prepared under the Naval Facilities Engineering Command (NAVFACENGCOM) LANTDIV Navy Contract N62470-95-D-6007, Navy Comprehensive Long-Term Environmental Action Navy (CLEAN), District III, Contract Task Order 0189. The technical approach is based on *Procedural Guidance for Statistically Analyzing Environmental Background Data* (NAVFACENGCOM, 1998) and the USEPA-approved *Work Plan and Sampling and Analysis Plan for Soil, Groundwater, Surface Water, and Sediment Background Investigation* (CH2M HILL, December 2000).

Figure 1-1 presents a regional location map of the Former NASD, and Figure 1-2 presents a facility map. Previous investigations at the Former NASD revealed elevated levels of metals in the soils, groundwater, surface water, and sediment at several Installation Restoration (IR) site locations. However, the investigations have not differentiated the degree to which these constituents were attributed either to site conditions or to background conditions associated with constituents that commonly occur in the environment. The background sampling data will be used to establish the range of background concentrations for metals at the Former NASD. The statistical methods followed to develop background concentrations are in accordance with USEPA guidance (USEPA, June 2001). The background levels will be used in site management decisions as well as during risk assessment in accordance with USEPA guidance on *Role of Background in CERCLA Cleanup Program* (USEPA, April 2002).

This report documents the Background Sampling Program conducted to support the IR program at the Former NASD, and is divided into seven sections.

Section 1 contains objectives of the background sampling program, background information about the Former NASD, physical characteristics of the study area, and the local geology and hydrogeology.

Section 2 provides the technical approach and investigation procedures for the sampling investigations.

Section 3 provides field sampling summaries and activities.

Section 4 includes sample results and statistical evaluation.

Section 5 presents the data quality evaluation.

Section 6 provides background sampling conclusions.

Section 7 provides background report and sampling references.

FIGURE 1-1 SITE LOCATION MAP

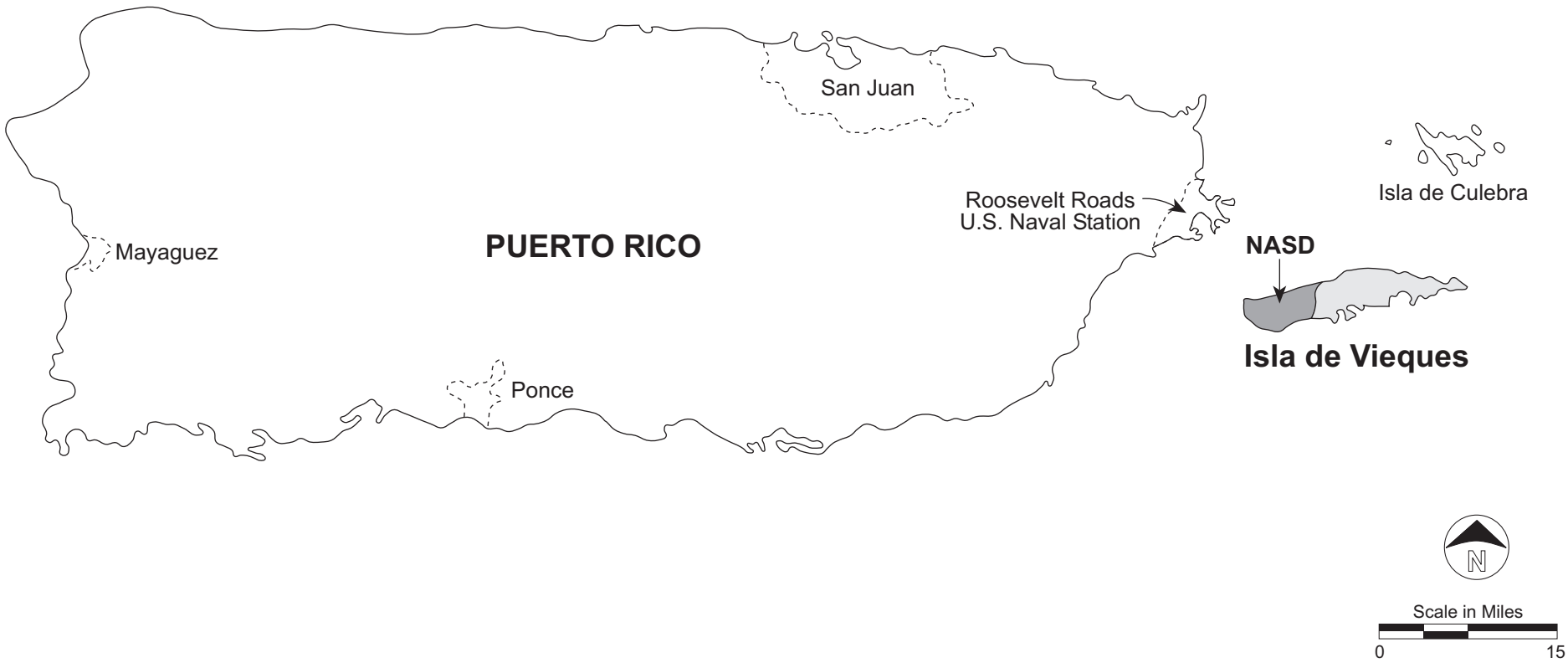

Figure 1-1
SITE LOCATION MAP
NASD, Vieques Island, Puerto Rico

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FIGURE 1-2 FACILITY MAP

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Figure 1-2
FACILITY MAP
Naval Ammunition Support Detachment, Vieques Island

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1.1 Background Sampling Objectives

CH2M HILL conducted a background sampling program from December 5 to December 21, 2000, to support implementation of the Navy's IR program at the Former NASD. The purpose of the background sampling program was to provide sufficient data to establish representative background concentration data for inorganic constituents that occur commonly in environmental media. Samples were collected specifically in the western part of Vieques to establish background levels suitable for comparisons with site data for sites within the Former NASD. Constituent concentrations detected in various media as part of environmental investigations including the Preliminary Assessment/Site Investigation (PA/SI), Expanded PA/SI, and Remedial Investigation (RI) at the site will be compared with background data established herein to evaluate whether reported concentrations of those constituents are related to NASD operations, or are common to the environmental media in which they occur. Background data were collected for soils, groundwater, surface water, and sediment. Outcrop rock samples also were collected and reported. The background data will be used to compare the distribution of data collected during the site investigations to the distribution of the background data set.

1.2 Facility Background

1.2.1 Location

Vieques Island lies roughly 7 miles southeast of the U.S. Naval Station Roosevelt Roads (NSRR), Puerto Rico (Figure 1-1). Vieques is the largest offshore island of Puerto Rico, with a surface area of approximately 51 square miles. The U.S. Navy occupies approximately 22,600 acres of the 33,000 acres that comprise Vieques Island. The 22,600 acres consist of the following:

- The Former NASD, which consists of 8,000 acres along the western third of the island
- The Eastern Maneuver Area (EMA), which consists of 11,000 acres located in the east-central portion of the island
- The Atlantic Fleet Weapons Training Facility (AFWTF), which consists of 3,600 acres along the eastern portion of the island

The background investigation for this report addresses the background conditions for the Former NASD.

1.2.2 Site History and Mission

The Former NASD was utilized by the U.S. Navy Atlantic Fleet for storage of munitions from 1942 to December 31, 2000. Activities at the Former NASD were directed under the consolidated command of Commander Fleet Air Caribbean, Naval Forces Caribbean, and Antilles Defense Command, which were headquartered at NSRR. The mission of the Former NASD was to receive, store, and issue all ordnance authorized by NSRR for support of Atlantic Fleet activities.

On May 1, 2001, the majority of the Former NASD was transferred from Navy control. The land was divided among the following parties (with approximate acreage noted): Department of Interior (DOI), 3,100 acres; Municipality of Vieques, 4,000 acres; and Puerto Rican Conservation Trust, 800 acres. The Navy retained approximately 100 acres, including the Relocatable Over the Horizon Radar (ROTHR) site and a communications facility, both located on Mount Pirata.

1.3 Physical Characteristics of Study Area

This section summarizes the environmental setting of the Former NASD, including site description, land use, climate, topography, surface water, geology, and hydrogeology.

1.3.1 Site Description

The majority of the site is undeveloped and heavily vegetated with trees, low-lying brush, and tall grasses. The southwestern portion of the site is the least developed. The east-central portion of the site was utilized for munitions magazines, which were scattered throughout the area. The northeastern portion of the site was the most developed, containing facilities for the main support compound. The southeastern portion of the site contains the recently completed ROTHR station and associated facilities.

Paved and dirt roads traverse the site. Access is limited to a single guarded security gate. The main gate to the site is located at the extreme northeast end of the site near the Vieques Municipal Airport. The approximate coordinates of the center of the site are 18 degrees 7 minutes north latitude and 65 degrees 33 minutes west longitude.

1.3.2 Structures, Roads, and Other Site Improvements

The central and northeastern portions of the site were the most developed, containing munitions storage magazines and installation support facilities. Paved roads are present along the north and east boundaries of the site, in the main support compound, and among the inactive munitions magazines. The road to the Mount Pirata communications facility is also paved. The remainder of the site is a patchwork of dirt and paved roads, most of which are overgrown with vegetation.

1.3.3 Vicinity Characteristics

The site is bounded by water on three sides: Vieques Sound to the north, Vieques Passage to the west, and the Caribbean Sea to the south. The east land-based border is controlled by the Puerto Rico Department of Natural Resources, the Puerto Rico Port Authority, and private landowners. The Vieques Municipal Airport property lies adjacent to the northeast portion of the site where the abutting property provides the runway approach clear zone. South of the airport property is undeveloped land managed by the Puerto Rico Department of Natural Resources. This property is used primarily for cattle grazing. Farther south lies the area known as the “South La Hueca” parcel. This area is inhabited by individual landowners with private homes, small pastures, and farms.

1.3.4 Land Use

The Former NASD occupied approximately 8,000 acres, most of which was undeveloped and leased to local landowners for cattle grazing. The Former NASD operated a 625-foot ammunition handling pier known as Mosquito Pier. Power on the Former NASD was received from Puerto Rico via underwater transmission lines. Therefore, no power production units other than emergency generators were located at the Former NASD. Significant facilities at the Former NASD included the Transportation Shop (Buildings 2015 and 2016), the Carpentry Shop, and the Sewage Treatment Plant. These operations are now closed, and most of the facilities were decommissioned after operations ceased. The Former NASD currently is inactive.

1.3.5 Climate

The climate of Vieques is tropical-marine. Temperatures are nearly constant, with an annual average of approximately 79 degrees Fahrenheit (°F). August is the warmest month (82°F) and February the coolest (76°F). Vieques lies directly in the path of the prevailing easterly trade winds that regulate the climate of Puerto Rico. The trade winds result in a rainfall pattern characterized by a dry season from December through July and a rainy season from August to November. Heavy precipitation may be induced by tropical storms from June to November. The western part of the island, where the site is located, averages approximately 50 inches of rainfall per year, 50 percent of which occurs during the rainy season (United States Geological Survey [USGS], 1989).

1.3.6 Topography and Surface Water

The topography of the site is characterized by a series of low hills and small valleys. The most elevated areas occur along a west-to-east axis near the center of the site. The highest point is Mount Pirata, approximately 987 feet above sea level. In general, the slope of the site tapers gradually down from the center to the coastal areas, with the exception of steep slopes in the vicinity of Mount Pirata.

Surface water present on the site consists of several lagoons and intermittent streams. The Arenas, El Pobre, and Kiani Lagoons are located at the northwestern end of the site, and the Playa Grande Lagoon is located at the southeast end of the site. These lagoons are generally very shallow with large concentrations of mangrove trees. Most streams on the site are ephemeral, flowing only for a short period of time after precipitation events. These natural storm drainage channels, dry most of the year, are located throughout the site, generally running in a northerly or southerly direction downward from the central elevated portions of the site. No lakes, rivers, or flowing springs are present on the site (USGS, 1989).

1.4 Local Geology and Hydrogeology

The geology of Vieques is characterized by volcanic rocks generally overlain by alluvial deposits and patches of limestone. Volcanic andesites, deposited in a marine environment, were intruded by a quartz-diorite plutonic complex that is exposed over a large percentage of the island. A gradual change in texture from coarse to fine-grained quartz-diorite has been observed from west to east. Limestone occurs in sectors of the north, south, and eastern parts of the island. The most extensive areas of limestone are found on the south coast peninsulas. The limestone is generally soft, yellowish, and well-indurated where

exposed to the atmosphere. The sedimentary deposits consist of a mixture of sand, silt, and clay. The floodplains consist of beach and dune deposits formed by calcite, quartz, volcanic rock fragments, and minor magnetite (USGS, 1989).

The U.S. Department of Agriculture (USDA) Soil Conservation Service *Soil Survey of Humacao Area of Eastern Puerto Rico* (USDA, January 1977) identified four soil types on the western end of Vieques. These soil types included:

1. Coastal beach deposits (Qb)
2. Swamp and marsh deposits (Qs)
3. Alluvial deposits (Qa)
4. Plutonic rock made up largely of granidiorite and quartz diorite (KTd)

The groundwater in this general area is from a single aquifer identified as the Resolución Valley aquifer, occurring only in a small portion of the western part of Vieques Island, located near the Navy water supply wells area. The valley slopes from Mount Pirata toward the Vieques Passage and receives more rainfall than any other area of Vieques. No perennial streams are present in the valley. The geology of the Resolución Valley aquifer consists of sedimentary deposits that overlie a layer of saprolite derived from plutonic rocks. Geophysical surveys show that the average thickness of alluvial deposits is approximately 30 feet (USGS, 1989).

SECTION 2

Technical Approach and Investigation Procedures

This section describes the technical approach developed on the basis of the approved *Background Investigation Work Plan for the Former NASD* (CH2M HILL, December 2000). The selection of background sampling locations was based on a review of aerial photographs, and site reconnaissance observations.

Field investigation protocols were conducted in accordance with the *Master Work Plan* (CH2M HILL, September 2000), which was approved by the Navy and USEPA for Installation Restoration (IR) program activities at the Former NASD (USGS, March 1997). The *Master Work Plan* is a set of documents prepared to address all sampling and analysis activities conducted at the Former NASD, and includes the following documents: Master Field Sampling Plan (FSP), Master Quality Assurance Project Plan (QAPP), Master Investigation-Derived Waste Plan (IDWP), and Master Health and Safety Plan (HASP).

2.1 Existing Data Review

Current and historical aerial photographs were reviewed to ensure that samples were placed in non-impacted areas. This included a review of aerial photographs from 1936, 1937, 1959, 1961, 1962, 1964, 1967, 1973, 1985, 1993, 1994, and 1999. In addition, each sampling location was inspected prior to sampling to verify that no apparent signs of past activities were present at the sample locations. Appendix K presents a comprehensive figure of the identified and suspected past operations located within the Former NASD.

Preliminary activities also included reviews of USGS reports, which documented a 1997 groundwater study of existing water supply wells on the Former NASD. Because the laboratory reporting limits were higher than the reporting limits used for the current IR investigations, the data collected by the USGS are not usable. Therefore, three existing water supply wells (KTD-Navy-01, KTD-Navy-06, and KTD-Navy-07) were sampled as part of this background study. Boring and well construction details were reviewed as part of Work Plan development. These three former Navy water supply wells have metal casings and are screened in the water table aquifer.

As described in the work plan, a site visit was conducted to evaluate the current condition and integrity of the wells before sampling. Well inspections included verification of intact protective casings and well locks, and measurements of total well depths.

2.2 Field Sampling Activities and Procedures

The background sampling efforts were conducted in December 2000, and included the collection of environmental samples from areas believed to be unaffected by historical NASD industrial activities. A total of 66 environmental samples were collected during this

field investigation. The total sample number did not include the required duplicates, blanks, or quality assurance/quality control (QA/QC) samples. The samples were analyzed for metals using the Contract Laboratory Procedures (CLP) Scope of Work (SOW) ILMO4.0 and USEPA Methods E200.7M, 245.2M, and 245.5M. Sample distribution by medium was as follows:

- Eight groundwater samples from the three former Navy water supply wells, one newly installed background well (AOC-K-MW03) under the IR program, and four newly installed background wells
- Twenty-six surface soil samples (collected from the surface to 6 inches below land surface [bls]) and 11 subsurface soil samples (collected from 2 to 6 feet bls)
- Five outcrop plutonic rock samples
- Eight surface water samples and eight sediment samples, with one of each type of sample taken from each of the eight sample locations

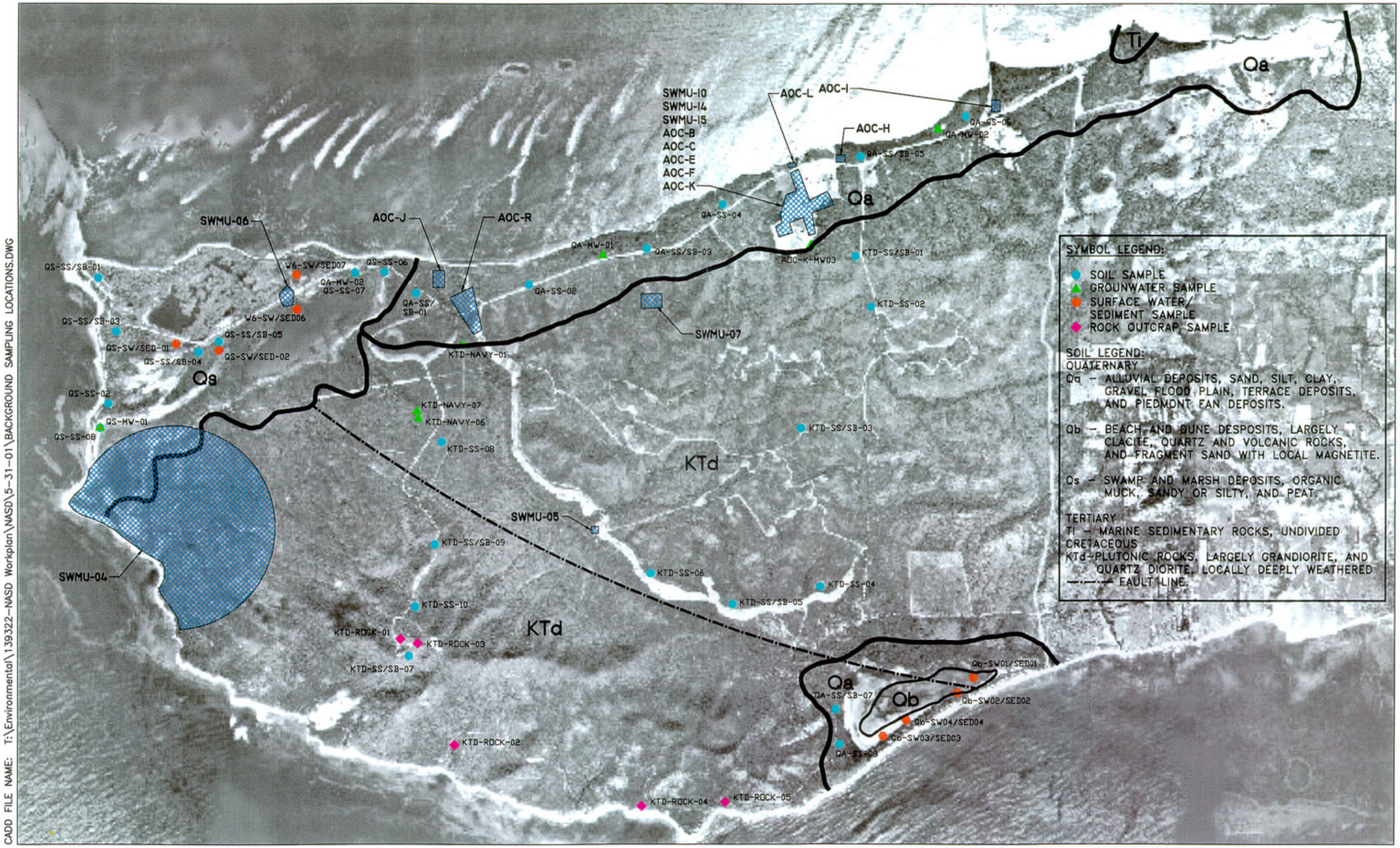
Figure 2-1 identifies the background sample locations. These locations were agreed upon by the USEPA and Navy, who were the only members of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Technical Review Committee (CTC) participating in its meeting on November 9, 2000. Figure 2-1 shows the areas of each soil type in relation to the IR sites.

Table 2-1 summarizes all background study samples, including QA/QC samples. Samples are discussed in greater detail in subsequent sections.

2.2.1 Soil and Rock Samples

As part of the background investigation, surface and subsurface soil samples were collected from the same locations. Surface soil was sampled from the surface to a depth of 6 inches bls using a stainless-steel trowel and mixing bowl. A stainless steel hand auger was used to collect the subsurface soil samples from a depth of 2 to 6 feet bls. Soil sample collection and decontamination of soil sampling equipment were conducted in accordance with the Standard Operating Procedures (SOP) for the collection of soil samples from the Master Work Plan (CH2M HILL, September 2000). Rock samples were collected from outcrop areas using a stainless steel geologist pick. Soils are described in the soil boring logs found in Appendix A.

FIGURE 2-1 BACKGROUND SAMPLE LOCATIONS



CADD FILE NAME: T:\Environmental\139322-NASD Workplan\NASD\5-31-01\BACKGROUND SAMPLING LOCATIONS.DWG

N

0 1000 2000
SCALE: IN FEET

Figure 2-1
BACKGROUND SAMPLE LOCATIONS
NASD, Vieques Island

CH2MHILL

TABLE 2-1
Background Investigation Samples *
NASD, Vieques, Puerto Rico

Parameter	Method	Number of Samples	Equip. Blanks	Field Blanks	Field Duplicates	MS/MS	Total No. of Samples
Groundwater Samples							
TAL Metals (Total)	E200.7M/E245.2M /E245.5M	8	4	1	4	1	18
TAL Metals (Dissolved)	E200.7M/E245.2M /E245.5M	8	4	1	4	1	18
Soil Samples (including rock samples)							
TAL Metals	E200.7M/E245.2M /E245.5M	42	-	-	6	2	50
Surface Water							
TAL Metals	E200.7M/E245.2M /E245.5M	8	-	--	4	1	13
Sediment			--	--	--		--
TAL Metals	E200.7M/E245.2M /E245.5M	8	-	--	4	1	13

* Note: Some of the originally collected samples are not included in the final data set as described in Executive Summary and Section 4.

2.2.2 Groundwater

Groundwater samples were collected from the wells using low-flow purging sampling techniques. A submersible Redi-Flow pump or peristaltic pump was used for groundwater sampling, depending on the depth to groundwater. The preferred method was the peristaltic pump. However, limitations of the pump prevented its use in wells in where the depth to groundwater was greater than 20 feet. Groundwater sampling and decontamination of groundwater sampling equipment were conducted in accordance with the SOPs for the collection of groundwater samples in the Master Work Plan (CH2M HILL, September 2000). Completed groundwater sampling logs are included in Appendix B.

2.2.3 Surface Water and Sediment

Surface water and sediment samples were collected from the same locations. Surface water samples were collected first to minimize sample turbidity. Surface water sampling, sediment sampling, and decontamination of all sampling equipment were conducted in

accordance with the SOPs for the collection of surface water and sediment samples in the *Master Work Plan* (CH2M HILL, September 2000).

2.3 Sample Designation

Sampling locations and collected media from the background investigation were assigned unique designations so that the sampling information and analytical data could be entered into a Geographic Information System (GIS) Data Management system for the Former NASD. Specifications for field data, analytical data, sample identification, and electronic deliverable format are described in the approved *Background Investigation Work Plan* (CH2M HILL, December 2000).

SECTION 3

Field Background Sampling Investigations

3.1 Sampling Locations

Accessible sampling locations were selected to provide representative data demonstrating the geologic variations across the Former NASD while ensuring that samples were received from areas with no apparent past or present human activities. The *Soil Survey of Humacao Area of Eastern Puerto Rico (*USDA, January, 1977*)* identified four soil types on the western end of Vieques, including:

1. Coastal beach deposits (Qb)
2. Swamp and marsh deposits (Qs)
3. Alluvial deposits (Qa)
4. Plutonic rock made up largely of granidiorite and quartz diorite (KTd)

Of these soil types, one IR site is located in soil classified as Qs; 13 IR sites are located in soil classified as Qa; and three IR sites are located in soil classified as KTd. No IR sites are located on the coastal beach deposits.

Soil, groundwater, surface water, and sediment samples were collected from Qs, Qa, and KTd to evaluate the concentrations of metals that commonly occur in the environment for each soil type. In addition, surface water and sediment samples were collected from Qs and Qb since limited surface water bodies are present on the Former NASD. Figure 2-1, presented previously, illustrates the background sample locations. The following subsections describe the sampling methods and rationale for each media.

3.1.1 Soil

To characterize the background soils, samples were collected from the Qa, Qs, and KTd soil types**.** In addition, five samples were collected from outcropping plutonic rocks since most of the deposits are largely made up of weathered plutonic rocks. The soil sampling locations are referenced on Figure 2-1 (presented previously) and again in Appendix K.

Surface soil samples (surface to 6 inches bls) were collected at all proposed background soil sample locations. Corresponding subsurface vadose-zone soil samples (2 to 6 feet bls) were collected at 50 percent of the proposed background surface soil sample locations. These sample depths correspond to the depths of samples collected during the PA/SI. The samples were analyzed for Target Analyte List (TAL) metals using USEPA Methods E200.7 and E245.5 (SOW IML03 or latest version).

3.1.2 Groundwater

Background data for groundwater metals were collected from five newly installed wells (four background wells and one upgradient IR well) and three former water supply wells. Figure 2-1 (presented previously) shows the locations of these wells. Three new background wells were installed in alluvial deposits common to most IR sites, and one was placed in

swamp and marsh deposits in SWMU 6. The upgradient IR well was installed near the interface between plutonic rock and alluvial deposits. The three former Navy water supply wells are located within plutonic bedrock (KTd).

The new background investigation wells were installed using 2-inch-diameter polyvinyl chloride (PVC) well screen and casing in accordance with the procedures outlined in the *Master Work Plan* (CH2M HILL, September 2000). Construction details of existing water supply wells were reviewed and validated prior to use for background sampling. The former water supply wells were screened in plutonic rock at similar depth intervals as the IR monitoring wells at SWMU 4 and SWMU 7. These wells were re-developed prior to implementing the sampling plan.

Well construction logs are included in Appendix C of this report.

3.1.3 Surface Water/Sediment

Six surface water and six sediment samples were collected as part of the background investigation at the locations shown in Figure 2-1. Two surface water samples and two sediment samples were collected from Laguna Kiani, while four surface water samples were collected from Laguna Playa Grande. In addition, data obtained from two surface water samples and two sediment samples identified as samples SW/SED06 and SW/SED07 (previously collected from Laguna Kiani in May, 2000 as part of the SWMU 6 PA/SI investigation) were also used in the background study. These two samples were collected away from SWMU 6 for the purpose of measuring background surface water/sediment quality.

3.2 Site Surveying

Background soil sample locations were spatially located using Global Positioning Satellite (GPS) techniques. The survey established latitude and longitude coordinates for each sample location. In addition, monitoring well elevations (in feet above mean sea level [msl]) were established to the nearest 0.01 foot. Traditional surveying techniques were used to establish well elevations for wells in public works, while GPS techniques were used on remote sites after field activities were completed.

SECTION 4

Background Values Estimation and Sampling Results

Various statistical evaluations can be conducted on the validated data for selection of a representative background data set and values. The rationale for the statistical evaluation is that a single sample result may not represent true background conditions. However, a set of data with an adequate number of samples could provide a range of background concentrations for the various constituents that are representative of a typical background distribution.

Tables 4-1 through 4-7 represent a statistical summary of detected sample parameters for groundwater, surface soil, subsurface soil, combined surface and subsurface soil, rock, surface water, and sediment samples, respectively. The "Average Detect" value included in these tables represent the mean of only detected concentrations, where as the "Arithmetic Mean" value includes detected concentrations and non-detected concentrations at half the detection limit value.

A representative background data set, when developed, may have multiple and varied uses at a site. A site-representative data set can be considered similar to a background data set when the following criteria are similar for both:

- Number of samples per data set from background and the site
- Frequency of detects
- Range of detected concentrations (as presented by boxplots in Appendix F)
- Calculated mean concentrations (see Appendix E, tables)
- Calculated Upper Tolerance Limit 95 percent (UTL95%) and upper 95 percent confidence limit (UCL95%) concentrations (see Appendix E and Tables 4-8 to 4-12)

Individual data points (point-estimates or individual sample result) from a site should be compared to background UTL95% values. Alternatively, when comparing a site maximum detected concentration with a background value to determine whether the site has been affected by the NASD operations, an upper-bound (maximum) detected value in the background is useful. Both UTL95% and UCL95% values can be used for this purpose.

Methods used for estimating the background concentrations are recommended by the USEPA. Details of the statistical tests conducted and results produced are presented in Appendix F. USEPA guidance recommends use of UTL95% concentrations as a background data set. USEPA, during its review, recommended inclusion of UCL95% estimates for future site comparisons. Thus, both UTL95% and UCL95% concentrations estimated following USEPA guidance are included in Tables 4-8 through 4-12.

TABLE 4-1
Statistical Summary of Detected Groundwater Sample Parameters
Former NASD Background Analysis

Constituent	Units	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Average Detect	Arithmetic Mean*	Minimum Non-detect Value	Maximum Non-detect Value
Aluminum	µg/L	4	100%	130	3,500	1,645	1,645	--	--
Antimony	µg/L	5	40%	5.1	5.2	5.2	2.8	1.2	1.2
Arsenic	µg/L	5	0%	--	--	--	1.5	1.5	1.5
Barium	µg/L	5	100%	180	960	398	398	--	--
Beryllium	µg/L	5	40%	1.4	1.8	1.6	0.74	0.17	0.17
Cadmium	µg/L	5	20%	1.0	1.0	1.0	0.31	0.14	0.14
Calcium	µg/L	5	100%	120,000	660,000	382,000	382,000	--	--
Chromium, Total	µg/L	5	80%	3.7	6.8	5.3	4.3	0.44	0.44
Cobalt	µg/L	5	80%	5.4	20	12	9.2	0.22	0.22
Copper	µg/L	5	80%	2.8	15	8.6	6.9	0.40	0.40
Iron	µg/L	5	100%	480	4,800	2,616	2,616	--	--
Lead	µg/L	5	0%	--	--	--	0.80	0.80	0.80
Magnesium	µg/L	3	100%	76,000	290,000	172,000	172,000	--	--
Manganese	µg/L	5	100%	400	17,000	6,022	6,022	--	--
Mercury	µg/L	5	0%	--	--	--	0.013	0.013	0.013
Nickel	µg/L	5	100%	2.4	19	7.5	7.5	--	--
Potassium	µg/L	4	100%	6,000	490,000	140,500	140,500	--	--
Selenium	µg/L	5	0%	--	--	--	2.3	2.3	2.3
Silver	µg/L	5	0%	--	--	--	0.29	0.29	0.29
Sodium	µg/L	2	100%	210,000	350,000	280,000	280,000	--	--
Thallium	µg/L	5	80%	4.8	18	9.4	7.9	1.7	1.7
Vanadium	µg/L	5	100%	3.5	75	23	23	--	--
Zinc	µg/L	3	33%	60	60	60	22	2.5	2.5
Aluminum, Dissolved	µg/L	5	0%	--	--	--	48	48	48
Antimony, Dissolved	µg/L	5	40%	3.8	9.1	6.5	3.3	1.2	1.2
Arsenic, Dissolved	µg/L	5	20%	5.5	5.5	5.5	2.3	1.5	1.5
Barium, Dissolved	µg/L	5	100%	120	870	364	364	--	--
Beryllium, Dissolved	µg/L	5	40%	1.0	2.2	1.6	0.74	0.17	0.17
Cadmium, Dissolved	µg/L	5	20%	1.1	1.1	1.1	0.33	0.14	0.14
Calcium, Dissolved	µg/L	5	100%	110,000	660,000	386,000	386,000	--	--
Chromium, Total, Dissolved	µg/L	5	40%	2.9	4.6	3.8	1.8	0.44	0.44
Cobalt, Dissolved	µg/L	5	60%	5.5	11	7.4	4.5	0.22	0.22
Copper, Dissolved	µg/L	5	0%	--	--	--	0.40	0.40	0.40
Iron, Dissolved	µg/L	5	60%	410	490	440	269	13	13
Lead, Dissolved	µg/L	5	0%	--	--	--	0.80	0.80	0.80
Magnesium, Dissolved	µg/L	3	100%	71,000	310,000	177,000	177,000	--	--
Manganese, Dissolved	µg/L	5	100%	190	18,000	6,218	6,218	--	--
Mercury, Dissolved	µg/L	5	0%	--	--	--	0.013	0.013	0.013
Nickel, Dissolved	µg/L	5	80%	2.1	12	4.9	4.0	0.47	0.47
Potassium, Dissolved	µg/L	4	100%	5,800	400,000	119,700	119,700	--	--
Selenium, Dissolved	µg/L	5	0%	--	--	--	2.3	2.3	2.3
Silver, Dissolved	µg/L	5	0%	--	--	--	0.28	0.28	0.29
Sodium, Dissolved	µg/L	2	100%	200,000	360,000	280,000	280,000	--	--
Thallium, Dissolved	µg/L	5	60%	5.5	16	9.5	6.4	1.7	1.7
Vanadium, Dissolved	µg/L	5	100%	2.8	32	9.7	9.7	--	--
Zinc, Dissolved	µg/L	3	33%	15	15	15	6.7	2.5	2.5

Note:
* Arithmetic Mean includes non-detects at one-half the detection limit, and represents the detection limit value when all samples are non-detects

TABLE 4-2
Statistical Summary of Detected Surface Soil Sample Parameters
Former NASD Background Analysis

Parameter	Units	Number of Samples	Frequency of Detection	Minimum Non-Detect Value	Maximum Non-Detect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean*	Geometric Mean	Standard Deviation
Aluminum	mg/kg	26	100.0%	--	--	1,900	24,000	9,212	7,540	5,530
Antimony	mg/kg	26	65.4%	0.26	0.35	0.35	2.3	0.65	0.56	0.44
Arsenic	mg/kg	26	80.8%	0.31	0.39	0.57	2.2	0.89	0.78	0.48
Barium	mg/kg	26	100.0%	--	--	6.7	190	62	45	48
Beryllium	mg/kg	26	80.8%	0.034	0.041	0.13	0.41	0.19	0.16	0.10
Cadmium	mg/kg	26	0.0%	0.028	0.040	--	--	0.033	-3.421	0.0034
Calcium	mg/kg	25	100.0%	--	--	1,900	210,000	26,728	10,722	46,273
Chromium, Total	mg/kg	26	100.0%	--	--	2.2	57	15	8.3	17
Cobalt	mg/kg	26	100.0%	--	--	1.0	22	8.1	5.9	5.6
Copper	mg/kg	26	100.0%	--	--	2.6	68	24	18	16
Iron	mg/kg	26	100.0%	--	--	3,000	38,000	16,385	13,640	8,605
Lead**	mg/kg	25	100.0%	--	--	1.1	7	3.6	3.2	2.4
Magnesium	mg/kg	26	100.0%	--	--	1,200	16,000	4,112	3,311	3,254
Manganese	mg/kg	26	100.0%	--	--	48	1,200	507	377	326
Mercury	mg/kg	26	100.0%	--	--	0.0037	0.031	0.014	0.012	0.0077
Nickel	mg/kg	26	100.0%	--	--	0.67	31	6.7	3.5	8.5
Potassium	mg/kg	26	100.0%	--	--	380	1,700	937	872	351
Selenium	mg/kg	26	19.2%	0.48	0.68	0.73	2.0	0.66	0.62	0.32
Silver	mg/kg	26	0.0%	0.059	0.084	--	--	0.069	-2.674	0.0072
Sodium	mg/kg	26	100.0%	--	--	25	4,000	762	240	1,275
Thallium	mg/kg	26	11.5%	0.35	0.50	0.45	0.67	0.43	0.42	0.066
Vanadium	mg/kg	26	100.0%	--	--	9.0	120	48	40	27
Zinc	mg/kg	26	100.0%	--	--	6.0	71	32	26	18

Notes:

* Arithmetic Mean includes non-detects at one-half the detection limit, and represents the detection limit value when all samples are non-detects

** Lead result from sample with Station ID QS-SS05 (sample ID BKG010) was not included in the analysis

TABLE 4-3
Statistical Summary of Detected Subsurface Soil Sample Parameters
Former NASD Background Analysis

Parameter	Units	Number of Samples	Frequency of Detection	Minimum Non-Detect Value	Maximum Non-Detect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean*	Geometric Mean	Standard Deviation
Aluminum	mg/kg	11	100.0%	--	--	1,600	29,000	10,427	7,676	8,208
Antimony	mg/kg	11	81.8%	0.30	0.31	0.48	1.4	0.72	0.65	0.35
Arsenic	mg/kg	11	72.7%	0.31	0.37	0.71	2.5	1.0	0.85	0.67
Barium	mg/kg	11	100.0%	--	--	6.4	320	71	35	93
Beryllium	mg/kg	11	90.9%	0.043	0.043	0.13	0.46	0.26	0.22	0.12
Cadmium	mg/kg	11	0.0%	0.029	0.039	--	--	0.033	-3.41	0.0038
Calcium	mg/kg	10	100.0%	--	--	1,700	200,000	37,650	11,398	63,817
Chromium, total	mg/kg	11	100.0%	--	--	3.6	74	19	11	23
Cobalt	mg/kg	11	100.0%	--	--	1.2	25	8.4	5.7	7.2
Copper	mg/kg	11	100.0%	--	--	1.8	46	22	16	15
Iron	mg/kg	11	100.0%	--	--	2,500	39,000	18,064	13,394	12,030
Lead	mg/kg	11	100.0%	--	--	0.30	5.9	2.5	1.9	1.7
Magnesium	mg/kg	11	100.0%	--	--	1,300	8,300	4,227	3,754	1,988
Manganese	mg/kg	11	100.0%	--	--	55	970	409	282	311
Mercury	mg/kg	11	63.6%	0.0027	0.0032	0.0048	0.025	0.0089	0.0067	0.0071
Nickel	mg/kg	11	100.0%	--	--	0.77	40	8.3	4.1	12
Potassium	mg/kg	11	100.0%	--	--	500	1,600	873	831	301
Selenium	mg/kg	11	27.3%	0.49	0.66	0.68	1.1	0.66	0.63	0.21
Silver	mg/kg	11	0.0%	0.061	0.082	--	--	0.070	-2.67	0.0080
Sodium	mg/kg	11	100.0%	--	--	81	6,300	1,795	724	2,239
Thallium	mg/kg	11	0.0%	0.36	0.49	--	--	0.42	-0.88	0.049
Vanadium	mg/kg	11	100.0%	--	--	9.8	130	54	42	38
Zinc	mg/kg	11	100.0%	--	--	3.5	36	21	16	12

Note:

* Arithmetic Mean includes non-detects at one-half the detection limit, and represents the detection limit value when all samples are non-detects

TABLE 4-4
Statistical Summary of Detected Combined Surface and Subsurface Soil Sample Parameters
Former NASD Background Analysis

Parameter	Units	Number of Samples	Frequency of Detection	Minimum Non-Detect Value	Maximum Non-Detect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean*	Geometric Mean	Standard Deviation
Aluminum	mg/kg	37	100.0%	--	--	1,600	29,000	9,573	7,580	6,346
Antimony	mg/kg	37	70.3%	0.26	0.35	0.35	2.3	0.67	0.58	0.41
Arsenic	mg/kg	37	78.4%	0.31	0.39	0.57	2.5	0.93	0.80	0.54
Barium	mg/kg	37	100.0%	--	--	6.4	320	65	42	63
Beryllium	mg/kg	37	83.8%	0.034	0.043	0.13	0.46	0.21	0.17	0.11
Cadmium	mg/kg	37	0.0%	0.028	0.040	--	--	0.033	-3.42	0.0035
Calcium	mg/kg	35	100.0%	--	--	1,700	210,000	29,849	10,911	51,132
Chromium, Total	mg/kg	37	100.0%	--	--	2.2	74	16	9.1	19
Cobalt	mg/kg	37	100.0%	--	--	1.0	25	8.2	5.8	6.0
Copper	mg/kg	37	100.0%	--	--	1.8	68	23	17	15
Iron	mg/kg	37	100.0%	--	--	2,500	39,000	16,884	13,567	9,604
Lead**	mg/kg	36	100.0%	--	--	0.30	7	3.3	2.9	2.3
Magnesium	mg/kg	37	100.0%	--	--	1,200	16,000	4,146	3,437	2,908
Manganese	mg/kg	37	100.0%	--	--	48	1,200	478	346	321
Mercury	mg/kg	37	89.2%	0.0027	0.0032	0.0037	0.031	0.013	0.010	0.0078
Nickel	mg/kg	37	100.0%	--	--	0.67	40	7.2	3.6	9.4
Potassium	mg/kg	37	100.0%	--	--	380	1,700	918	860	334
Selenium	mg/kg	37	21.6%	0.48	0.68	0.68	2.0	0.66	0.63	0.28
Silver	mg/kg	37	0.0%	0.059	0.084			0.069	-2.67	0.0073
Sodium	mg/kg	37	100.0%	--	--	25	6,300	1,069	333	1,658
Thallium	mg/kg	37	8.1%	0.35	0.50	0.45	0.67	0.42	0.42	0.061
Vanadium	mg/kg	37	100.0%	--	--	9.0	130	50	40	30
Zinc	mg/kg	37	100.0%	--	--	3.5	71	29	23	17

Notes:

* Arithmetic Mean includes non-detects at one-half the detection limit, and represents the detection limit value when all samples are non-detects

** Results from Station ID QA-SS05 (sample BKG010) were not included in the analysis

TABLE 4-5
Statistical Summary of Detected Rock Sample Parameters
Former NASD Background Analysis

Parameter	Units	Number of Samples	Frequency of Detection	Minimum Non-Detect	Maximum Non-Detect	Minimum Detect	Maximum Detect	Arithmetic Mean*	Standard Deviation
Aluminum	mg/kg	6	100%	--	--	2,000	5,600	4,017	1,351
Antimony	mg/kg	6	0%	0.24	0.25	--	--	0.24	0.0041
Arsenic	mg/kg	6	0%	0.29	0.30	--	--	0.29	0.0041
Barium	mg/kg	6	100%			18	160	70	52
Beryllium	mg/kg	6	33%	0.033	0.033	0.16	0.20	0.082	0.077
Cadmium	mg/kg	6	0%	0.027	0.028	--	--	0.027	0.0004
Calcium	mg/kg	6	100%	--	--	2,000	38,000	8,717	14,360
Chromium, total	mg/kg	6	100%	--	--	0.86	2.5	1.6	0.61
Cobalt	mg/kg	6	100%	--	--	2.2	6.9	4.7	1.7
Copper	mg/kg	6	100%	--	--	2.5	59	17	21
Iron	mg/kg	6	100%	--	--	4,800	10,000	8,300	2,426
Lead	mg/kg	6	83%	0.16	0.16	0.96	3.0	1.4	0.99
Magnesium	mg/kg	6	100%	--	--	910	4,300	2,935	1,178
Manganese	mg/kg	6	100%	--	--	320	840	607	214
Mercury	mg/kg	6	50%	0.0025	0.0026	0.0030	0.0063	0.0035	0.0015
Nickel	mg/kg	6	100%	--	--	0.69	2.5	1.3	0.69
Potassium	mg/kg	6	100%	--	--	170	530	345	136
Selenium	mg/kg	6	0%	0.46	0.47	--	--	0.46	0.0041
Silver	mg/kg	6	0%	0.057	0.058	--	--	0.057	0.0005
Sodium	mg/kg	6	100%	--	--	54	670	294	278
Thallium	mg/kg	6	0%	0.34	0.35	--	--	0.34	0.0041
Vanadium	mg/kg	6	100%	--	--	7.0	24	19	6.9
Zinc	mg/kg	6	100%	--	--	12	43	32	12

Note:

* Arithmetic Mean includes non-detects at one-half the detection limit, and represents the detection limit value when all samples are non-detects

TABLE 4-6
Statistical Summary of Detected Surface Water Sample Parameters
Former NASD Background Analysis

Parameter	Units	Number of Detects	Number of Samples	Frequency of Detection	Minimum Non-Detect Value	Maximum Non-Detect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean*
Aluminum	µg/L	2	2	100%	--	--	530	5000	2,765
Antimony	µg/L	1	2	50%	1.2	1	3.3	3.3	2.3
Arsenic	µg/L	1	2	50%	1.5	1	15.0	15.0	8
Barium	µg/L	2	2	100%	--	--	17	37	27
Beryllium	µg/L	2	2	100%	--	--	1.1	2.5	1.8
Cadmium	µg/L	1	2	50%	--	--	1.1	1.1	0.6
Calcium	µg/L	2	2	100%	--	--	390,000	480,000	435,000
Chromium, total	µg/L	1	2	50%	0.4	0.4	4.3	4.3	2.4
Cobalt	µg/L	1	2	50%	0.2	0.2	2.0	2.0	1.1
Copper	µg/L	1	2	50%	--	--	14	14	7.2
Iron	µg/L	2	2	100%	--	--	590	4900	2,745
Lead	µg/L	0	2	0%	0.8	0.8	--	--	ND(0.8)
Manganese	µg/L	2	2	100%	--	--	28	85	57
Mercury	µg/L	0	2	0%	--	--	--	--	0.013
Nickel	µg/L	2	2	100%	--	--	3	5.2	4
Selenium	µg/L	0	2	0%	2	2	--	--	ND(2.3)
Silver	µg/L	0	2	0%	0.3	0.3	--	--	ND(0.285)
Thallium	µg/L	2	2	100%	--	--	5.1	9.7	7.4
Vanadium	µg/L	2	2	100%	--	--	3	8	6
Zinc	µg/L	0	2	0%	3	3	--	--	ND(2.5)

Notes:

ND(XX) - Constituent not detected (arithmetic mean includes non-detects at the detection limit)

* Arithmetic Mean includes non-detects at one-half the detection limit, and represents the detection limit value when all samples are non-detects

TABLE 4-7
Statistical Summary of Detected Sediment Sample Parameters
Former NASD Background Analysis

Parameter	Units	Number of Samples	Frequency of Detection	Minimum Non-Detect Value	Maximum Non-Detect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean*	Geometric Mean	Standard Deviation
Aluminum	mg/kg	6	100.0%	--	--	2,600	10,000	5,867	5,016	3,479
Antimony	mg/kg	6	16.7%	0.36	1.3	0.59	0.59	0.61	0.54	0.35
Arsenic	mg/kg	6	0.0%	0.44	1.5	--	--	0.69	-0.48	0.41
Barium	mg/kg	6	100.0%	--	--	6.9	69	28	20	25
Beryllium	mg/kg	6	50.0%	0.051	0.17	0.17	0.24	0.16	0.13	0.081
Cadmium	mg/kg	6	0.0%	0.041	0.14	--	--	0.064	-2.86	0.038
Calcium	mg/kg	6	100.0%	--	--	8,900	160,000	79,483	59,991	49,747
Chromium, total	mg/kg	6	100.0%	--	--	2.3	7.8	4.5	4.2	2.0
Cobalt	mg/kg	6	100.0%	--	--	0.96	4.7	2.5	2.1	1.7
Copper	mg/kg	6	100.0%	--	--	3.3	26	14	11	9.6
Iron	mg/kg	6	100.0%	--	--	2,300	14,000	7,300	6,007	4,749
Lead	mg/kg	6	100.0%	--	--	0.56	8.0	4.4	3.2	3.0
Magnesium	mg/kg	6	100.0%	--	--	2,200	14,000	8,317	7,110	4,344
Manganese	mg/kg	6	100.0%	--	--	24	350	118	81	121
Mercury	mg/kg	6	33.3%	0.0038	0.0054	0.013	0.052	0.014	0.0078	0.019
Nickel	mg/kg	6	100.0%	--	--	0.50	4.1	1.7	1.3	1.3
Potassium	mg/kg	6	100.0%	--	--	1,300	5,200	2,867	2,465	1,651
Selenium	mg/kg	6	33.3%	0.72	2.4	0.78	1.1	1.1	1.0	0.64
Silver	mg/kg	6	0.0%	0.086	0.30	--	--	0.14	-2.11	0.082
Sodium	mg/kg	6	100.0%	--	--	7,800	67,000	22,217	16,406	22,493
Thallium	mg/kg	6	0.0%	0.51	1.8	--	--	0.81	-0.32	0.49
Vanadium	mg/kg	6	100.0%	--	--	7.2	40	21	17	13
Zinc	mg/kg	6	100.0%	--	--	4.9	48	22	17	16

Note:

* Arithmetic mean includes non-detects at 1/2 detection limit, and represents the detection limit value when all samples are non-detects

Table 4-8

Vieques Soil Sample Background Concentration Estimates

NASD Background Analysis

		Combined Soil Data							QS Soil Type							KTD Soil Type							QA Soil Type						
Parameter	**Units**	**Dist**	**N**	**Min**	**Max**	**Mean**	**UTL**	**UCL**	**Dist**	**N**	**Min**	**Max**	**Mean**	**UTL**	**UCL**	**Dist**	**N**	**Min**	**Max**	**Mean**	**UTL**	**UCL**	**Dist**	**N**	**Min**	**Max**	**Mean**	**UTL**	**UCL**
Aluminum	mg/kg	L	37	1,600	29,000	9,573	29,000	* **12,821**	L	12	1,600	11,000	3,875	11,000	5,416	N	13	6,900	18,000	11,346	18,000	* 13,053	N	12	5,000	29,000	13,350	29,000	* 17,291
Antimony	mg/kg	NP	37	0.35	2.3	0.67	2.3	**0.8**	N	12	0.35	1.0	0.53	1.0	* 0.6	N	13	0.52	1.4	0.68	1.4	* 0.8	L	12	0.59	2.3	0.81	2.3	1.0
Arsenic	mg/kg	L	37	0.57	2.5	0.93	2.5	* **1.1**	N	12	0.70	2.5	1.3	2.5	* 1.6	N	13	0.57	1.2	0.72	1.2	* 0.9	L	12	0.66	2.2	0.78	2.2	1.7
Arsenic (SUBSURFACE SOIL)	mg/kg	N	11	0.71	2.5	1.0	2.5	**1.4**	N	4	1.1	2.5	1.7	2.5	* NA	NP	3	0.87	1.0	0.96	1.0	NA	N	4	0.71	0.71	0.43	0.7	* NA
Arsenic (SURFACE SOIL)	mg/kg	L	26	0.57	2.2	0.89	2.2	**1.0**	N	8	0.70	2.1	1.1	2.1	* NA	N	10	0.57	1.2	0.65	1.2	* 0.9	N	8	0.66	2.2	0.95	2.2	* NA
Barium	mg/kg	L	37	6.4	320	65	320	* **104**	N	12	6.4	24	15	24	* 18	L	13	20	190	84	190	129	L	12	30	320	94	320	145
Beryllium	mg/kg	N	37	0.13	0.46	0.21	0.45	**0.24**	N	12	0.13	0.41	0.23	0.41	* 0.30	N	13	0.13	0.27	0.17	0.27	* 0.02	N	12	0.13	0.46	0.24	0.46	* 0.29
Cadmium	mg/kg	NP	37	ND	ND	0.033	0.040	**0.017**	NP	12			0.036	0.040	* 0.019 *	NP	13	--	--	0.031	0.036	* 0.016 *	NP	12	--	--	0.033	0.036	* 0.017
Calcium	mg/kg	NP	35	1,700	210,000	29,849	210,000	**44,232**	L	10	25,000	210,000	84,000	210,000	102,366	N	13	2,800	9,100	4,838	9,100	* 5,742	L	12	1,700	45,000	11,817	45,000	31,602
Chromium, TOTAL	mg/kg	NP	37	2.2	74	16	74	**21**	NP	12	2.6	48	9.4	48	15	L	13	2.2	52	13	52	29	L	12	4.5	74	26	74	65
Cobalt	mg/kg	NP	37	1.0	25	8.2	25	**10**	NP	12	1.0	13	2.9	13	5	N	13	6.7	13	9.1	13	* 10	N	12	4.3	25	13	33	* 16
Copper	mg/kg	NP	37	1.8	68	23	68	**27**	L	12	1.8	35	9.8	35	20	N	13	15	47	28	47	* 34	N	12	9.1	68	31	68	* 40
Iron	mg/kg	N	37	2,500	39,000	16,884	37,531	**19,549**	L	12	2,500	18,000	6,475	18,000	9,350	N	13	14,000	28,000	20,692	28,000	* 23,118	N	12	12,000	39,000	23,167	39,000	* 27,755
Lead	mg/kg	L	36	0.30	6.9	3.3	6.9	* **4**	N	12	0.30	6.9	2.8	6.9	* 4	N	13	1.1	5.7	3.2	5.7	* 4	N	11	1.4	6	3.96	6	* 4.76
Magnesium	mg/kg	L	37	1,200	16,000	4,146	12,834	**5,087**	L	12	1,300	11,000	3,842	11,000	6,192	N	13	1,500	7,200	3,985	7,200	* 4,810	L	12	1,200	16,000	4,625	16,000	8,354
Manganese	mg/kg	N	37	48	1,200	478	1,167	**0,567**	L	12	48	360	132	360	202	N	13	290	1,200	626	1,200	* 738	N	12	260	1,200	663	1,200	* 808
Mercury	mg/kg	L	37	0.0037	0.031	0.013	0.031	* **0.014**	N	12	0.0037	0.016	0.0091	0.016	* 0.011	N	13	0.0037	0.024	0.011	0.024	* 0.014	N	12	0.0048	0.031	0.018	0.031	* 0.022
Nickel	mg/kg	NP	37	0.67	40	7.2	40	**10**	NP	12	0.67	26	3.9	26	7	L	13	1.3	18	5.1	18	10	L	12	1.8	40	13	40	38
Potassium	mg/kg	L	37	380	1,700	918	1,700	* **1,031**	L	12	380	1,700	859	1,700	1,150	N	13	520	1,400	875	1,400	* 1,019	N	12	570	1,400	1,023	1,400	* 1,174
Selenium	mg/kg	NP	37	0.68	2.0	0.66	2.0	**0.5**	NP	12			0.61	0.68	* 0.32 *	NP	13	0.73	0.73	0.54	0.73	0.35	L	12	0.68	2.0	0.85	2.0	0.99
Silver	mg/kg	NP	37	ND	ND	0.069	0.084	**0.036**	NP	12			0.075	0.084	* 0.040 *	NP	13			0.065	0.076	* 0.034 *	NP	12	--	--	0.069	0.077	* 0.036
Sodium	mg/kg	NP	37	25	6,300	1,069	6,300	**1,519**	N	12	300	6,300	2,803	6,300	* 3,836	L	13	25	310	116	310	0,204	L	12	50	1,200	367	1,200	0,881
Thallium	mg/kg	NP	37	0.45	0.67	0.42	0.67	**0.26**	NP	12			0.45	0.50	* 0.23 *	N	13	0.45	0.46	0.39	0.46	* 0.28	NP	12	0.67	0.67	0.43	0.67	0.30
Vanadium	mg/kg	L	37	9.0	130	50	130	* **66**	L	12	9.0	63	22	63	33	N	13	29	80	53	80	* 61	N	12	34	130	73	130	* 90
Zinc	mg/kg	N	37	3.5	71	29	65	**33**	L	12	3.5	31	12	31	19	N	13	23	53	36	53	* 40	N	12	17	71	38	71	* 47

Note:

* Value exceeds the maximum detected value, it is the detection limit value when all samples are non-detects

NA = not available -- sample size too small

ND-- Not detected in background soil media

Range of detection limits for pooled samples without detects:

Cadmium: 0.028-0.04 mg/kg

Silver: 0.059-0.084 mg/kg

Dist = type of data distribution

95th UTL(UCL) = 95th percentile Upper Tolerance Limit (95% upper confidence limit)

NP = nonparametric

N = normal

L = lognormal

4.1 Statistical Procedures Used and Their Purpose

Background data from NASD were evaluated through a series of statistical procedures described in the following paragraphs. Analytical data are included in Appendix D. Appendix E presents the results of the statistical analysis for each sample medium. Appendix G presents a more detailed account of the statistical procedures. Figure 4-1 presents a flow chart of the statistical evaluation process.

1. Internal consistency evaluation was performed to determine whether the data reproducibility is adequate in the analytical results. All background data were used for the final data analysis, since the relative percentage differences (RPD) between normal samples and duplicate samples were within acceptable limits for all the data (see Appendix H).

2. The graphical data distribution type was determined through descriptive statistics using the boxplots method. These boxplots also identified whether any outliers existed in the data sets. Results indicated that no extreme values existed that required elimination from consideration as representative of background.

3. Following the submittal of the Draft Background Investigative Report, field review of background sample locations was conducted in July 2002 by representatives of USEPA, EQB, DOI, MOV, and the community. The review comments and discussions with the CTC resulted in elimination of some of the data points from the background data set for surface soil, groundwater, and surface water (see Appendix J). No changes, however, were made to the subsurface soil, rock samples, or sediment data sets. Six sediment samples (four from Laguna Playa Grande and two from Laguna Kiani) were included in the background data set. Changes made based on elimination of some of the data for surface soil, groundwater, and surface water samples are summarized here, and presented in the tables in this section.

   - The surface soil sample (QA-SS05) had lead concentrations that could be considered an "outlier." Therefore, this surface soil sample value for lead was eliminated from final background data evaluation, and all other data were included for establishing background values for soils.

   - Some of the groundwater data were removed from the background data set from former water supply wells because of the presence of metal casings on these wells. All of these wells are located in soil type KTd. Wells not included in the data analysis were KTD-NAVY01, KTD-NAVY07, and KTD-NAVY08.

   - Surface water samples from Laguna Playa Grande detected elevated concentrations for some of the inorganic constituents, possibly as a result of high turbidity in the water samples. Therefore, all surface water samples from Laguna Playa Grande were eliminated from inclusion in the background data set. Since all sediment samples from this Laguna had similar inorganic levels, all six sediment samples were retained as representative of background.

FIGURE 4-1 DECISION FLOWCHART FOR UTL CALCULATIONS

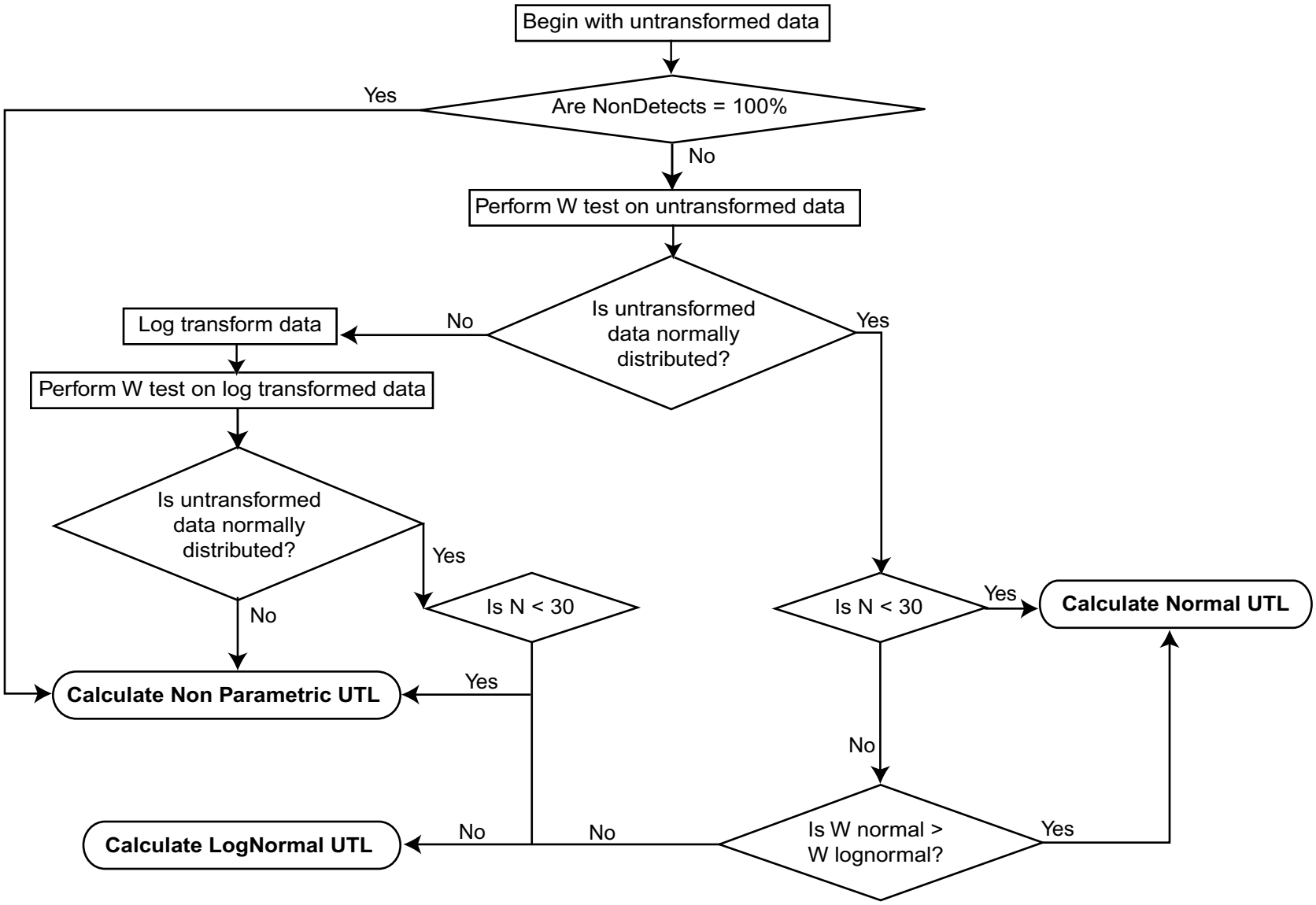


FIGURE 4-1
Decision Flowchart for UTL Calculations

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4. In accordance with USEPA guidance, the theoretical data distribution type was determined using the Shapiro-Wilk test method, which calculated a W-statistic value. This W-statistic was used to compare against a critical value from a look-up table. This test helped determine whether data were normal, log normal, or non-normal in distribution using a theoretical distribution standard. All three distribution types were identified for individual constituents and matrix types. Therefore, UTL95% and UCL95% values were calculated according to the type of distribution identified in procedures (see Appendix G for procedure description and Appendix E for results of the statistical analysis).

5. Analysis of variance (ANOVA) tests were used to determine whether all soil data would be combined into one data set or kept separately. The differences and similarities in background constituent concentrations between different soil types, between soil depths, and groundwater data from wells finished in different soil types were evaluated using a Mann-Whitney test (two sample data sets) and a Kruskal-Wallis test (more than two data sets). Soil data were combined, since only two constituents showed a difference in one or two soil types. Groundwater showed a significant difference between natural soil formations from which water was collected. During review of the draft report, comments indicated that some of the variability might have been attributed to metal casings used for the Navy wells. Therefore, data from the three former Navy supply wells were removed from the background data analysis. All the remaining five background wells with PVC casings were retained in one data set for groundwater.

6. A UTL95% concentration was calculated per media (i.e., soil, rock, sediments, surface water and groundwater) and per constituent detected for each media, according to the results of the tests described herein.

7. A UCL95% value also was estimated for the background data sets, where sample size was adequate, using data distribution test results described herein.

A statistical estimate based on the data distribution type was selected for future comparisons with single data points or maximum site concentrations for various sites within the Former NASD. The ULT95% value was estimated for use as background value for point estimate comparisons with the site data. A UCL95% value also may be used for comparison with single sample results or with UCL95% estimates for the site data. The type of statistical procedures used for UTL95% and UCL95% estimates are either normal (when data are normally distributed), log normal (when log-transformed data are normally distributed), or non-parametric procedures (when data distribution type could not be determined by the statistical tests). The procedure selected and used per constituent is listed adjacent to the value in Tables 4-8 through 4-12.

4.2 Summary Statistics for Final Data Set

Appendix J presents all the comments received from the regulators and the Technical Subcommittee and the ultimate responses made by consensus to these comments. The executive summary includes a synopsis of these decisions. Based on these decisions, a final data set was developed to represent background conditions at the Former NASD. A final data set included the soil data collected from background locations within the Former

NASD, except for one surface soil lead result from location QA-SS05. Groundwater data from three former Navy water supply wells (KTD-NAVY01, KTD-NAVY07, and KTD-NAVY08) were not included in the final background data set because of potential for metal well casings to have influenced metal concentrations in the water samples. Laguna Playa Grande surface water samples reported elevated metals concentrations, which were likely attributable to elevated turbidity levels. Sediment samples from Laguna Playa Grande were similar to other sediment samples from Laguna Kiani, and therefore all four sediment samples were retained as background sediment samples. Four samples were originally planned for collection from Laguna Kiani. However, because of their proximity to SWMU 6, only two were collected as part of the background data set (see Appendix K). Tables 4-8 through 4-12 present the background data by media. The analytical data used in this evaluation are included in Appendix D. Sampling locations were presented previously in Figure 2-1 and Appendix K. Appendix E contains a technical memorandum discussing detailed results of the statistical analysis.

4.2.1 Soils

Surface soils were represented by the first 6 inches of soil. A total of 26 surface soil samples were collected for analysis for inorganic constituents. For lead analysis, only 25 samples were available because sample QA-SS05 was not included in the background data set. Common soil inorganic constituents were measured in soil samples collected from soil types KTd, QS, and QA. The UTL95% and UCL95% concentrations were estimated for the 21 inorganic elements detected in soil matrix. Table 4-8 includes a statistical summary of the detected concentrations including the minimum, mean, maximum, UTL95%, and UCL95% values.

The ANOVA tests indicated that soil constituent concentrations in surface and subsurface soils were similar for most elements. However, approximately 15 constituents appeared to be present in different concentrations when compared among soil types. For constituents indicating a difference in concentration levels among the three soil types, a separate listing of UTL95%, UCL95% and mean values also are provided in Table 4-8.

A background (UTL95%) value was not estimated for constituents not detected in any samples. A detection limit value is provided, however, for comparison with site data analytical results and detection limits.

4.2.2 Rock

A total of five samples and one field duplicate sample were collected from plutonic rock that is part of the surface formation within Vieques Island. Because all of the rock sample data were one population, no ANOVA tests were conducted for this data. Distribution types were determined, however, and are listed in Table 4-9. Table 4-9 also summarizes the data and the recommended background values (UTL95%).

TABLE 4-9
Vieques Rock Sample Background Estimates
NASD Background Analysis

Parameter	Units	Dist.	Sample Number	Minimum Detect	Maximum Detect	Mean	UTL	
Aluminum	mg/kg	N	6	2,000	5,600	4,017	5,600	*
Antimony	mg/kg	NP	6	--	--	0.24	0.25	*
Arsenic	mg/kg	NP	6	--	--	0.29	0.30	*
Barium	mg/kg	N	6	18	160	70	160	*
Beryllium	mg/kg	NP	6	0.16	0.20	0.082	0.2	
Cadmium	mg/kg	NP	6	--	--	0.027	0.028	*
Calcium	mg/kg	NP	6	2,000	38,000	8,717	38,000	
Chromium, total	mg/kg	N	6	0.86	2.5	1.6	2.5	*
Cobalt	mg/kg	N	6	2.2	6.9	4.7	6.9	*
Copper	mg/kg	L	6	2.5	59	17	59	
Iron	mg/kg	NP	6	4,800	10,000	8,300	10,000	
Lead	mg/kg	N	6	0.96	3.0	1.4	3.0	*
Magnesium	mg/kg	N	6	910	4,300	2,935	4,300	*
Manganese	mg/kg	N	6	320	840	607	840	*
Mercury	mg/kg	L	6	0.0030	0.0063	0.0035	0.0063	
Nickel	mg/kg	N	6	0.69	2.5	1.3	2.5	*
Potassium	mg/kg	N	6	170	530	345	530	*
Selenium	mg/kg	NP	6	--	--	0.46	0.47	*
Silver	mg/kg	NP	6	--	--	0.057	0.058	*
Sodium	mg/kg	N	6	54	670	294	670	*
Thallium	mg/kg	NP	6	--	--	0.34	0.35	*
Vanadium	mg/kg	N	6	7.0	24	19	24	*
Zinc	mg/kg	N	6	12	43	32	43	*

Note:
* Value exceeds the maximum detected value, it is the detection limit value when all samples are non-detects
Dist = type of data distribution
95th UTL = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)
NP = nonparametric
N = normal
L = lognormal

4.2.3 Groundwater

In total, 19 inorganic constituents were detected in groundwater samples. Three of the former Navy water supply wells were eliminated from consideration as background wells because these wells were identified to have metal casings that might have affected inorganic constituent levels from these wells. Table 4-10 includes the estimated statistical background values (UTL95%) for the remaining five wells (four newly installed wells and one upgradient well installed during IR [station ID AOC-K-MW03]). A UCL95% value could not be calculated because all of the values defaulted to the maximum concentration. Each groundwater sample was also analyzed for filtered metals to provide an indication of the dissolved metals within the groundwater. These results are also included in the tables.

4.2.4 Sediment

Six sediment samples (four from Laguna Playa Grande and two from Laguna Kiani) were collected and analyzed for the same 23 constituents as the other media in this analysis. Because concentration ranges of inorganic constituents in both sediment data sets were similar, they were retained as representative of background conditions. Table 4-11 includes constituents detected and background values calculated based on listed distribution type.

4.2.5 Surface Water

Six surface water samples and six sediment background samples were collected. Two of the surface water samples from Laguna Playa Grande were determined to contain elevated levels of inorganic constituents, possibly as a result of the more turbid nature of the surface water in Laguna Playa Grande. Therefore, the four surface water samples from Laguna Playa Grande were not included in this background data set. As a result, the background surface water data set consisted of only two samples. Table 4-12 includes a statistical summary of the analytical results and estimated background values for these two data points.

4.3 Use of Background Concentrations

The background concentrations (Tables 4-8 to 4-12) estimated will be used for comparisons with site-specific sample data from the site investigations at the Former NASD. Both surface and subsurface soil samples collected from any of the sites investigated can be compared with the same set of background values. The rock samples also may be used for site-specific comparisons if site samples are collected from rock.

The groundwater data evaluated is representative of two types of soils (no background wells in KTd soil type). Therefore, where site groundwater data is collected from these soil types, data included in this report can be used for comparison. However, if a site-specific upgradient well was available for background comparison, such a well would likely provide more suitable reference/background comparison data.

The surface water sediment data set is useful for providing a general comparison to site-specific data. Where possible, however, site-specific upstream background surface water and sediment data will be collected as needed for comparisons with site-specific data for inorganic constituents.

TABLE 4-10
Vieques Groundwater Sample Background Estimates
NASD Background Analysis

Parameter	Units	Dist.	Sample Number	Minimum Detect	Maximum Detect	Mean	95th UTL	
Aluminum	µg/L	N	4	130	3,500	1645	3,500	*
Antimony	µg/L	NP	5	5.1	5.2	5.2	5.2	
Arsenic	µg/L	NP	5	--	--	--	--	
Barium	µg/L	L	5	180	960	398	960	*
Beryllium	µg/L	NP	5	1.4	1.8	1.60	1.8	
Cadmium	µg/L	NP	5	1.0	1.0	1.00	1.0	
Calcium	µg/L	L	5	120,000	660,000	382,000	660,000	*
Chromium, total	µg/L	N	5	3.7	6.8	5.3	6.8	*
Cobalt	µg/L	N	5	5.4	20	11.5	20	*
Copper	µg/L	L	5	2.8	15	8.6	15	*
Iron	µg/L	N	5	480	4,800	2,616	4,800	*
Lead	µg/L	NP	5	--	--	--	--	
Magnesium	µg/L	L	3	76,000	290,000	172,000	290,000	*
Manganese	µg/L	L	5	400	17,000	6,022	17,000	*
Mercury	µg/L	N	5	--	--	--	--	*
Nickel	µg/L	L	5	2.4	19	7.5	19	*
Potassium	µg/L	L	4	6,000	490,000	140,500	490,000	*
Selenium	µg/L	N	5	--	--	--	2.3	*
Silver	µg/L	NP	5	--	--	--	--	
Sodium	µg/L	NP	2	210,000	350,000	280,000	350,000	
Thallium	µg/L	L	5	4.8	18	9.4	18	*
Vanadium	µg/L	L	5	3.5	75	23	75	*
Zinc	µg/L	NP	3	60.0	60	60	60	
Dissolved Inorganic Chemicals								
Aluminum, dissolved	µg/L	NP	5	--	--	--	--	
Antimony, dissolved	µg/L	L	5	4	9	6.5	9	*
Arsenic, dissolved	µg/L	NP	5	6	6	5.5	5.5	
Barium, dissolved	µg/L	L	5	120	870	364	870	*
Beryllium, dissolved	µg/L	L	5	1	2	1.60	2	*
Cadmium, dissolved	µg/L	NP	5	1	1	1.10	1	
Calcium, dissolved	µg/L	L	5	110,000	660,000	386,000	660,000	*
Chromium, total, dissolved	µg/L	N	5	3	5	3.8	5	*
Cobalt, dissolved	µg/L	N	5	6	11	7.4	11	*
Copper, dissolved	µg/L	NP	5	--	--	--	--	
Iron, dissolved	µg/L	N	5	410	490	0,440	490	*
Lead, dissolved	µg/L	NP	5	--	--	--	--	
Magnesium, dissolved	µg/L	L	3	71,000	310,000	177,000	310,000	*
Manganese, dissolved	µg/L	L	5	190	18000	6,218	18,000	*
Mercury, dissolved	µg/L	NP	5	--	--	--	--	
Nickel, dissolved	µg/L	L	5	2	12	4.9	12	*
Potassium, dissolved	µg/L	L	4	5,800	400,000	119,700	400,000	*
Selenium, dissolved	µg/L	NP	5	--	--	--	--	
Silver, dissolved	µg/L	NP	5	--	--	--	--	
Sodium, dissolved	µg/L	NP	2	200,000	360,000	280,000	360,000	
Thallium, dissolved	µg/L	L	5	6	16	9.5	16	*
Vanadium, dissolved	µg/L	L	5	3	32	9.7	32	*
Zinc, dissolved	µg/L	NP	3	15	15	15.0	15	

Note:
Dist = type of data distribution
95th UTL = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)
* Value exceeds the maximum detected value, it is the detection limit value when all samples are non-detects
NP = nonparametric
N = normal
L = lognormal
NA = Not applicable -- Sample size too small to calculate

TABLE 4-11
Vieques Sediment Sample Background Estimates
NASD Background Analysis

Parameter	Units	Dist.	Sample Number	Minimum Detect	Maximum Detect	Mean	95th UTL	
Aluminum	mg/kg	N	6	2,600	10,000	5,867	10,000	
Antimony	mg/kg	L	6	0.59	0.59	0.61	0.59	
Arsenic	mg/kg	NP	6	--	--	0.69	1.5	*
Barium	mg/kg	N	6	6.9	69	28	69	
Beryllium	mg/kg	N	6	0.17	0.24	0.16	0.24	*
Cadmium	mg/kg	NP	6	--	--	0.064	0.14	*
Calcium	mg/kg	N	6	8,900	160,000	79,483	160,000	*
Chromium, total	mg/kg	N	6	2.3	7.8	4.5	7.8	
Cobalt	mg/kg	N	6	0.96	4.7	2.5	4.7	
Copper	mg/kg	N	6	3.3	26	14	26	
Iron	mg/kg	N	6	2,300	14,000	7,300	14,000	
Lead	mg/kg	N	6	0.56	8.0	4.4	8.0	*
Magnesium	mg/kg	N	6	2,200	14,000	8,317	14,000	*
Manganese	mg/kg	L	6	24	350	118	350	
Mercury	mg/kg	NP	6	0.013	0.052	0.014	0.052	
Nickel	mg/kg	N	6	0.50	4.1	1.7	4.1	
Potassium	mg/kg	N	6	1,300	5,200	2,867	5,200	*
Selenium	mg/kg	L	6	0.78	1.1	1.1	1.1	
Silver	mg/kg	NP	6	--	--	0.14	0.30	*
Sodium	mg/kg	L	6	7,800	67,000	22,217	67,000	
Thallium	mg/kg	NP	6	--	--	0.81	1.8	*
Vanadium	mg/kg	N	6	7.2	40	21	40	
Zinc	mg/kg	N	6	4.9	48	22	48	

Note:
* Value exceeds the maximum detected value, it is the detection limit value when all samples are non-detects
Dist. = type of data distribution
95th UTL = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)
NP = nonparametric
N = normal
L = lognormal

TABLE 4-12
Vieques Surface Water Sample Background Estimates
NASD Background Analysis

Parameter	Units	Dist	Sample Number	Minimum Detect	Maximum Detect	Mean	95th UTL
Aluminum	µg/L	NA	2	530	5,000	2,765	NA
Antimony	µg/L	NA	2	3.3	3.3	2.3	NA
Arsenic	µg/L	NA	2	15	15	8	NA
Barium	µg/L	NA	2	17	37	27	NA
Beryllium	µg/L	NA	2	1.1	2.5	1.8	NA
Cadmium	µg/L	NA	2	1.1	1.1	0.6	NA
Calcium	µg/L	NA	2	390,000	480,000	435,000	NA
Chromium, total	µg/L	NA	2	4.3	4.3	2	NA
Cobalt	µg/L	NA	2	2.0	2.0	1	NA
Copper	µg/L	NA	2	14	14	7	NA
Iron	µg/L	NA	2	590	4,900	2,745	NA
Lead	µg/L	NA	2	--	--	1	NA
Manganese	µg/L	NA	2	28	85	57	NA
Mercury	µg/L	NA	2	--	--	0.013	NA
Nickel	µg/L	NA	2	3.1	5	4	NA
Selenium	µg/L	NA	2	--	--	2.3	NA
Silver	µg/L	NA	2	--	--	0.29	NA
Thallium	µg/L	NA	2	5.1	9.7	7.4	NA
Vanadium	µg/L	NA	2	2.7	8	6	NA
Zinc	µg/L	NA	2	--	--	3	NA

Note:
NA - A value not estimated due to small sample size

Whenever a site contaminant concentration is below or near the estimated background (UTL95%) value, the background concentration distribution range should be considered for decision making. The range of soil sample concentrations from a site may be compared with the range of background concentrations. If the minimum, mean, and maximum concentrations of the site-specific constituent concentrations are below UTL95% background concentration, then, the constituent is likely not specific to site operations. A detection limit value was included in these tables so if future detection limits are lowered, constituents may be detected.

Where appropriate, two data sets occasionally may be compared using other additional statistical tests. These evaluations could include comparisons of data distributions by different statistical methods such as UCL95%, and the site data population should be compared with the background population using statistical methods such as Students t-test, ANOVA, Wilcoxon-Rank Sum (WRS) test, Mann-Whitney test, and/or Kruskall-Wallis test. These additional comparisons could be used for future data evaluations if a UTL95%-based background value is exceeded for a specific site, and if other site-specific information indicates contamination is not likely to be site-related. If these test results indicate that differences between data sets are not significant, site concentrations are not likely to be different from background values.

SECTION 5

Data Quality Evaluation

The purpose of the DQE process is to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance with the method requirements; either the laboratory did, or did not, analyze the samples within the limits of the analytical method. Evaluation of matrix interferences is more subtle and involves the analysis of several areas of results, including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results. Appendix I presents data tables showing the DQE results.

Two surface water samples (W6-SW06 and W6-SW07), two sediment samples (W6-SD06 and W6-SD07), and one groundwater sample (AOC-K-MW-03) were collected upgradient of IR sites as part of the PA/SI investigations. These data were added into the background data set because they were collected to identify upgradient site conditions. The three additional samples, however, were not included in the DQE described in this section because DQEs had been prepared previously for these samples.

5.1 Introduction

Samples were collected from December 5 through December 21, 2000. Field QC samples included field duplicates, field blanks, and equipment blanks. Table 5-1 lists the number of each type of sample by analytical method. The samples were analyzed for the following analytical fractions:

- ICPES metals by CLP SOW ILMO4.0, method 200.7M
- Mercury by CLP SOW ILM04.0, methods 245.2M and 245.5M

Two surface water samples (W6-SW06 and W6-SW07), two sediment samples (W6-SD06 and W6-SD07), and one groundwater sample (AOC-K-MW-03) were collected upgradient of IR sites as part of the PA/SI investigations. These data were added to the background data set because they were collected to identify upgradient site conditions.

Before the analytical results were released by the laboratory, both the sample and QC data were reviewed carefully to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and constituent interpretations. Additionally, the QC data were reduced and the resulting data were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Any non-conforming data were discussed in the data package cover letter and case narrative.

TABLE 5-1
Sample Analytical Summary
Former NASD Background Analysis

Matrix	Analytical Method	Preparation Method	Normal Sample	Field Duplicate	Ambient Blank	Equipment Blank
WG	E200.7	FLDFLT	7	2	0	0
RK	E200.7	SW3050	6	0	0	0
SB	E200.7	SW3050	11	2	0	0
SD	E200-7	SW3050	6	2	0	0
SS	E200.7	SW3050	26	4	0	0
SW	E200.7	SW3050	6	2	0	0
WG	E200.7	SW3050	7	2	1	4
WG	E245.2	FLDFLT	7	2	0	0
SW	E245.2	METHOD	6	2	0	0
WG	E245.2	METHOD	7	2	1	4
RK	E245.5	METHOD	6	0	0	0
SB	E245.5	METHOD	11	2	0	0
SD	E245.5	METHOD	6	2	0	0
SS	E245.5	METHOD	26	4	0	0

Notes:
WG = groundwater sample
SW = surface water sample
RK = rock outcrop sample
SB = soil boring sample (3 to 4 feet)
SS = surface soil sample (0 to 1 feet)
SD = sediment sample

The hardcopy data packages were reviewed by the project data validation subcontractor (Heartland Environmental Services, Inc.) using the process outlined in the USEPA Region II's *Functional Guidelines for Data Review* (USEPA, 1991). Data validation checklists used were those specified by USEPA Region II. Areas of review included (when applicable to the SOW) holding time compliance, calibration verification, blank results, matrix spike precision and accuracy, method accuracy as demonstrated by laboratory control samples (LCSs), field duplicate results, and interference checks. The Region II data review worksheet was completed for each data package and any non-conformance was documented. The data review and validation process was independent of the laboratory's checks, and focused on the usability of the data to support the project data interpretation and decision-making processes.

Data not within the acceptance limits were appended with a qualifying flag, which consisted of a single or double-letter abbreviation that reflected a problem with the data. Although the qualifying flags were appended to data records during the database query process, they were also included in the final data summary tables deliverable so that the data would not be used indiscriminately. These also include the secondary, or two-digit "sub-qualifier" flags, which were entered into the comments field of the database. The secondary qualifiers provided the reasoning behind the assignment of a specific qualifier to the data. Table 5-2 presents and defines the sub-qualifiers. The following primary flags were used to qualify the data:

- **U -** Undetected. Analyte was analyzed for but not detected above the method detection limit (MDL).
- **UJ -** Detection limit estimated. Analyte was analyzed for, and qualified as not detected. The result was estimated.
- **J -** Estimated. The analyte was present, but the reported value might not have been accurate or precise.
- **R -** Rejected. The data were unusable. (Note: Analyte/compound might or might not have been present.)

Attachment A lists the changes in data qualifiers because of the validation processes. Attachment I presents all rejected data.

5.1.1 Holding Times

The holding times for each parameter were evaluated according to SW-846 requirements. All samples were analyzed within established holding times.

5.1.2 Calibration

Appendix I indicates that six selenium results were estimated (UJ) because of continuing calibration deficiencies. All six results were non-detects. All other calibration criteria were met.

TABLE 5-2
Summary of Data Qualifiers
Former NASD Background Analysis

Code	Definition
TN	Tune
BS	Blank Spike/LCS
IS	Internal Standard
MS	Matrix Spike and/or Matrix spike Duplicate Recovery
MD	Matrix Spike/Matrix spike Duplicate Precision
2S	Second Source
SD	Serial Dilution
SS	Spike Surrogate
LR	Analyte present above linear (or calibration) range
IC	Initial Calibration
CC	Continuing Calibration Verification
PD	Pesticide Degradation
LD	Lab Duplicate
2C	Second Column (Confirmation)
HT	Holding Time
PS	Post spike
BL	Blank
RE	Re-extraction
DL	Dilution
IB	In-Between
FD	Field Duplicate
OT	Other

5.1.3 Method Accuracy

The LCS reflects method accuracy. The LCS consists of deionized water spiked with target compounds or elements and processed through the entire method of preparation and analysis. All LCS recoveries met control limit criteria for these data, indicating that the method was in control.

5.2 Potential Field Sampling and Laboratory Contamination

Three types of blank samples were used to monitor potential contamination introduced during field sampling, sample handling, shipping activities, or sample preparation and analysis in the laboratory.

- **Equipment Blank (EB)**: The EB was a sample of the target-free water used for the final rinse during the equipment decontamination process. This blank was used to monitor potential contamination caused by incomplete equipment decontamination. Four equipment rinse blanks were submitted to the laboratory for this field effort, and the results showed that all analytes were below MDLs.
- **Field Blank or Ambient Blank (FB or AB)**: The field blank was an aliquot of the source water used for equipment decontamination. This blank monitored contamination that might have been introduced from the water used for decontamination. A single field blank was collected during this sampling event, and the results indicated that all analytes were below MDLs.
- **Laboratory Method Blank or Method Blank (MB)**: A laboratory method blank was ASTM Type II water that was treated as a sample (in that it underwent the same analytical process as the corresponding field samples). Method blanks were used to monitor laboratory performance and contamination introduced during the analytical procedure. One method blank was prepared and analyzed for every 20 samples or per analytical batch, whichever was more frequent. The results indicated that all analytes were below MDLs.

According to the USEPA Functional Guidelines (USEPA, 1991), concentrations of inorganic contaminants detected in the associated blanks were multiplied by 5. The resulting concentration multiple was used to qualify results as potential field and/or laboratory contamination rather than environmental contamination.

Appendix I indicates that no values were flagged as non-detects as a result of blank contamination. Table 5-3 compiles the blank detections into a "frequency of detection" by target parameter. Additionally, Appendix I compiles frequency of detection by target analyte for all field samples after validation.

Appendix I contrasts the frequency of detection in field samples and blanks where common elements were involved. The majority of the blank detections were orders of magnitude below actual field sample results. However, comparison of blank and field sample results for chromium and thallium reflected systematic contamination from the laboratory and/or the field. All of the thallium detections and many of the chromium detections would normally have been qualified as non-detects when utilizing USEPA's Functional Guidelines "five times rule."

TABLE 5-3
Summary of Parameter Detections
Former NASD Background Analysis

Matrix	Type	Analytical Method	Prep Method	Parameter	Number Analyzed	Number Detected	Min Detected	Max Detected	Min RL	Max RL	Min DL	Max DL	Units
WQ	EB1	E200.7	SW3050	Barium	4	1	1.7	1.7	200	200	0.13	0.13	µg/L
SOIL	LB	E200.7	SW3050	Calcium	7	1	33	33	1,000	1,000	2.8	2.8	mg/kg
WATER	LB	E200.7	SW3050	Calcium	4	2	134	292	5,000	5,000	28	28	µg/L
WQ	EB1	E200.7	SW3050	Calcium	4	3	180	570	5,000	5,000	28	28	µg/L
WATER	LB	E200.7	FLDFLT	Calcium, dissolved	3	1	292	292	5,000	5,000	28	28	µg/L
WQ	AB1	E200.7	SW3050	Chromium, total	1	1	7.8	7.8	10	10	0.87	0.87	µg/L
WQ	EB1	E200.7	SW3050	Chromium, total	4	1	3.2	3.2	10	10	0.87	0.87	µg/L
WQ	EB1	E200.7	SW3050	Copper	4	1	3.3	3.3	25	25	0.80	0.80	µg/L
WATER	LB	E200.7	SW3050	Iron	4	1	70	70	100	200	25	25	µg/L
WQ	EB1	E200.7	SW3050	Iron	4	1	220	220	100	100	25	25	µg/L
SOIL	LB	E200.7	SW3050	Magnesium	7	2	11	11	1,000	1,000	0.13	1.3	mg/kg
WATER	LB	E200.7	SW3050	Magnesium	4	1	468	468	5,000	5,000	13	13	µg/L
WQ	EB1	E200.7	SW3050	Magnesium	4	2	49	550	5,000	5,000	13	13	µg/L
WATER	LB	E200.7	FLDFLT	Dissolved	3	2	108	468	5,000	5,000	13	13	µg/L
WATER	LB	E200.7	SW3050	Manganese	4	1	77	7.7	15	15	0.33	0.33	µg/L
WQ	EB1	E200.7	SW3050	Manganese	4	2	3.3	4.5	15	15	0.3	0.33	µg/L
WATER	LB	E200.7	FLDFLT	Dissolved	3	1	7.7	7.7	1	15	0.33	0.33	µg/L
WQ	EB1	E200.7	SW3050	Nickel	4	2	1.6	2.0	40	40	0.93	0.93	µg/L
WATER	LB	E200.7	SW3050	Potassium	4	1	144	14	5,000	5,000	30	30	µg/L
WQ	EB1	E200.7	SW3050	Potassium	4	2	170	230	5,000	5,000	30	30	µg/L
WATER	LB	E200.7	FLDFLT	Dissolved	3	1	144	144	5,000	5,000	30	30	µg/L
SOIL	LB	E200.7	SW3050	Sodium	7	2	108	108	1,000	1,000	20	20	mg/kg
WATER	LB	E200.7	SW3050	Sodium	4	1	4,240	4,240	5,000	5,000	200	200	µg/L
WQ	EB1	E200.7	SW3050	Sodium	4	2	310	5,100	5,000	5,000	200	200	µg/L
WATER	LB	E200.7	FLDFLT	Sodium, dissolved	3	2	761	4,240	5,000	5,000	200	200	µg/L
WATER	LB	E200.7	SW3050	Thallium	4	3	6.7	7.4	10	10	3.4	3.4	µg/L
WQ	AB1	E200.7	SW3050	Thallium	1	1	7.7	7.7	10	10	3.4	3.4	µg/L
WQ	EB1	E200.7	SW3050	Thallium	4	2	5.6	6.2	10	10	3.4	3.4	µg/L
WATER	LB	E200.7	FLDFLT	Thallium, dissolved	3	1	6.7	6.7	10	10	3.4	3.4	µg/L
SOIL	LB	E200.7	SW3050	Zinc	7	1	1.6	1.6	4.0	4.0	0.50	0.50	mg/kg
WQ	AB1	E200.7	SW3050	Zinc	1	1	24	24	20	20	5.0	5.0	µg/L
WQ	EB1	E200.7	SW3050	Zinc	4	2	11	79	20	20	5.0	5.0	µg/L

5.3 Matrix Effects

5.3.1 Matrix Spike Accuracy and Native Duplicate Precision

A matrix spike (MS) is an aliquot of sample spiked with a known concentration of target analyte(s). The MS is used to document the accuracy of a method as influenced by a given sample matrix. All MS accuracy results are listed in Appendix I. Another measurement of precision is the native duplicate. This is an intra-laboratory split sample that is not spiked, but reflects the actual concentrations in the sample and its duplicate. Appendix I presents laboratory native duplicate precision statistics.

Inorganic results may be qualified solely upon the results of the MS accuracy and native duplicate precision statistics. Instances in which the native sample concentration for a given element exceeds the spike added concentration by a factor of four or more are disregarded because the spike added would be masked by the native concentration. According to USEPA Functional Guidelines, metals results obtained through analysis by traditional methods with recoveries of greater than 30 percent and outside the 75 to 125 percent recovery control limits are required to be flagged as estimated. An aqueous control limit of ±20 percent for the RPD was used for original and duplicate sample values greater than or equal to five times the Reporting Limit (RL). Solid samples utilized a control limit of 35 RPD. A control limit of ± the RL was used if either the sample for the duplicate value was less than five times the RL for waters or two times the RL for soils. In cases in which only one result was greater than five times the RL level and the other was below, the ± RL criteria were applied.

As Appendix I indicates, the majority of the accuracy and precision results for the combined background and NASD II main efforts were well within established criteria. Only 44 of 546 MS measurements (8 percent) were outside criteria. Precision data indicated that 25 of 580 results were outside control limits. Appendix I lists data that were qualified for accuracy (MS) or precision (LD) deficiencies. These data indicated that the specific sample matrix did not greatly influence the overall analytical process or the final numerical sample result.

5.3.2 Field Duplicate Sample Results

Field duplicate analyses measure both field and laboratory precision and can also be affected by the homogeneity of the samples.

Depending upon the method, up to four sets of field duplicates were collected during this field effort. The native and duplicate samples were analyzed for the same parameters.

An aqueous control limit of ± 20 percent for the RPD was used for original and duplicate sample values greater than or equal to five times the RL. Solid samples utilized a control limit of 35 RPD. A control limit of ± the RL was used if either the sample for the duplicate value was less than five times the RL for waters or two times the RL for soils. In the cases in which only one result was greater than the five times the RL level and the other was below, the ± RL criteria were applied. Appendix I includes a summary of the field duplicate measurements and their associated precision statistic.

As Appendix I indicates, only 14 of 246 results (5.7 percent) were qualified as outside criteria. Thus, the vast majority of the calculated precision data were within defined control

limits. These precision data indicated that matrix heterogeneity and sampling technique did not greatly influence the final numerical result.

5.4 Total versus Dissolved Metals

Appendix I presents the dissolved versus total metals concentrations. Criteria for evaluation of the data included data that were at least five times the RL, with the difference between results less than 10 percent of the dissolved concentration. These comparisons revealed that the dissolved concentration was greater than the total concentration in only 19 of 199 results (9.5 percent).

5.5 Sample Results for Metals Near the MDL

The MDL is defined as the minimum concentration of an analyte that can be identified, measured, and reported with 99 percent confidence that the analyte concentration is greater than zero. Sample results at or near the MDL reported in blanks (especially metals), however, may represent Type I or II errors. This phenomenon is compounded when measurements are associated with a matrix. A Type I (or alpha) error occurs when the value reported was dismissed as a biased high or false positive result, and a Type II (or beta) error was considered a biased low or false negative result. Thus, some values at the lower levels of detection may have been false positives caused by instrument noise or low-level background shifts rather than a true analyte signal. Additionally, concentrations near the MDL are considered not necessarily accurate or precise.

5.6 Precision, Accuracy, Representativeness, Completeness, Comparability (PARCCs)

Precision is defined as the agreement between duplicate results, and was estimated by comparing native laboratory duplicates and field duplicate sample results. Other than the documented exceptions, the precision between native and field duplicate sample results was within acceptable criteria for the majority of the measurements, indicating that the sample matrix did not significantly interfere with the overall analytical process.

Accuracy is a measure of the agreement between an experimental determination and the true value of the parameter being measured. For inorganic analyses, an MS and LCS were spiked with a known reference material before preparation. The MS provided a measure of the matrix effects on the analytical accuracy. The LCS results demonstrated the accuracy of the method. MS and LCS recoveries were within the method acceptance limits for the majority of the measurements; therefore, other than the documented exceptions, no evidence existed to indicate that significant matrix interference would affect the usability of the data.

Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is a subjective parameter and is used to evaluate the efficacy of the sampling plan design. Representativeness was demonstrated by providing full descriptions in the project scoping

documents of the sampling techniques and the rationale used for selecting sampling locations.

Completeness is defined as the percentage of measurements that are judged to be valid compared to the total number of measurements made. A goal of 90 percent usable data was established in the initial project scope document, and 97.1 percent (1,854 of 1,909 measurements) of the data were determined to be valid. The only rejected values were attributed to dilutions required to accurately quantify a concentration. One of the values, the native or the dilution, had to be rejected because only one valid value can exist in the database per target, per sample.

Comparability is another qualitative measure designed to express the confidence with which one data set may be compared to another. Data from this investigation were comparable with other data collected at the site because only USEPA methods were used to analyze the sample and USEPA Level III QC data were available to support the quality of the data.

5.7 DQE Summary and Conclusions

Conclusions of the data quality evaluation process are as follows:

- The laboratory analyzed the samples according to the USEPA methods stated in the work plan, as demonstrated by the deliverable summaries and analytical run sequences.
- Sample results at or near the MDL reported in blanks (especially metals) may represent Type I or II errors. This phenomenon is compounded when measurements are associated with a matrix. A Type I (or alpha error) occurs when the value reported is dismissed as a biased high or false positive result, and a Type II (or beta error) is considered a biased low or false negative result. Thus, some values at the lower levels of detection may have been false positives caused by instrument noise or low-level background shifts rather than a true analyte signal.
- Spike recoveries and duplicate sample results (other than the exceptions documented in the text and attachments) indicated that the specific sample matrix did not significantly interfere with the analytical process or the final numerical result.

The project PARCC objectives were met, and the data can be used in the project decision-making process, as qualified by the DQE process.

SECTION 6

Background Investigation Summary and Conclusions

This section presents the summary and conclusions of the background investigation for the Former NASD.

The sampling encompassed surface soil, subsurface soil, rock, surface water, sediment, and groundwater. The appropriate numbers of samples (for the range of 75 to 95 percent confidence and coverage) were collected as described in the work plan (CH2M HILL, December 2000). Representative background point estimate values, the UTL95% and UCL95% values, were calculated for the detected inorganic constituents in each media.

A statistical approach was used as the primary method for developing a point estimate for the background concentrations. Ranges of detected concentrations also were included for future site comparisons. This approach was supported by a graphical method that showed similar background concentrations.

The background UTL95% concentrations developed and presented in Tables 4-8 through 4-12 of this report can be used as reliable indications of the commonly occurring inorganic constituents at the Former NASD. These data can be used to evaluate whether constituents detected during future investigations are the result of background concentrations or are related to site-specific activities at The Former NASD. Site chemical data can be compared with the background chemical concentrations; if the site data indicate concentrations below the background UTL95% concentrations, these constituents are likely to occur and be common to the matrix in which they were found, and not related to site activities.

If inorganic constituents exceed the background concentrations for a specific site, and other site-specific information indicates contamination is not likely to be site-related, then additional statistical comparisons will be considered according to USEPA guidance. These evaluations could include comparisons of data (population) distributions using different statistical methods such as UCL95% comparisons, maximum versus maximum concentration comparisons. For these evaluations, the entire site data population for a particular media is compared with the background population for that media using other more powerful procedures such as the t-test, Mann-Whitney test, and the ANOVA. The Kruskal and Wallis test to determine the similarity (equality) of the distributions of two or more (background versus onsite) data sets.

These additional comparisons should be used when a screening level comparison UTL95%-based background value or range of concentration distribution comparisons are exceeded for a specific site.

Rock samples were collected to compare relative metals concentrations in rock to soil and groundwater values. Plutonic rock outcrop samples are not meant to be used for direct statistical comparison to site samples; rather they were collected to establish individual metals levels in the rock itself. The concentration of individual metals in rock samples are compared to the soil data set, as discussed in the following paragraph.

The following discussion summarizes the data evaluation conducted in developing a representative background data set for the Former NASD. The statistical analysis concluded that no significant differences existed between surface and subsurface soil chemical data, whereas rock sample chemical levels appeared to be significantly different from soil levels. Therefore, surface and subsurface soil sample chemical data were combined for development of a background soil data set, whereas rock samples were kept as a separate data set.

As previously noted, one background outlier soil sample with high lead levels was deleted from the calculation of the UTL95% background lead concentration in soils.

The metal casings present on three former Navy water supply wells might have influenced the metal concentrations in groundwater samples from these wells. Therefore, data from these wells were removed from the representative background data for groundwater.

For future remedial investigations, wells located in the upgradient locations of individual sites will be identified for comparisons during individual site evaluations. In the absence of such wells, background wells or alternative wells will be identified as appropriate on a site-specific basis.

Surface water/sediment background data from Laguna Playa Grande may not be usable because of elevated metals levels, and samples might be turbid. For future RI/FS investigations, background for each surface water body will be established for each site.

The data quality assessment showed that the project PARCC objectives were met. Therefore, all the data are valid to be used in the project decision-making process.

SECTION 7

References

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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD SS01 / SB01 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 850 END : 905 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	W/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS
Surface	0-6"	NA	NA	NA	Medium Brown silt with some sand, roots and organic matter	sample collected SS01 using stainless steel hand auger and homogenized using bowl and spoon. FD, MS/MSD also collected
5	4'-5'	NA	NA	NA	Reddish brown, sandy, clayey, silt with 5% gravel/rock (1/4")	sample collected SB01 using stainless steel hand auger and homogenized using bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	KTD SS02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques
ELEVATION : NA
DRILLING METHOD AND EQUIPMENT USED Hand Auger
DATE: 12/05/00 START : 1555 END : 1600 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown, moist, sandy silt with some organics	Sample collected SS02 using stainless steel hand auger and homogenized with stainless steel bowl and spoon. FD collected.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD SS03 / SBO3 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1100 END : 1105 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Reddish brown silt with approximately 5% rock (1/2 cm diameter)	Sample collected SSO3 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5	4'-5'	NA	NA	NA	Yellowish orange silty sand with 5% gravel approximately 1/4" diameter	Sample collected SBO3 using stainless steel hand auger and homogenized with stainless steel bowl and spoon
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KTD (3)

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD SS04 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 925 END : 930 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown silt with some sand, roots and organic matter.	Sample collected SS04 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD SS05/ SBO5 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 940 END : 950 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6" 6" 6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS
Surface	0-6"	NA	NA	NA	Sandy silt, medium brown with <5% gravel (<1/2 cm diameter)	Sample collected SSO5using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5	4'-5'	NA	NA	NA	Reddish brown silty sand with gravel of approx. 5% and less than 1/4" diameter	Sample collected SBO5 using stainless steel hand auger and homogenized with stainless steel bowl and spoon
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD SS06 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1015 END : 1020 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Sandy silty with less than 1/2 cm gravel	Sample collected SS06 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	KTD SS07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/07/00 START : 1120 END : 1125 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Light brown silty sand with less than 1/4" diameter gravel.	Sample collected SS07using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD SS08 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/05/00 START : 1500 END : 1505 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	W TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown silt. Some root and organics.	Sample collected SS08 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	KTD SS09	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/07/00 START : 1135 END : 1140 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS
Surface	0-6"	NA	NA	NA	Dark brown-black sandy soil with high organic content and small rocks	Sample collected SS09 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD SS10 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/07/00 START : 1130 END : 1135 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 0"-0"-0"-0" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS
Surface	0-6"	NA	NA	NA	Brown sandy silty with high quantity of gravel (>1/2 cm diameter)	Sample collected SS10 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QA SS01/ SBO1 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques
ELEVATION : NA
DRILLING METHOD AND EQUIPMENT USED Hand Auger
DATE: 12/06/00 START : 1030 END : 1100 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Brown sandy silt with some organics and gravel (gravel <1 cm diameter)	Sample collected SSO1 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5	4'-5'	NA	NA	NA	Dark brown sandy silt with some small gravel pieces.	Sample collected QA SBO1 using stainless steel hand auger and homogenized with stainless steel bowl and spoon. FD/MS/MSD collected.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QA SS02 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/07/00 START : 1440 END : 1445 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	H/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown sandy silt with some root and organic matter	Sample collected QA SSO2 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QA SS03/ SBO3 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING
LOCATION : NASD, Vieques
ELEVATION : NA
DRILLING METHOD AND EQUIPMENT USED Hand Auger
DATE: 12/07/00 START : 940 END : 1000 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Clayey silt with high organic content. Brown color with small rocks (<1/4 cm)	Sample collected QA SSO3 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5	4'-5'	NA	NA	NA	Clayey silt, reddish brown with large approx. 2" diameter jagged rock	Sample collected QA SBO3 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QA SS04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1440 END : 1442 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown sandy silt with some organic matter and roots	Sample collected QA SS04 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QA SS05/ SBO5 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/05/00 START : 1340 END : 1410 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown sandy silt	Sample collected QA SSO5 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5					Medium brown sandy silt with large rock/gravel approx 1/4-1/2" diameter.	Sample collected QA SBO5 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QA SS06 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques
ELEVATION : NA
DRILLING METHOD AND EQUIPMENT USED Hand Auger
DATE: 12/06/00 START : 1330 END : 1335 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	W/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown clayey silt, moist, easily penetrated with hand auger.	Sample collected QA SS06 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QA SS07/ SBO7 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING
LOCATION : NASD, Vieques
ELEVATION : NA
DRILLING METHOD AND EQUIPMENT USED Hand Auger
DATE: 12/05/00 START : 1635 END : 1640 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Sandy silt, medium brown with some organic matter. Little gravel content	Sample collected QA SSO7 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5	4'-6'	NA	NA	NA	Clayey silty sand, reddish brown with less than 5% gravel, no larger than 1/4" diameter.	Sample collected QA SBO7 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QA SS08	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1135 END : 1140 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown, moist sandy silt with little gravel, gravel is less than 1/4" diameter. Some organics.	Sample collected QA SS08 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QS SS01/ SBO1 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1330 END : 1350 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Organic matter 0-3". Remainder is silty sand with light brown color	Sample collected QS SSO1 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
	3- 3.75'	NA	NA	NA	Saturated medium to coarse sand, light brown	Sample colected at 3/75' (hit groundwater) s. steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QS SS02 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1400 END : 1405 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Brown silty sand with few small rock >.5 cm diam. and some organic matter. Medium to coarse consistency.	Sample collected QS SS02 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QS SS03 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1420 END : 1425 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	COMMENTS
Surface	0-6"	NA	NA	NA	Sandy silt with small quantity of rocks, dark brown color, high organic matter composition	Sample collected QS SS03 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
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CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QS SS04/SBO4 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques
ELEVATION : NA
DRILLING METHOD AND EQUIPMENT USED Hand Auger
DATE: 12/06/00 START : 1420 END : 1425 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS
Surface	0-6"	NA	NA	NA	Dark grey sandy silt - highly organic and moist Sand is fine to medium	Sample collected using stainless steel hand auger and mixed with s.steel bowl and spoon.
	6" - 1'	NA	NA	NA	Dark grey sandy silt - highly organic, saturated.	Sample collected QS SB04 using stainless steel and auger and mixed with stainless steel bowl and spoon. Water table hit at 1'.
5						
10						
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QS SS05/SBO5 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1420 END : 1425 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Silty sand, high organic content, greyish color	Sample collected using stainless steel hand auger and mixed with s.steel bowl and spoon.
	6" - 1'	NA	NA	NA	Saturated silty sand. Strong organic odor Sand is fine to coarse (well graded)	Sample collected QS SB05 using stainless steel and auger and mixed with stainless steel bowl and spoon. Water table hit at 1'.
5						
10						
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QS SS06	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1440 END : 1445 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown sandy silt, high organic matter content (black).	Sample collected QS SS06 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5						
10						
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QS SS07/SB07 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING
LOCATION : NASD, Vieques
ELEVATION : NA
DRILLING METHOD AND EQUIPMENT USED Hand Auger
DATE: 12/06/00 START : 1635 END : 1640 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Dark grey coarse silty sand with organics.	Sample collected using stainless steel hand auger and mixed with s.steel bowl and spoon.
	0.5' - 1'	NA	NA	NA	Dark grey coarse silty sand with some organics.	Groundwater found at approximately 1.25'. Sample collected QS SB07using stainless steel bowl and spoon
5						
10						
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QS SS08 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1410 END : 1415 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	Medium brown sandy silty. Sand is medium to coarse.	Sample collected QS SS08 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5						
10						
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QS SED01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING LOCATION : NASD, Vieques

ELEVATION : NA

DRILLING METHOD AND EQUIPMENT USED Hand Auger

DATE: 12/06/00 START : 1620 END : 1625 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS
Surface	0-6"	NA	NA	NA	Highly organic black silt with sulfurous odor	Sample collected QS SED01 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	QS SED02 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SOIL SAMPLING
LOCATION : NASD, Vieques
ELEVATION : NA
DRILLING METHOD AND EQUIPMENT USED Hand Auger
DATE: 12/06/00 START : 1600 END : 1610 LOGGER : J. Hayes, K. Karvazy

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
Surface	0-6"	NA	NA	NA	White shell fragments in a dark brown to black colored silt	Sample collected QS SED02 using stainless steel hand auger and homogenized with stainless steel bowl and spoon.
5						
10						
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QS-MW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NASD Phase II, PA/S I LOCATION : QS Background, Green Beach

ELEVATION : DRILLING CONTRACTOR Geoworks

DRILLING METHOD AND EQUIPMENT USED Hand auger

WATER LEVELS 5' START : ######## END : 12/14/00 LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
	0-5'	NA	Hand auger	NA	Sand with shell, medium grey, fine sand, 50% shell wet	0 / 0
5						
10						
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QS-MW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NASD Phase II, PA/S I

LOCATION : QS Background, Green Beach Road

ELEVATION :

DRILLING CONTRACTOR Geoworks

DRILLING METHOD AND EQUIPMENT USED Hand auger

WATER LEVELS 5'

START : ########

END : 12/14/00

LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
	0-5'	NA	Hand auger	NA	Sand with shell, medium gray, fine sand, 50% shell wet	0 / 0
5						
10						
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QA-MW01	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Background Sampling LOCATION : MW001 - HW 200

ELEVATION : DRILLING CONTRACTOR Geoworks

DRILLING METHOD AND EQUIPMENT USED Mobile Drill Model B-61

WATER LEVELS : START : 1450 (12/07/00) END : LOGGER : E. Isern

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0 - 3'	NA	Cuttings	NA	Sandy clay, brown, 5% moisture content, loosely packed, few pebbles (rounded, 1/4")	Mobile Drill, Model B-61 Torque converter clutch pressure 240-280
5	6' - 8'	NA	Cuttings	NA	Sandy clay, light brown, loosely packed	
0	11' - 13'	NA	Cuttings	NA	Mostly clay, brown, moisture content 7-8% some silt	Ground is hard packed, drill bit is smoking (vapor)
15	16' - 18'	NA	Cuttings	NA	Silty clay, brownish gray, very hard, some pebbles (angular) 1/4" - 1/2"	Very hard ground, drill bit is smoking (vapor)
20	22' - 24'	NA	Cuttings	NA	Silty clay, light brown, pebbles (fragments, angular < 1/4")	Moisture is vaporized by drill bit
25						1600 - End of day

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QA-MW01	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : Background Sampling LOCATION : MW001 - HW 200

ELEVATION : DRILLING CONTRACTOR Geoworks

DRILLING METHOD AND EQUIPMENT USED Mobile Drill Model B-61

WATER LEVELS : START : END : 1400 12/08/00 LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
35						▽
40						
45					TD = 45' BLS	
50						
55						

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
160403.FI.ZZ	QAMW-2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NASD Phase II Background LOCATION : QAMW-2 along HY 200

ELEVATION : DRILLING CONTRACTOR Geoworks

DRILLING METHOD AND EQUIPMENT USED HAS B-61

WATER LEVELS 6.0 ft START : ######### END : 12-14-00 LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
	0-2	NA	Cuttings	NA	Sand, light gray, fine, some silt, trace shell, moist	0	0
5							
	6-8	NA	Cuttings	NA	Silty sand, light gray, very fine, trace shell, wet	0	0
0							
	10-12	NA	Cuttings	NA	Silt with sand, light gray, very fine trace shell, wet	0	0
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	AOC-K-MW-3 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : NASD VIEQUES P.R. LOCATION : AOC-K (UPGRADIENT)

ELEVATION : DRILLING CONTRACTOF GEOWORKS

DRILLING METHOD AND EQUIPMENT USED : 8.25" DIA. HAS

WATER LEVELS : ~52 BLS START : 1100 12/07/00 END : 1030 12/08/00 LOGGER : MLW

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
					SILTY SAND (SM), DARK REDDISH BROWN, MINOR CLAY CONTENT LOOSE DRY. MINOR GRAVEL	
5						
					SAND (SP) WITH SOME GRAVEL , MED BROWN, LOOSE, MINOR CLAY.	
10						HOT AUGERS
					SAND (SP) AS ABOVE SOME CLAY BASIS	
15						
20						
25						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	AOC-K-MW-3 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : NASD VIEQUES P.R. LOCATION : AOC-K (UPGRADIENT)

ELEVATION : DRILLING CONTRACTOF GEOWORKS

DRILLING METHOD AND EQUIPMENT USED : 8.25" DIA. HSA & AIR HAMMER

WATER LEVELS : ~52 BLS START : 12/07/00 END : 1500 12/04/00 LOGGER : MLW

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
35						
0						
45						
50					SAND (SP) SOME MINOR GRAVEL, FINE, LOOSE DRY	
55						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	AOC-K-MW-3 SHEET 3 OF 3

SOIL BORING LOG

PROJECT : LOCATION : AOC-K UPGRADIENT

ELEVATION : DRILLING CONTRACTOR :

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : ~52 BLS START : END : 1030 12/08/00 LOGGER : MLW

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
						WATER
65						
75					TD = 76' BLS	
80						
85						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD ROCK 01 SHEET 1 OF 1

ROCK SAMPLING LOG

PROJECT : Rock Sampling LOCATION : NASD

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : Rock Hammer

WATER LEVELS : START : 12/04/00 END : 12/04/00 LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm) Breathing Zone Above Hole
Surface	NA		NA	NA	Weathered granodiorite, highly oxidized, iron and manganese, hematite, limonite, quartz and feldspar, crystals, soft, crumbly, reddish brown.	
35						
40						
45						
50						
55						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD ROCK 02 SHEET 1 OF 1

ROCK SAMPLING LOG

PROJECT : Rock Sampling LOCATION : NASD

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : Rock Hammer

WATER LEVELS : START : 12/04/00 END : 12/04/00 LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
Surface	NA		NA	NA	Granodiorite, feldspar, quartz, biotite, mica, +25-35% mafic minerals, slightly weathered, oxidized iron and magnetite, hard, crystalline, black, grey and white.	
35						
40						
45						
50						
55						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD ROCK 03 SHEET 1 OF 1

ROCK SAMPLING LOG

PROJECT : Rock Sampling LOCATION : NASD
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : Rock Hammer
WATER LEVELS : START : 12/06/00 END : 12/06/00 LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
Surface	NA		NA	NA	Weathered granodiorite, collected from fractured highly oxidized, mafic minerals, weathered to iron oxides, feldspar weathered to clay, soft, crumbly, reddish brown and tan.	
35						
40						
45						
50						
55						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD ROCK 04 SHEET 1 OF 1

ROCK SAMPLING LOG

PROJECT : Rock Sampling LOCATION : NASD

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : Rock Hammer

WATER LEVELS : START : 12/06/00 END : 12/06/00 LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
Surface	NA		NA	NA	Weathered granodiorite, highly oxidized, iron and manganese, hematite, limonite, quartz and feldspar, crystals, soft, crumbly, reddish brown.	
35						
40						
45						
50						
55						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
160403.FI.ZZ	KTD ROCK 05 SHEET 1 OF 1

ROCK SAMPLING LOG

PROJECT : Rock Sampling LOCATION : NASD
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : Rock Hammer
WATER LEVELS : START : 12/06/00 END : 12/06/00 LOGGER : M. Clasen

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	m/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm). Breathing Zone Above Hole
Surface	NA		NA	NA	Granodiorite, slightly oxidized, higher quartz content less biotite, hard, gray, with black mafic minerals, 10-20% iron oxide	
35						
40						
45						
50						
55						

CH2M HILL
WELL SAMPLING FIELD SHEET

PROJECT# 160403.FI.ZZ

WELL NUMBER:	QS-MW01	**SITE:**	Background - Green Beach
FIELD CREW:	E. Isern, E. Cabale		

		CASING DIA.		GAL/FT OF CASING	
DEPTH TO WATER (FT):	= 3.81				
WELL DEPTH (FT):	7.39	2 IN.		0.1632	
WATER COLUMN (FT):	= 3.58	4 IN.		0.6528	
GAL/FT OF CASING	x 1.02	6 IN.		1.4688	
CASING VOLUME (GAL)	= 0.584	8 IN.		2.611	
NO. OF VOLUMES min.(3)	x 3	10 IN.		4.0797	
PURGE VOLUME (GAL)	= 1.75	12 IN.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. PERIST.	**OTHER:**	**BAILER** : TEFLON, SS , OTHER:
TIME ON: 1719 - 1734		BAILER VOL.. (gal) .25 / .33
FLOW RATE (gpm): 0.13 to 0.068 gpm		REQUIRED PULLS:
PUMP TIME (min): 15		VOL. PURGED (gals):
VOL. PURGED (gals): 1.0		OTHER:

FIELD PARAMETERS	**FIELD MEASUREMENTS**					WITHIN 10% Y / N
	1st	2nd	3rd	4th	5th	6th
TIME	1724	1728	1733			
VOL. (gal)	0.260	0.530	0.790			
pH (s.units)	6.7	6.81	6.7			
ORP (mV)	112.2	84.4	-25.4			
TEMP.(C)	26.64	26.26	26.44			
Salinity (ppt)	47550	47280	46949			
DO (mg/L)	17.26	9.39	8.33			
Turbidity (NTU)	132	113.3	44.5			
COND.(umhos/cm)	17497	48497	48486			

SAMPLE PARAMETERS (**GRAB** OR **COMPOSITE**) :

FILTERED METALS COLLECTED: Y / N 1.0um, 0.45um, OTHER?

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:

ODOR: NONE , LOW , MEDIUM , HIGH , VERY STRONG , H_2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILTS

COMMENTS: No purge volume was used due to small water column. Little to none sediments. Well was previously purged dry while developing.

OTHER: PLEASE USE BACK OF SHT. FOR SKETCHING MAPS, WELL LOCATION NOTES ECT. **SEE BACK OF SHT Y / N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 12/18/2000 / @ 1735

SIGNED/SAMPLER: E. Isern 12/18/2000

CH2M HILL
WELL SAMPLING FIELD SHEET

PROJECT# 160403.FI.ZZ

WELL NUMBER:	QS-MW02	**SITE:** Background- Road to Green Beach, swamp near Kiani Lagoon			
FIELD CREW:	E. Isern, E. Cabale				
DEPTH TO WATER (FT):	= 3.58	CASING DIA.		GAL/FT OF CASING	
WELL DEPTH (FT):	7.35	2 IN.		0.1632	
WATER COLUMN (FT):	= 3.77	4 IN.		0.6528	
GAL/FT OF CASING	x .1632	6 IN.		1.4688	
CASING VOLUME (GAL)	= 0.615	8 IN.		2.611	
NO. OF VOLUMES min.(3)	x 3	10 IN.		4.0797	
PURGE VOLUME (GAL)	= 1.846	12 IN.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. PERIST.	**OTHER:**	**BAILER** : TEFLON, SS ,OTHER:
TIME ON: 1313-1324		BAILER VOL., (gal) .25 / .33
FLOW RATE (gpm): 0.218		REQUIRED PULLS:
PUMP TIME (min): 11		VOL. PURGED (gals):
VOL. PURGED (gals): 2.1		OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS 1st	2nd	3rd	4th	5th	WITHIN 10% Y / N 6th
TIME	1316	1318	1320	1323		
VOL. (gal)	0.528	1.060	1.590	2.11		
pH (s.units)	6.82	6.76	6.72	6.69		
ORP (mV)	-127.8	-165.7	-179.2	-190.8		
TEMP.(C)	27.28	27.3	27.33	27.32		
Salinity (ppt)	55870	56075	56300	56455		
DO (mg/L)	2.58	2.65	2.87	3.13		
Turbidity (NTU)	1577.9	1580.1	1372.9	1580.6		
COND.(umhos/cm)	58357	58611	58823	58991		

SAMPLE PARAMETERS (GRAB OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / N 1.0um 0.45um OTHER:

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:

ODOR: NONE , LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILT:

COMMENTS: Slight H2S smell.

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. **SEE BACK OF SHT Y / N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 12/20/2000 / @ 1325

SIGNED/SAMPLER: E. Isern 12/20/2000

CH2M HILL
WELL SAMPLING FIELD SHEET

PROJECT# 160403.FI.ZZ

WELL NUMBER:	QAMW01	**SITE:**	Background-along main road
FIELD CREW:	E. Isem, E. Cabale		

			CASING DIA.		GAL/FT OF CASING	
DEPTH TO WATER (FT):	=	29.42				
WELL DEPTH (FT):		45.94	2 IN.		0.1632	
WATER COLUMN (FT):	=	16.52	4 IN.		0.6528	
GAL/FT OF CASING	x	0.1632	6 IN.		1.4688	
CASING VOLUME (GAL)	=	2.696	8 IN.		2.611	
NO. OF VOLUMES min.(3)	x	3	10 IN.		4.0797	
PURGE VOLUME (GAL)	=	8.088	12 IN.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. PERIST.	**OTHER:**	**BAILER :** TEFLON. SS OTHER:
TIME ON: 1359		BAILER VOL.: (gal) .25 / .33
FLOW RATE (gpm): Stopped		REQUIRED PULLS:
PUMP TIME (min): Pumping		VOL. PURGED (gals):
VOL. PURGED (gals):		OTHER:

FIELD PARAMETERS	**FIELD MEASUREMENTS** 1st	2nd	3rd	4th	5th	WITHIN10% Y / N 6th
TIME	1417					
VOL (gal)	1.850					
pH (s.units)	7.6					
ORP (mV)	-283.5					
TEMP.(C)	27.44					
Salinity (ppt)	3332					
DO (mg/L)	7.56					
Turbidity (NTU)	996.2					
COND.(umhos/cm)	3472					

BAILED DRY

SAMPLE PARAMETERS (GRAB OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / N 1.0um,0.45um, OTHER:

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:

ODOR: NONE , LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILT

COMMENTS: Pump could not pull water from well. Used bailer but well did not produce enough water to sample. Left site & came back to sample at time below. Note: Filtered sample was collected @ 1730. The unfiltered sample will be collected 12/21/00 in order to let well recharge - was collected @ 0810.

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. **SEE BACK OF SHT Y / N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS: 12/21/00 @ 0810 (Unfiltered)

SAMPLE DATE/ TIME: 12/20/2000 / @ 1730 (Filtered)

SIGNED/SAMPLER: E. Isem

CH2M HILL
WELL SAMPLING FIELD SHEET

PROJECT#_____ 160403.FI.ZZ

WELL NUMBER:	QAMW02	**SITE:**	Background-along road near Mosquito Pier
FIELD CREW:	E. Cabale, E. Isern		

			CASING DIA.		GAL/FT OF CASING	
DEPTH TO WATER (FT):	=	6.33				
WELL DEPTH (FT):		17.46	2 IN.		0.1632	
WATER COLUMN (FT):	=	11.13	4 IN.		0.6528	
GAL/FT OF CASING	x	0.1632	6 IN.		1.4688	
CASING VOLUME (GAL)	=	1.816	8 IN.		2.611	
NO. OF VOLUMES min.(3)	x	3	10 IN.		4.0797	
PURGE VOLUME (GAL)	=	5.45	12 IN.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. PERIST.	**OTHER:**	**BAILER** : TEFLON, SS ,OTHER:
TIME ON: 1449 - 1517		BAILER VOL., (gal) .25 / .33
FLOW RATE (gpm): 0.003		REQUIRED PULLS:
PUMP TIME (min): 68		VOL. PURGED (gals):
VOL. PURGED (gals): 5.283		OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS 1st	2nd	3rd	4th	5th	WITHIN10% Y / N 6th
TIME	1456	1459	1501	1508	1510	1517
VOL. (gal)	1.321	1.849	2.378	3.17	3.96	5.28
pH (s.units)	6.88	6.83	6.8	6.77	6.76	6.75
ORP (mV)	-50.5	-67.7	-77.7	-100.5	-121.3	-121.5
TEMP.(C)	28.91	28.85	28.9	28.87	28.9	28.9
Salinity (ppt)	9839	10136	10239	10297	10295	10242
DO (mg/L)	3.76	3.7	3.94	4.57	4.95	5.22
Turbidity (NTU)	1586.8	1079.5	1586.9	1586.9	1587.1	1587.5
COND.(umhos/cm)	10610	10904	11013	11058	11060	11005

SAMPLE PARAMETERS (GRAB OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / N 1.0um,0.45um, OTHER:

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:

ODOR: NONE , LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILTS

COMMENTS: Turning very clear

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. **SEE BACK OF SHT Y / N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 12/20/2000 / @ 1518

SIGNED/SAMPLER: _____

PAGE_____ OF ____

CH2M HILL
WELL SAMPLING FIELD SHEET

PROJECT#_____ 160403.FI.ZZ

WELL NUMBER:	Ktd - NAVY 01	**SITE:**	Background-in magazine area
FIELD CREW:	E. Cabale, J. Hayes		

			CASING DIA.		GAL/FT OF CASING	
DEPTH TO WATER (FT):	=	21.23				
WELL DEPTH (FT):		76.96	2 IN.		0.1632	
WATER COLUMN (FT):	=	55.73	4 IN.		0.6528	
GAL/FT OF CASING	x	2.611	6 IN.		1.4688	
CASING VOLUME (GAL)	=	145.5	8 IN.		2.611	
NO. OF VOLUMES min.(3)	x	3	10 IN.		4.0797	
PURGE VOLUME (GAL)	=	436	12 IN.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. PERIST.	**OTHER:**	**BAILER** : TEFLON, SS , OTHER:
TIME ON: 1500		BAILER VOL.. (gal) .25 / .33
FLOW RATE (gpm): 10.0		REQUIRED PULLS:
PUMP TIME (min): 15		VOL. PURGED (gals):
VOL. PURGED (gals): N/A		OTHER:

FIELD PARAMETERS	**FIELD MEASUREMENTS**					WITHIN 10% Y / N
	1st	2nd	3rd	4th	5th	6th
TIME	1500	1510	1515			
VOL. (gal)						
pH (s.units)	7.39	7.15	6.98			
ORP (mV)	-4.5	-59.9	-66.2			
TEMP.(C)	26.45	27.07	27.08			
Salinity (ppt)	-	-	-			
DO (mg/L)	0.31	0.17	0.17			
Turbidity (NTU)	7.8	8.5	5.6			
COND.(umhos/cm)	1149	1135	1137			

SAMPLE PARAMETERS (GRAB OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / N 1.0um.0.45um. OTHER:

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:

ODOR: NONE , LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILTS

COMMENTS:

Not turbid even during initial purge.

OTHER: PLEASE USE BACK OF SHT. FOR SKETCHING MAPS , WELL LOCATION NOTES ECT. **SEE BACK OF SHT Y / N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER : MS, MSD, FD

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 12/13/2000 / @ 1530

SIGNED/SAMPLER: J. Hayes 12/13/2000

PAGE_____OF_____

CH2M HILL
WELL SAMPLING FIELD SHEET

PROJECT#_____ 160403.FI.ZZ

WELL NUMBER:	NAVY 07	**SITE:**	Background- In magazine area
FIELD CREW:	J. Hayes, E. Cabale		

			CASING DIA.		GAL/FT OF CASING	
DEPTH TO WATER (FT):	=	21.61				
WELL DEPTH (FT):		44.12	2 IN.		0.1632	
WATER COLUMN (FT):	=	22.5	~~4 IN.~~		~~0.6528~~	
			5 IN.		1.02	
GAL/FT OF CASING	x	1.02	~~6 IN.~~		~~1.4688~~	
CASING VOLUME (GAL)	=	22.96	8 IN.		2.611	
NO. OF VOLUMES min.(3)	x	3	10 IN.		4.0797	
PURGE VOLUME (GAL)	=	68.9	12 IN.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. PERIST.	**OTHER:**	**BAILER** : TEFLON, SS ,OTHER:
TIME ON: ~~1048~~		BAILER VOL.. (gal) .25 / .33
FLOW RATE (gpm): 10.0		REQUIRED PULLS:
PUMP TIME (min): 10		VOL. PURGED (gals):
VOL. PURGED (gals): 80.0		OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS 1st	2nd	3rd	4th	5th	WITHIN 10% Y / N 6th
TIME	1048	1055	1056	1058		
VOL. (gal)	0.000	70.000	80.000			
pH (s.units)	7.67	7.59	7.63	DRY		
ORP (mV)	-149.1	-182.4	-164.2			
TEMP.(C)	27.27	26.77	26.79			
Salinity (ppt)	-	-	-			
DO (mg/L)	0.15	0.13	0.14			
Turbidity (NTU)	25.9	68.8	56.8			
COND.(umhos/cm)	943	919	920			

SAMPLE PARAMETERS (GRAB OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / N 1.0um,0.45um, OTHER:

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:

ODOR: NONE , LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILTS

COMMENTS:

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. **SEE BACK OF SHT Y / N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 12/14/2000 / @ 1125

SIGNED/SAMPLER: J. Hayes 12/14/2000

CH2M HILL
WELL SAMPLING FIELD SHEET

PROJECT# 160403.FI.ZZ

WELL NUMBER:	NAVY 08	**SITE:**	Background- in magazine area
FIELD CREW:	J. Hayes, E. Cabale, E. Isem		

		CASING DIA.		GAL/FT OF CASING	
DEPTH TO WATER (FT):	= 28.20				
WELL DEPTH (FT):	58.15	2 IN.		0.1632	
WATER COLUMN (FT):	= 29.95	4 IN.		0.6528	
GAL/FT OF CASING	x 1.02	5 IN.		1.02	
		6 IN.		1.4688	
CASING VOLUME (GAL)	= 30.55	8 IN.		2.611	
NO. OF VOLUMES min.(3)	x 3	10 IN.		4.0797	
PURGE VOLUME (GAL)	= 91.65	12 IN.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. PERIST.	**OTHER:**	**BAILER :** TEFLON, SS ,OTHER:
TIME ON: 942		BAILER VOL.. (gal) .25 / .33
FLOW RATE (gpm): 10.0		REQUIRED PULLS:
PUMP TIME (min): 16		VOL. PURGED (gals):
VOL PURGED (gals): 150.0		OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS 1st	2nd	3rd	4th	5th	WITHIN10% Y / N 6th
TIME	942	950	955	958		
VOL (gal)	0.000	80.000	130.000	150.00		
pH (s.units)	7.4	7.39	7.37	7.37		
ORP (mV)	-99.5	-60.5	-56.5	-59.6		
TEMP.(C)	26.99	26.28	26.58	26.54		
Salinity (ppt)	-	-	-	-		
DO (mg/L)	0.13	0.21	0.18	0.19		
Turbidity (NTU)	79.9	102.3	119	120		
COND.(umhos/cm)	875	870	850	860		

SAMPLE PARAMETERS (GRAB OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / N 1.0um,0.45um, OTHER:

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:

ODOR: NONE , LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILTS

COMMENTS:

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. **SEE BACK OF SHT Y / N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 12/14/2000 / @ 1000

SIGNED/SAMPLER: J. Hayes 12/14/2000

CH2M HILL
WELL SAMPLING FIELD SHEET

PROJECT# 160403.FLZZ

WELL NUMBER: AOC-K-MW-3	SITE: WATER WELL - PUBLIC WORKS
FIELD CREW: E. ISERN, E. CABALE	(leave blank if on previous page)

			CASING DIA.		GAL/FT OF CASING	
DEPTH TO WATER (FT):		54.68				
WELL DEPTH (FT):		-68.88	2 IN.		0.1632	
WATER COLUMN (FT):	=	14.20	4 IN.		0.6528	
GAL/FT OF CASING	x	0.1632	6 IN.		1.4688	
CASING VOLUME (GAL)	=	2.317	8 IN.		2.611	
NO. OF VOLUMES min.(3)	x	3	10 IN.		4.0797	
PURGE VOLUME (GAL)	=	6.952	12 IN.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. PERIST.	OTHER:	BAILER : TEFLON, SS ,OTHER:
TIME ON: 1216-1228		BAILER VOL., (gal) .25 / .33
FLOW RATE (gpm): 0.5 L/6.57 SEC		REQUIRED PULLS:
PUMP TIME (min): 12 MIN.		VOL. PURGED (gals):
VOL. PURGED (gals): 60 L		OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS					WITHIN10% Y / N
	1st	2nd	3rd	4th	5th	6th
TIME	1500	1502	1504	1507		
VOL (gal)	30 L	36L	40L	50 L		
pH (s.units)	6.01	6.85	6.90	6.93		
ORP (mV)	183.6	143.5	148.8	153.1		
TEMP.(C)	27.57	27.49	27.48	27.45		
Salinity (ppt)	1840	1831	1836	1840		
DO (mg/L)	5.26	4.46	6.29	10.46		
Turbidity (NTU)	1580.9	1580.7	1580.6	749.6		
COND.(umhos/cm)	1931.0	1922	1912	1928		

SAMPLE PARAMETERS (GRAB OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / N 1.0um 0.45um. OTHER:

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:

ODOR: NONE LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILTS

COMMENTS: Pumped for 10 mins. In order to see if it cleared, but was the same.

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. SEE BACK OF SHT Y / N.

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 12/19/2000 / @ 1510

SIGNED/SAMPLER:

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
160403.FI.ZZ	QS MW01	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : NASD, Vieques, Background LOCATION : QS-MW01
DEVELOPMENT CONTRACTOR : NA
DEVELOPMENT METHOD AND EQUIPMENT USED : Geopump
START WATER LEVELS : 3.88 ft START : 930 END : 1005 LOGGER : J. Hayes

MAXIMUM DRAWDOWN DURING PUMPING:
RANGE AND AVERAGE DISCHARGE RATE: 0.2 gal/min
TOTAL QUANTITY OF WATER DISCHARGE 6.5 gal
DISPOSITION OF DISCHARGE WATER: grey in color, the cleared up.

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
932	0.4	3.88	1121.7	26.82	7.62	45424	Sulfur odor
945	3		808.1	26.41	7.49	43526	
1000	6		52.1	26.88	7.51	46856	

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
160403.FI.ZZ	QS MW02	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : NASD, Vieques, Background LOCATION : QS-MW01
DEVELOPMENT CONTRACTOR : NA
DEVELOPMENT METHOD AND EQUIPMENT USED : Geopump
START WATER LEVELS : 3.71 ft START : 920 END : 1058 LOGGER : J. Hayes

MAXIMUM DRAWDOWN DURING PUMPING:
RANGE AND AVERAGE DISCHARGE RATE 0.2 gal/min
TOTAL QUANTITY OF WATER DISCHARGE 7.0 gal
DISPOSITION OF DISCHARGE WATER: On the ground. This well is not in a contaminated site.

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1025	0.6	3.71	147.7	27.36	7.53	50494	Clear
1047	4.4		175	27.47	7.34	54210	
1055	6		18.5	27.21	7.25	54553	
1058	6.6		24.6	26.97	7.31	54889	

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
160403.FI.ZZ	QA MW01	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : NASD Background LOCATION : QAMW01
DEVELOPMENT CONTRACTOR : NA
DEVELOPMENT METHOD AND EQUIPMENT USED : Geopump
START WATER LEVELS : 6.95 ft START : 1110 END : 1225 LOGGER : J. Hayes

MAXIMUM DRAWDOWN DURING PUMPING:
RANGE AND AVERAGE DISCHARGE RATE:
TOTAL QUANTITY OF WATER DISCHARGE 4 gal
DISPOSITION OF DISCHARGE WATER: On the ground - well not close to known contaminated area.

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1110	0.5		1562.7	27.37	8.36	3633	Reddish color, odorless
1145	1.5		1564.1	27.51	8.04	3244	
1225	4		1157	28.03	7.74	3232	
←		DRY					→

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
160403.FI.ZZ	QA MW02	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : Background Sampling for NASD, Vieques, PR LOCATION : QAMW02
DEVELOPMENT CONTRACTOR : CH2M HILL
DEVELOPMENT METHOD AND EQUIPMENT USED : Geopump
START WATER LEVELS : 6.95 ft START : 1736 END : 1800 LOGGER : E. Isern

MAXIMUM DRAWDOWN DURING PUMPING:
RANGE AND AVERAGE DISCHARGE RATE: from .207 gpm - .104 gpm
TOTAL QUANTITY OF WATER DISCHARGE 8.5 gal
DISPOSITION OF DISCHARGE WATER: To the ground - well was not in known contaminated area.

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1736	0.3	6.95	445.5	28.08	6.76	9570	Little sediment, light brown, no odor otherwise clear water
1740	0.8	7.5	440	27.18	6.8	9865	almost clear
1745	2	8.1	316.1	25.85	6.77	9941	almost clear
1748	4.5	8.3	104.4	27.42	6.7	10060	almost clear
1752	6	8.4	121.3	27.86	6.6	10115	clear
1800	8.5	8.33	73.9	27.61	6.62	10847	clear

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
160403.FI.ZZ	AOC-K-MW-3	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : NASD VIEQUES, P.R. LOCATION : AOC-K VIEQUES P.R.
DEVELOPMENT CONTRACTOR : CH2MHILL
DEVELOPMENT METHOD AND EQUIPMENT USED : BAILER
START WATER LEVELS : 51.63 FT. BLS START : 1630 12/08/00 END : LOGGER : MLW

MAXIMUM DRAWDOWN DURING PUMPING:
RANGE AND AVERAGE DISCHARGE RATE:
TOTAL QUANTITY OF WATER DISCHARGED:
DISPOSITION OF DISCHARGE WATER:

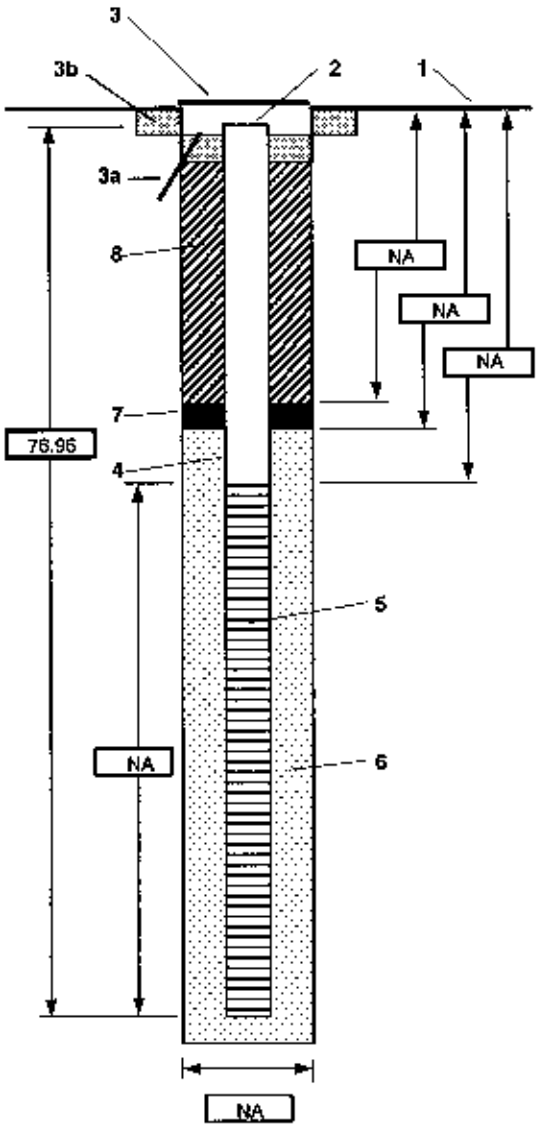
Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
##### 1630	0						START BAILING
1700	3/3 DRY						STOP

PROJECT NUMBER	WELL NUMBER		
160403.FI.ZZ	NAVY01	SHEET 1	OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT : NASD, Vieques, PR
LOCATION : Magazine Area
DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : NA
WATER LEVELS : 21.23 FT BELOW TOC START : NA END : NA LOGGER : J. Hayes



1- Ground elevation at well: NA

2- Top of casing elevation: NA

3- Wellhead protection cover type: 10 IN Manhole cover within enclosed shelte
a) drain tube?: NO
b) concrete pad dimensions: 24 IN by 24 IN

4- Dia./type of well casing: 6 IN Ductile Iron pipe

5- Type/slot size of screen: NA

6- Type screen filter: NA
a) Quantity used: NA

7- Type of seal: NA
a) Quantity used: NA

8- Grout
a) Grout mix used: NA
b) Method of placement: NA
c) Vol. of well casing grout: NA

Development method: NA

Development time: NA

Estimated purge volume: 436 GAL

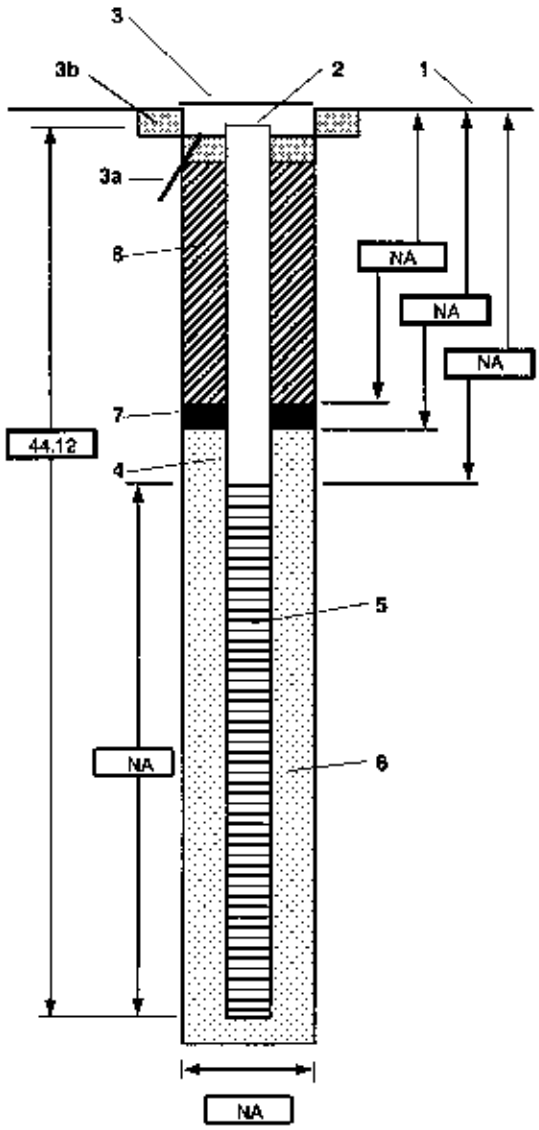
Comments: Existing water production well that was destroyed after sampling by another contractor as part of NASD closure requirements.

PROJECT NUMBER	WELL NUMBER		
160403.FI.ZZ	NAVY07	SHEET 1	OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT : NASD, Vieques, PR LOCATION : Magazine Area
DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : NA
WATER LEVELS : 21.61 BTOC START : NA END : NA LOGGER : J. Hayes



1- Ground elevation at well	NA
2- Top of casing elevation	NA
3- Wellhead protection cover type	Manhole cover within abandoned shelter
a) drain tube?	NO
b) concrete pad dimensions	60 IN by 60 IN
4- Dia./type of well casing	5 IN Ductile iron pipe
5- Type/slot size of screen	NA
6- Type screen filter	NA
a) Quantity used	NA
7- Type of seal	NA
a) Quantity used	NA
8- Grout	
a) Grout mix used	NA
b) Method of placement	NA
c) Vol. of well casing grout	NA
Development method	NA
Development time	NA
Estimated purge volume	68.9 GAL

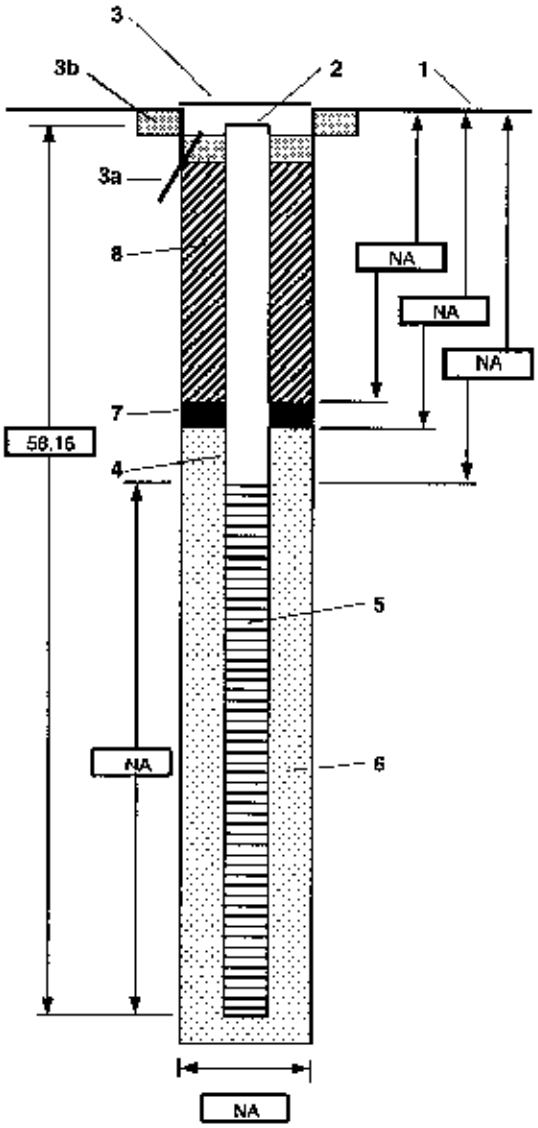
Comments Existing water production well that was destroyed after sampling by another contractor as part of NASD closure requirements.

PROJECT NUMBER	WELL NUMBER	
160403.FI.ZZ	NAVY08	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT : NASD, Vieques, PR LOCATION : Magazine Area
DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : NA
WATER LEVELS : 28.2 BTOC START : NA END : NA LOGGER : J. Hayes



1- Ground elevation at well: NA

2- Top of casing elevation: NA

3- Wellhead protection cover type: Manhole cover within abandoned shelter
a) drain tube?: NO
b) concrete pad dimensions: 60 IN by 60 IN

4- Dia./type of well casing: 5 IN Ductile Iron pipe

5- Type/slot size of screen: NA

6- Type screen filter: NA
a) Quantity used: NA

7- Type of seal: NA
a) Quantity used: NA

8- Grout
a) Grout mix used: NA
b) Method of placement: NA
c) Vol. of well casing grout: NA

Development method: NA

Development time: NA

Estimated purge volume: 91.65 GAL

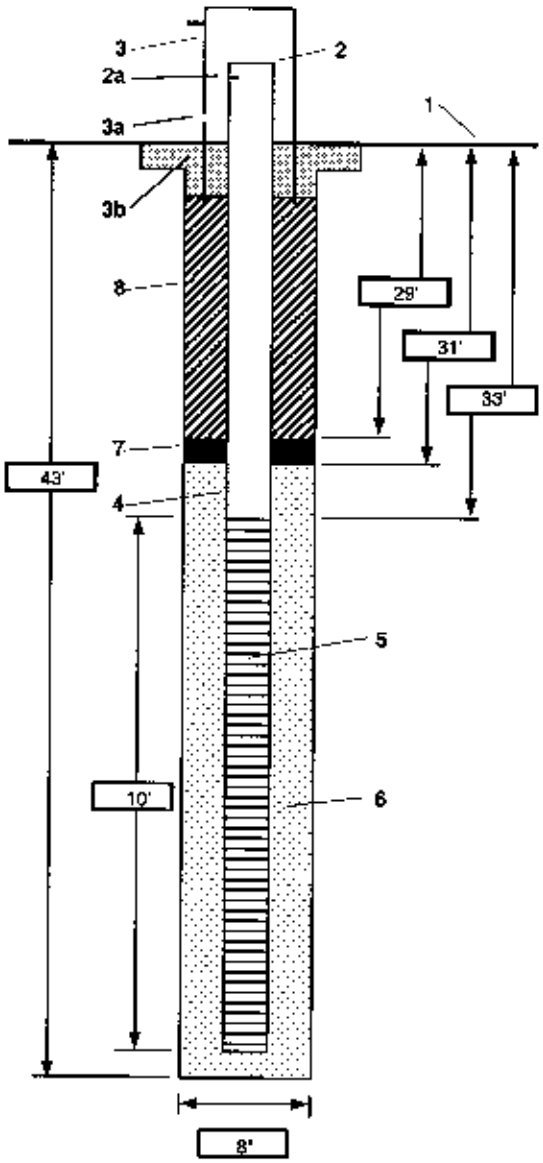
Comments: Existing water production well that was destroyed after sampling by another contractor as part of NASD closure requirements.

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
160403.FI.ZZ	QA - MW1	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : NASD Vieques, PR
LOCATION : Along asphalt main road
DRILLING CONTRACTOR : Geoworks
DRILLING METHOD AND EQUIPMENT USED : HAS B-61
WATER LEVELS : 6.0 FT BLS
START : 1100 12/08/00
END : 12-11-00
LOGGER : E.I. & E.C.



1- Ground elevation at well: NA

2- Top of casing elevation: NA
a) vent hole? NO

3- Wellhead protection cover type: 4" square steel vault
a) weep hole? No
b) concrete pad dimensions: 2.5' x 2.5' x 4"

4- Dia./type of well casing: 2" diameter SCH 40 PVC

5- Type/slot size of screen: 2" diameter SCH 40 PVC
0.010 SLOT

6- Type screen filter: Washed sand and fine gravel
a) Quantity used: 10 bags, 30#

7- Type of seal: Enviro Plug, Sodium Bentonite
a) Quantity used: 1/2, 50# bag

8- Grout
a) Grout mix used: Cement mixed w/sand
b) Method of placement: pour
c) Vol. of well casing grout: ---

Development method:

Development time:

Estimated purge volume:

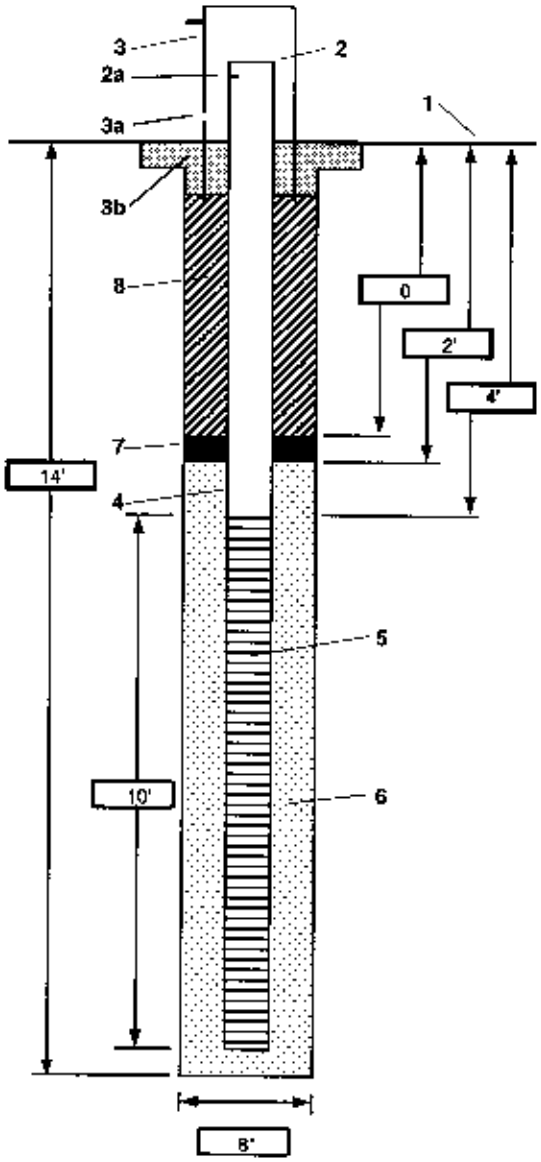
Comments: No sump on well

CH2MHILL

PROJECT NUMBER	WELL NUMBER QA-MW2 SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : NASD Background LOCATION : Background - HY 200
DRILLING CONTRACTOR : Geoworks
DRILLING METHOD AND EQUIPMENT USED : HAS B-61
WATER LEVELS : 6.0 FT BLS START : 12/13/2000 END : 12-14-00 LOGGER : M. Clasen



1- Ground elevation at well

2- Top of casing elevation
a) vent hole?

3- Wellhead protection cover type Steel above ground
a) weep hole? No
b) concrete pad dimensions 2.5' x 2.5'

4- Dia./type of well casing 2" diameter SCH 40 PVC

5- Type/slot size of screen 2" diameter SCH 40 PVC
0.010 SLOT

6- Type screen filter Washed sand and gravel
a) Quantity used 4 bags

7- Type of seal Enviro Plug, Sodium Bentonite
a) Quantity used 1/2 bag

8- Grout
a) Grout mix used cement w/sand
b) Method of placement pour
c) Vol. of well casing grout

Development method

Development time

Estimated purge volume

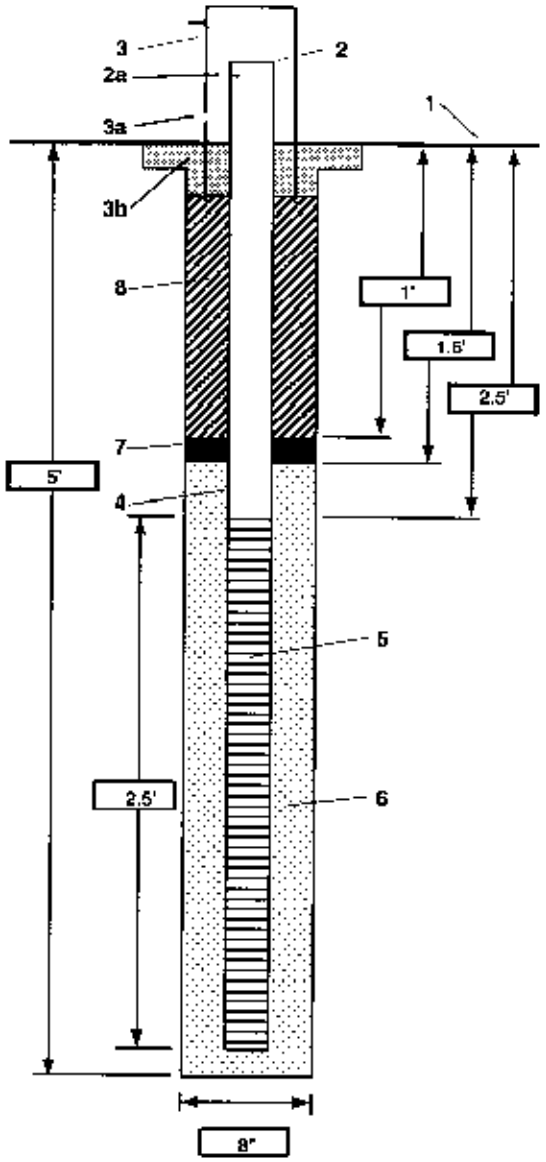
Comments No sump on well

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
160403.FI.ZZ	QS - MW1	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : NASD Vieques, PR
LOCATION : Green Beach Area
DRILLING CONTRACTOR : Geoworks
DRILLING METHOD AND EQUIPMENT USED : HAS B-61
WATER LEVELS : 6.0 FT BLS
START : 1100 12/14/00
END : 12-14-00
LOGGER : MC



1- Ground elevation at well: NA

2- Top of casing elevation: NA
a) vent hole? NO

3- Wellhead protection cover type: 4" square steel cover
a) weep hole? No
b) concrete pad dimensions: 2.5' x 2.5' x 4"

4- Dia./type of well casing: 2" diameter SCH 40 PVC

5- Type/slot size of screen: 2" diameter SCH 40 PVC
0.010 SLOT

6- Type screen filter: Washed sand and fine gravel
a) Quantity used: 10bag, 30#

7- Type of seal: Enviro Plug, Sodium Bentonite
a) Quantity used: 1/4, 50# bag

8- Grout
a) Grout mix used: Cement mixed w/sand
b) Method of placement: pour
c) Vol. of well casing grout: ---

Development method:

Development time:

Estimated purge volume:

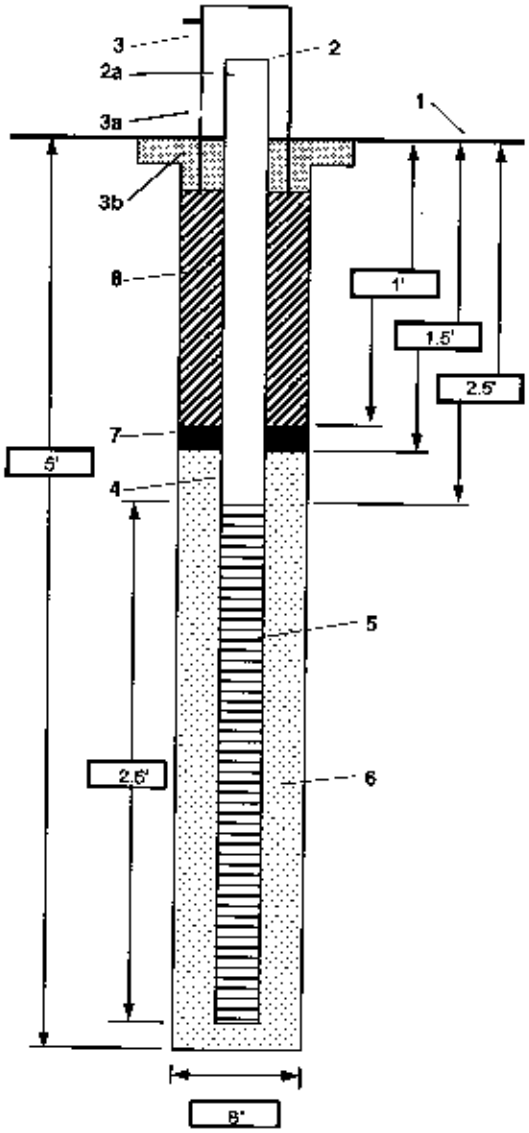
Comments: No sump on well

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
160403.FI.ZZ	QS - MW2	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : NASD Vieques, PR LOCATION : Green Beach Area
DRILLING CONTRACTOR : Geoworks
DRILLING METHOD AND EQUIPMENT USED : HAS B-61
WATER LEVELS : 6.0 FT BLS START : 1030 12/14/00 END : 12-14-00 LOGGER : MC



1- Ground elevation at well: NA

2- Top of casing elevation: NA
a) vent hole? NO

3- Wellhead protection cover type: 4" square steel cover
a) weep hole? No
b) concrete pad dimensions: 2.5' x 2.5' x 4"

4- Dia./type of well casing: 2" diameter SCH 40 PVC

5- Type/slot size of screen: 2" diameter SCH 40 PVC
0.010 SLOT

6- Type screen filter: Washed sand and fine gravel
a) Quantity used: 10bag, 30#

7- Type of seal: Enviro Plug, Sodium Bentonite
a) Quantity used: 1/4, 50# bag

8- Grout
a) Grout mix used: Cement mixed w/sand
b) Method of placement: pour
c) Vol. of well casing grout: ----

Development method:

Development time:

Estimated purge volume:

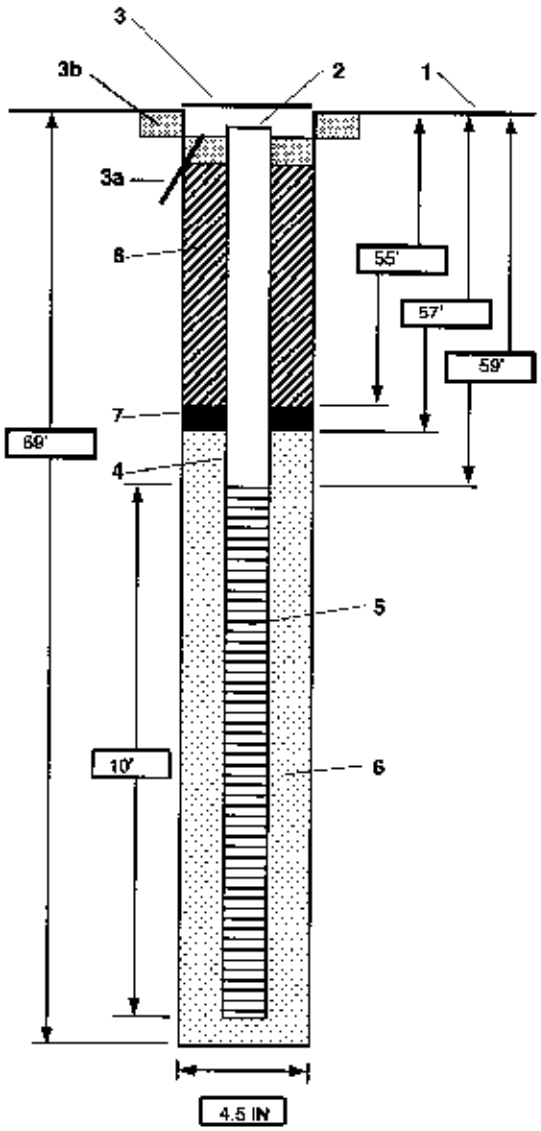
Comments: No sump on well

PROJECT NUMBER	WELL NUMBER
160403.FI.ZZ	AOC-K-MW-3 SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT : NASD VIEQUES P.R. LOCATION : AOC-K
DRILLING CONTRACTOR : GEOWORKS
DRILLING METHOD AND EQUIPMENT USED : 8.5 DIA. HAS
WATER LEVELS : START : 1110 12/8/00 END : 1500 12/8/00 LOGGER : MLW



1- Ground elevation at well: NA

2- Top of casing elevation: NA

3- Wellhead protection cover type: 8" DIAM. FLUSH MOUNT
a) drain tube?: NO
b) concrete pad dimensions: 2.5' X 2.5'

4- Dia./type of well casing: 2" DIAM. SCH 40 PVC

5- Type/slot size of screen: 2" DIAM. SCH 40 PVC 10 SLOT

6- Type screen filter: WASHED SAND AND GRAVEL
a) Quantity used: 10 BAGS

7- Type of seal: ENVIRO PLUG SODIUM BENTONITE
a) Quantity used: 1/2 50# BAG

8- Grout
a) Grout mix used: CEMENT W/SAND
b) Method of placement:
c) Vol. of well casing grout:

Development method:

Development time:

Estimated purge volume:

Comments:

Appendix D

Analytical Data - Groundwater

NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK-IR
	StationID	KTD-NAVY1	KTD-NAVY1	KTD-NAVY7	KTD-NAVY8	QA-MW01	QA-MW02	QA-MW02	QS-MW01	QS-MW02	AOC-K-MW03
	SampleID	BKG067	BKG068FD1	BKG070	BKG069	BKG045	BKG046FD1	BKG047	BKG025	BKG026	NDE220
	DateCollected	12/13/2000	12/13/2000	12/14/2000	12/14/2000	12/21/2000	12/20/2000	12/20/2000	12/18/2000	12/20/2000	
Parameter	**Units**	(not used)	(not used)	(not used)	(not used)						
DISSOLVED METALS											
ALUMINUM, DISSOLVED	UG/L	220 =	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U
ANTIMONY, DISSOLVED	UG/L	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	9.1 J	3.8 J	2.4 U
ARSENIC, DISSOLVED	UG/L	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	5.5 J	2.9 U	2.9 U
BARIUM, DISSOLVED	UG/L	71 B	75 J	62 J	15 J	120 J	230 =	230 =	870 J	400 =	200 =
BERYLLIUM, DISSOLVED	UG/L	0.33 J	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	2.2 J	1 J	0.33 U
CALCIUM, DISSOLVED	UG/L	56000 =	59000 =	24000 =	19000 =	180000 J	330000 J	330000 J	660000 J	650000 J	110000 U
CADMIUM, DISSOLVED	UG/L	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	1.1 J	0.27 U	0.27 =
CHROMIUM, DISSOLVED	UG/L	0.87 U	0.87 U	0.87 U	0.87 U	0.87 U	0.87 U	0.87 U	4.6 J	2.9 J	0.87 U
COBALT, DISSOLVED	UG/L	0.43 U	0.43 U	0.43 U	0.43 U	5.7 J	0.43 U	0.43 U	11 J	5.5 J	0.43 U
COPPER, DISSOLVED	UG/L	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
IRON, DISSOLVED	UG/L	2800 J	2900 J	14000 J	4300 J	25 U	420 J	420 J	410 =	490 J	25 U
LEAD, DISSOLVED	UG/L	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
MAGNESIUM, DISSOLVED	UG/L	34000 =	36000 =	12000 =	15000 =	150000 =	310000 =	310000 =	1500000 =	1700000 =	71000 =
MANGANESE, DISSOLVED	UG/L	94 =	98 =	1400 =	210 =	3100 J	1000 J	1100 J	18000 J	8700 J	190 =
MERCURY, DISSOLVED	UG/L	0.025 U	0.025 U	0.025 U	0.025 U	0.025 UJ	0.025 UJ	0.025 UJ	0.025 U	0.025 UJ	NA
NICKEL, DISSOLVED	UG/L	1.9 J	2.1 J	1.8 J	1.9 J	12 J	2 J	2.4 J	3.2 J	2.1 J	0.93 U
POTASSIUM, DISSOLVED	UG/L	2500 J	2600 J	40000 J	2000 J	13000 J	60000 J	60000 J	400000 J	720000 J	5800 J
SELENIUM, DISSOLVED	UG/L	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U
SILVER, DISSOLVED	UG/L	0.57 U	0.57 U	0.57 U	0.57 U	0.56 U	0.56 U	0.56 U	0.56 U	0.56 U	0.57 U
SODIUM, DISSOLVED	UG/L	150000 =	150000 =	130000 =	170000 =	360000 =	1500000 =	1500000 =	10000000 =	12000000 =	200000 =
THALLIUM, DISSOLVED	UG/L	6.3 J	8.6 J	5.4 J	5.1 J	5.5 J	6.4 J	7.1 J	16 =	3.4 U	3.4 U
VANADIUM, DISSOLVED	UG/L	2.5 J	3 J	0.7 U	1.9 J	32 J	2.6 J	2.8 J	3 J	5.9 J	4.9 J
ZINC, DISSOLVED	UG/L	6.7 J	5.6 J	5 U	10 J	15 J	5 U	5 U	20 U	20 U	5 U
TOTAL METALS											
ALUMINUM	UG/L	95 U	95 U	320 =	95 U	3500 J	95 U	130 J	3000 R	950 J	2000 =
ANTIMONY	UG/L	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	5.1 J	5.2 J	2.4 U
ARSENIC	UG/L	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
BARIUM	UG/L	73 J	73 J	71 J	15 J	180 J	220 =	210 =	960 J	390 =	250 =
BERYLLIUM	UG/L	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	1.8 J	1.4 J	0.33 U
CADMIUM	UG/L	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	1 J	0.27 U	0.27 U
CALCIUM	UG/L	56000 =	58000 =	25000 =	18000 =	180000 J	330000 J	320000 J	660000 J	630000 J	120000 =
CHROMIUM, TOTAL	UG/L	0.87 U	0.87 U	1.6 J	2 J	6.8 J	0.87 U	0.87 U	5.9 J	3.7 J	4.9 J
COBALT	UG/L	0.43 U	0.43 U	1.5 J	0.43 U	20 J	1.2 J	0.43 U	12 J	8.6 J	5.4 J
COPPER	UG/L	0.8 U	0.8 U	0.8 U	0.8 U	15 J	0.8 U	0.8 U	4.4 J	2.8 J	12 J
IRON	UG/L	3400 =	3500 J	29000 J	23000 J	4800 J	440 J	480 J	2700 J	1300 J	3800 =
MAGNESIUM	UG/L	34000 J	35000 =	13000 =	14000 =	150000 =	310000 =	290000 =	1400000 =	1600000 =	76000 =
MANGANESE	UG/L	100 =	98 =	1600 =	300 =	3200 J	980 J	910 J	17000 J	8600 J	400 =
LEAD	UG/L	1.6 U	1.6 U	4.7 =	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
MERCURY	UG/L	0.025 U	0.025 U	0.025 U	0.025 U	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ	NA
NICKEL	UG/L	1.8 J	1.9 J	5.7 J	2.9 J	19 J	2.8 J	3.1 J	2.4 J	3.9 J	9.2 J
POTASSIUM	UG/L	2600 J	2500 J	40000 =	2000 J	10000 J	59000 J	56000 J	490000 =	700000 J	6000 J
SELENIUM	UG/L	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U
SILVER	UG/L	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
SODIUM	UG/L	140000 =	150000 =	130000 =	160000 =	350000 =	1500000 =	1400000 =	10000000 =	12000000 =	210000 =
THALLIUM	UG/L	7.2 J	7.8 J	8.8 J	6 J	3.4 U	6 J	4.8 J	18 =	6.9 J	8 J
VANADIUM	UG/L	1.9 J	3.2 J	1.8 J	2.2 J	75 =	3.2 J	3.5 J	7.6 J	8.5 J	20 J
ZINC	UG/L	8.4 J	9.9 J	1300 =	14 J	60 =	5 U	5 U	20 U	20 U	5 U

Data Flags:

U = Undetected; analyte was analyzed but not detected above the method detection limit.

UJ = Detection limit was estimated; analyte was analyzed and qualified as undetected.

J = Estimated value; compounds detected at concentrations between the reporting limit and the method detection limit.

B = Analyte was detected in the associated method blank.

(not used) = Data not used in final background groundwater data set

Appendix D

Analytical Data - Surface Water

NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK
	StationID	QB-SW01	QB-SW02	QB-SW03	QB-SW03	QB-SW04	QS-SW01	QS-SW01	QS-SW02
	SampleID	BKG083	BKG084	BKG085FD1	BKG086	BKG087	BKG022	BKG024FD1	BKG023
	DateCollected	12/20/2000	12/20/2000	12/20/2000	12/20/2000	12/20/2000	12/06/2000	12/06/2000	12/06/2000
Parameter	**Units**	(not used)	(not used)	(not used)	(not used)	(not used)			
TOTAL METALS									
ALUMINUM	UG/L	16000 R	230000 R	500000 R	350000 R	220000 R	5000 J	1500 J	530 J
ANTIMONY	UG/L	3.7 J	7.6 J	13 J	10 J	9.4 J	2.4 U	2.4 U	3.3 J
ARSENIC	UG/L	7.8 J	15 =	19 =	18 =	13 =	15 =	5.2 J	2.9 U
BARIUM	UG/L	100 J	480 J	1200 J	760 J	630 J	37 J	20 J	17 J
BERYLLIUM	UG/L	2.8 J	5.4 =	11 =	8.4 =	6.8 =	1.1 J	1.2 J	2.5 J
CADMIUM	UG/L	1.7 J	16 =	39 =	23 =	11 =	1.1 J	0.27 U	0.27 U
CALCIUM	UG/L	570000 J	830000 J	12000000 J	8600000 J	1600000 J	390000 =	380000 =	480000 =
CHROMIUM, TOTAL	UG/L	4.4 J	68 =	120 =	78 =	59 =	4.3 J	1.2 J	0.87 U
COBALT	UG/L	5.4 J	63 =	120 =	76 =	54 =	2 J	1.1 J	0.43 U
COPPER	UG/L	16 J	350 =	970 =	610 =	430 =	14 J	4.5 J	0.8 U
IRON	UG/L	14000 J	190000 J	340000 J	230000 J	160000 J	4900 =	1600 =	590 =
MAGNESIUM	UG/L	1900000 =	8300000 =	14000000 =	13000000 =	2100000 =	1200000 =	1100000 =	1600000 =
MANGANESE	UG/L	620 J	7100 J	17000 J	10000 J	5600 J	85 =	46 =	28 =
LEAD	UG/L	1.6 U	75 =	150 =	93 =	85 =	1.6 U	1.6 U	1.6 U
MERCURY	UG/L	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ
NICKEL	UG/L	4.2 J	39 J	61 =	43 =	32 J	5.2 J	3.3 J	3.1 J
POTASSIUM	UG/L	980000 =	4500000 =	6300000 =	5800000 =	980000 =	620000 J	580000 J	810000 J
SELENIUM	UG/L	4.6 U	18.4 U	18.4 U	18.4 U	4.6 U	4.6 U	4.6 U	4.6 U
SILVER	UG/L	0.57 U	1 J	2.4 J	1.3 J	0.57 U	0.57 U	0.57 U	0.57 U
SODIUM	UG/L	14000000 =	47000000 =	65000000 =	64000000 =	13000000 =	8600000 =	8200000 =	11000000 =
THALLIUM	UG/L	3.4 J	3.4 U	13.6 U	3.4 U	3.4 U	9.7 J	7.5 J	5.1 J
VANADIUM	UG/L	44 J	370 =	690 =	450 =	320 =	8.3 J	3 J	2.7 J
ZINC	UG/L	20 U	470 =	1600 =	1000 =	560 =	5 U	5 U	5 U

Data Flags:

U = Undetected; analyte was analyzed but not detected above the method detection limit.

UJ = Detection limit was estimated; analyte was analyzed and qualified as undetected.

J = Estimated value; compounds detected at concentrations between the reporting limit and the method detection limit.

B = Analyte was detected in the associated method blank.

(not used) = Data not used in final background groundwater data set

Appendix D
Analytical Data - Surface Soil
NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK
	StationID	KTD-SS01	KTD-SS01	KTD-SS010	KTD-SS02	KTD-SS02	KTD-SS03	KTD-SS04	KTD-SS05	KTD-SS06	KTD-SS07
	SampleID	BKG049	BKG050FD1	BKG064	BKG052	BKG055FD1	BKG053	BKG056	BKG057	BKG059	BKG060
	DateCollected	12/06/2000	12/06/2000	12/07/2000	12/05/2000	12/05/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/07/2000
Parameter	**Units**										
TOTAL METALS											
ALUMINUM	MG/KG	18000 =	17000 =	8900 J	8200 =	8600 =	13000 =	9100 =	7400 =	15000 =	11000 J
ANTIMONY	MG/KG	1.2 J	1.2 J	0.29 UJ	0.66 J	0.71 J	0.71 J	0.59 J	0.3 UJ	0.87 J	0.26 UJ
ARSENIC	MG/KG	1.2 J	0.85 J	0.35 U	0.6 J	0.37 U	0.87 J	0.57 J	0.72 J	0.99 J	0.31 U
BARIUM	MG/KG	61 =	64 =	150 J	57 =	66 =	39 J	43 =	85 =	72 =	170 J
BERYLLIUM	MG/KG	0.17 J	0.17 J	0.22 J	0.037 U	0.042 U	0.041 U	0.034 U	0.17 J	0.24 J	0.27 J
CADMIUM	MG/KG	0.031 U	0.03 U	0.032 U	0.031 U	0.034 U	0.033 U	0.028 U	0.034 U	0.036 U	0.029 U
CALCIUM	MG/KG	5100 J	4900 J	3300 J	3400 J	3700 J	5000 J	4700 J	2800 J	4900 J	7500 J
CHROMIUM, TOTAL	MG/KG	41 J	36 J	2.2 J	3.1 J	4 J	4 J	6.2 J	3.2 J	6.3 J	2.8 =
COBALT	MG/KG	13 =	12 =	6.7 J	6.9 J	8.2 J	11 J	7.3 J	8.6 J	10 J	6.9 J
COPPER	MG/KG	30 =	27 =	17 J	30 =	34 =	47 =	41 =	15 =	36 =	18 J
IRON	MG/KG	26000 J	25000 J	19000 J	17000 J	21000 J	23000 J	17000 J	14000 J	24000 J	20000 J
MAGNESIUM	MG/KG	4300 J	4200 J	2800 J	3000 J	3400 J	7100 J	4000 J	1500 J	3700 J	3300 J
MANGANESE	MG/KG	640 =	640 J	660 J	290 J	360 J	540 J	440 J	1200 J	780 J	690 J
LEAD	MG/KG	4.2 =	4 =	4.4 =	1.1 =	1.2 =	1.3 =	2.6 =	3.6 =	4.1 =	5.7 =
MERCURY	MG/KG	0.024 J	0.026 J	0.0091 J	0.0037 J	0.0032 U	0.0051 J	0.0087 J	0.019 J	0.013 J	0.019 J
NICKEL	MG/KG	13 =	12 =	1.3 J	1.8 J	1.8 J	3.2 J	3.3 J	1.4 J	2.7 J	1.7 J
POTASSIUM	MG/KG	1200 =	990 J	520 J	680 J	770 J	860 J	1000 J	1300 =	910 J	910 J
SELENIUM	MG/KG	0.52 U	0.51 U	0.73 J	0.52 U	0.58 U	0.57 U	0.48 U	0.58 U	0.61 U	0.49 U
SILVER	MG/KG	0.065 U	0.064 U	0.068 U	0.065 U	0.072 U	0.071 U	0.059 U	0.072 U	0.076 U	0.061 U
SODIUM	MG/KG	130 J	170 J	25 J	93 J	79 J	26 J	100 J	84 J	180 J	79 J
THALLIUM	MG/KG	0.39 U	0.38 U	0.41 U	0.39 U	0.43 U	0.42 U	0.35 U	0.46 J	0.45 U	0.45 J
VANADIUM	MG/KG	74 =	69 =	52 J	50 =	63 =	42 =	45 =	33 =	63 =	50 J
ZINC	MG/KG	37 =	36 =	44 =	25 =	28 =	42 =	31 =	26 =	43 =	53 =

Data Flags:

U = Undetected; analyte was analyzed but not detected above the method detection limit.
UJ = Detection limit was estimated; analyte was analyzed and qualified as undetected.
J = Estimated value; compounds detected at concentrations between the reporting limit and the method detection limit.
B = Analyte was detected in the associated method blank.
(not used) = Data not used in final background groundwater data set

Appendix D
Analytical Data - Surface Soil
NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK
	StationID	KTD-SS08	KTD-SS09	QA-SS01	QA-SS02	QA-SS03	QA-SS04	QA-SS05	QA-SS06	QA-SS07	QA-SS08
	SampleID	BKG062	BKG063	BKG030	BKG033	BKG034	BKG009	BKG010	BKG012	BKG040	BKG042FD1
	DateCollected	12/05/2000	12/07/2000	12/07/2000	12/05/2000	12/07/2000	12/05/2000	12/05/2000 (not used)	12/05/2000	12/06/2000	12/06/2000
Parameter	**Units**										
TOTAL METALS											
ALUMINUM	MG/KG	6900 =	13000 J	6300 J	15000 =	16000 J	13000 =	10000 =	24000 =	5000 =	6500 =
ANTIMONY	MG/KG	0.59 J	0.52 J	0.31 UJ	0.95 J	1.1 J	0.73 J	0.76 J	2.3 J	0.32 U	0.3 U
ARSENIC	MG/KG	0.59 J	0.32 U	0.66 J	1.3 J	0.37 U	0.79 J	1.2 J	2.2 J	0.39 U	0.74 J
BARIUM	MG/KG	76 =	190 J	32 J	83 =	70 J	62 =	83 =	69 =	57 =	91 =
BERYLLIUM	MG/KG	0.13 J	0.26 J	0.19 J	0.21 J	0.25 J	0.16 J	0.13 J	0.22 J	0.25 J	0.34 J
CADMIUM	MG/KG	0.028 U	0.03 U	0.035 U	0.031 U	0.035 U	0.029 U	0.029 U	0.032 U	0.036 U	0.034 U
CALCIUM	MG/KG	3300 =	9100 J	45000 J	5900 =	5900 J	4700 =	6100 =	27000 =	3600 =	1800 =
CHROMIUM, TOTAL	MG/KG	17 =	15 =	7.1 =	36 =	49 =	21 =	19 =	57 =	5.1 =	4.8 =
COBALT	MG/KG	7.9 J	12 =	4.6 J	19 =	17 =	9.4 J	11 =	22 =	4.3 J	6.7 J
COPPER	MG/KG	17 =	32 J	32 J	34 =	26 J	38 =	31 =	68 =	9.6 =	9.8 =
IRON	MG/KG	15000 =	24000 J	12000 J	26000 =	25000 J	21000 =	20000 =	38000 =	15000 =	15000 =
MAGNESIUM	MG/KG	2200 =	7200 J	3000 J	4100 =	4500 J	4600 =	3900 =	16000 =	1300 J	1300 =
MANGANESE	MG/KG	700 =	760 J	260 J	740 =	620 J	430 =	660 =	880 =	510 =	1100 =
LEAD	MG/KG	4 =	4.5 =	5.6 =	5.1 =	3 =	4.6 =	13 =	6 =	3.6 =	2.6 =
MERCURY	MG/KG	0.013 J	0.016 J	0.017 J	0.031 J	0.027 J	0.014 J	0.03 J	0.009 J	0.0091 J	0.013 J
NICKEL	MG/KG	4.5 J	9.6 J	2.9 J	17 =	22 J	11 =	9.8 =	31 =	1.8 J	2.4 J
POTASSIUM	MG/KG	560 J	1400 =	1100 J	570 J	770 J	1400 =	1400 =	1400 =	1200 J	610 J
SELENIUM	MG/KG	0.48 U	0.51 U	1.2 J	0.53 U	2 =	0.49 U	0.49 U	0.54 U	0.87 J	1.1 J
SILVER	MG/KG	0.059 U	0.063 U	0.073 U	0.066 U	0.073 U	0.061 U	0.061 U	0.067 U	0.077 U	0.071 U
SODIUM	MG/KG	66 J	62 J	740 J	310 J	120 J	210 J	150 J	450 J	50 J	100 J
THALLIUM	MG/KG	0.35 UJ	0.37 U	0.44 U	0.39 UJ	0.67 J	0.36 UJ	0.36 UJ	0.4 UJ	0.46 U	0.42 U
VANADIUM	MG/KG	44 =	68 J	36 J	94 =	88 J	62 =	61 =	120 =	39 =	37 =
ZINC	MG/KG	23 =	44 =	19 =	48 =	26 =	34 =	59 =	71 =	62 =	23 =

Appendix D
Analytical Data - Surface Soil
NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK
	StationID	QA-SS08	QS-SS01	QS-SS02	QS-SS03	QS-SS03	QS-SS04	QS-SS05	QS-SS06	QS-SS07	QS-SS08
	SampleID	BKG043	BKG003	BKG005	BKG006	BKG007FD1	BKG036	BKG037	BKG039	BKG013	BKG016
	DateCollected	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000
Parameter	**Units**										
TOTAL METALS											
ALUMINUM	MG/KG	6200 =	1900 =	2400 =	2200 =	2300 =	11000 J	3400 J	5400 J	3300 =	3900 =
ANTIMONY	MG/KG	0.3 U	0.62 J	0.29 U	0.35 U	0.3 U	1 J	0.82 J	0.35 J	0.29 U	0.54 J
ARSENIC	MG/KG	0.66 J	2.1 J	1.3 J	1.2 J	1.3 J	0.94 J	1.2 J	0.7 J	0.79 J	0.84 J
BARIUM	MG/KG	92 =	6.9 J	22 J	12 J	12 J	21 J	17 J	22 J	6.7 J	24 J
BERYLLIUM	MG/KG	0.33 J	0.41 J	0.22 J	0.21 J	0.18 J	0.13 J	0.31 J	0.036 U	0.04 U	0.36 J
CADMIUM	MG/KG	0.033 U	0.04 U	0.033 U	0.04 U	0.034 U	0.032 U	0.036 U	0.03 U	0.033 U	0.038 U
CALCIUM	MG/KG	1900 =	170000 =	30000 =	45000 =	47000 =	50000 J	210000 J	39000 J	25000 =	120000 =
CHROMIUM, TOTAL	MG/KG	4.5 =	3.8 =	2.6 =	3.8 =	4.4 =	48 =	5.1 =	5.5 =	3.5 =	6.6 =
COBALT	MG/KG	7.4 J	1.1 J	1.6 J	1 J	1 J	13 =	1.4 J	3.8 J	1.6 J	2 J
COPPER	MG/KG	9.1 =	2.6 J	3.6 J	7.1 J	7.1 =	35 J	12 J	15 J	5.7 J	5.5 J
IRON	MG/KG	14000 =	3000 =	6800 =	4200 =	4500 =	18000 J	4600 J	10000 J	4100 =	5300 =
MAGNESIUM	MG/KG	1200 J	4600 =	1300 =	1600 =	1400 =	11000 J	3600 J	2300 J	1600 =	3200 =
MANGANESE	MG/KG	1200 =	92 =	110 =	67 =	61 =	360 J	120 J	210 J	48 =	180 =
LEAD	MG/KG	3.5 =	1.3 =	2 =	6.9 =	6.8 =	2.5 =	4.3 =	3.3 =	2.2 =	1.1 =
MERCURY	MG/KG	0.021 J	0.014 J	0.0037 J	0.011 J	0.013 J	0.0067 J	0.016 J	0.011 J	0.0059 J	0.011 J
NICKEL	MG/KG	2 J	0.67 J	0.73 J	1.2 J	1.1 J	26 J	1.3 J	1.9 J	1.2 J	2 J
POTASSIUM	MG/KG	660 J	540 J	380 J	490 J	490 J	1700 =	750 J	900 J	820 J	940 J
SELENIUM	MG/KG	0.82 J	0.68 U	0.56 U	0.67 U	0.58 U	0.55 U	0.61 U	0.51 U	0.56 U	0.65 U
SILVER	MG/KG	0.07 U	0.084 U	0.07 U	0.083 U	0.072 U	0.069 U	0.076 U	0.063 U	0.07 U	0.081 U
SODIUM	MG/KG	94 J	1200 J	300 J	470 J	550 J	3600 =	3600 =	360 J	3300 =	4000 =
THALLIUM	MG/KG	0.42 U	0.5 U	0.42 U	0.5 U	0.43 U	0.41 U	0.45 U	0.37 U	0.42 U	0.48 U
VANADIUM	MG/KG	34 =	9 J	21 =	12 J	12 J	63 J	14 J	36 J	15 =	15 =
ZINC	MG/KG	24 =	8.4 =	7.6 =	24 =	24 =	31 =	7.1 =	20 =	6 =	9.3 =

Appendix D
Analytical Data - Subsurface Soil
NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK	BACK
	StationID	KTD-SB01	KTD-SB03	KTD-SB05	QA-SB01	QA-SB01	QA-SB03	QA-SB05
	SampleID	BKG051	BKG054	BKG058	BKG031FD1	BKG032	BKG035	BKG011
	DateCollected	12/06/2000	12/06/2000	12/06/2000	12/07/2000	12/07/2000	12/07/2000	12/05/2000
Parameter	**Units**							
TOTAL METALS								
ALUMINUM	MG/KG	16000 =	10000 =	11000 =	16000 J	19000 J	29000 J	9700 =
ANTIMONY	MG/KG	1.4 J	0.73 J	0.68 J	0.28 UJ	0.59 J	1.3 J	0.77 J
ARSENIC	MG/KG	1 J	0.87 J	1 J	0.34 U	0.71 J	0.34 U	0.31 U
BARIUM	MG/KG	72 =	20 J	57 =	230 J	320 J	150 J	83 =
BERYLLIUM	MG/KG	0.19 J	0.18 J	0.25 J	0.41 J	0.46 J	0.31 J	0.13 J
CADMIUM	MG/KG	0.029 U	0.029 U	0.029 U	0.031 U	0.036 U	0.032 U	0.029 U
CALCIUM	MG/KG	4200 J	6100 J	3500 J	31000 J	32000 J	4800 J	3200 =
CHROMIUM, TOTAL	MG/KG	52 J	5.7 J	6 J	7.4 =	9.9 =	74 =	22 =
COBALT	MG/KG	12 =	8.7 J	6.8 J	14 =	16 =	25 =	9.8 J
COPPER	MG/KG	31 =	17 =	38 =	28 J	32 J	46 J	38 =
IRON	MG/KG	28000 J	15000 J	27000 J	24000 J	27000 J	39000 J	26000 =
MAGNESIUM	MG/KG	4400 J	4800 J	3500 J	3300 J	4000 J	8300 J	3300 =
MANGANESE	MG/KG	550 J	370 J	520 J	990 J	970 J	870 J	480 =
LEAD	MG/KG	2 =	1.3 =	2.4 =	3.8 =	4.8 =	1.9 =	4.1 =
MERCURY	MG/KG	0.0078 J	0.0027 U	0.0027 U	0.01 J	0.0084 J	0.025 J	0.016 J
NICKEL	MG/KG	18 =	4 J	1.7 J	4.5 J	5.2 J	40 J	8.1 J
POTASSIUM	MG/KG	880 J	560 J	600 J	820 J	980 J	870 J	1100 =
SELENIUM	MG/KG	0.49 U	0.5 U	0.49 U	0.8 J	1.1 J	0.68 J	0.49 U
SILVER	MG/KG	0.061 U	0.061 U	0.061 U	0.066 U	0.076 U	0.067 U	0.061 U
SODIUM	MG/KG	310 J	81 J	270 J	810 J	760 J	1200 =	200 J
THALLIUM	MG/KG	0.36 U	0.37 U	0.36 U	0.4 U	0.45 U	0.4 U	0.36 UJ
VANADIUM	MG/KG	80 =	29 =	62 =	78 J	88 J	130 J	85 =
ZINC	MG/KG	27 =	31 =	36 =	25 =	29 =	36 =	28 =

Data Flags:

U = Undetected; analyte was analyzed but not detected above the method detection limit.
UJ = Detection limit was estimated; analyte was analyzed and qualified as undetected.
J = Estimated value; compounds detected at concentrations between the reporting limit and the method detection limit.
B = Analyte was detected in the associated method blank.

Appendix D
Analytical Data - Subsurface Soil
NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK
	StationID	QA-SB07	QS-SB01	QS-SB04	QS-SB05	QS-SB07	QS-SB07
	SampleID	BKG041	BKG004	BKG008	BKG038	BKG014	BKG015FD1
	DateCollected	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000	12/06/2000
Parameter	**Units**						
TOTAL METALS							
ALUMINUM	MG/KG	7000 =	1600 =	4900 =	3300 J	3200 =	3200 =
ANTIMONY	MG/KG	0.3 U	0.48 J	0.68 J	0.67 J	0.31 U	0.31 U
ARSENIC	MG/KG	0.37 U	2.5 J	1.9 J	1.3 J	1.1 J	0.37 U
BARIUM	MG/KG	30 J	6.4 J	15 J	16 J	6.6 J	6.7 J
BERYLLIUM	MG/KG	0.29 J	0.41 J	0.28 J	0.27 J	0.043 U	0.042 U
CADMIUM	MG/KG	0.034 U	0.035 U	0.039 U	0.038 U	0.035 U	0.035 U
CALCIUM	MG/KG	1700 =	180000 =	95000 =	200000 J	26000 =	24000 =
CHROMIUM, TOTAL	MG/KG	6.8 =	4.9 =	19 =	6.1 =	3.6 =	3.7 =
COBALT	MG/KG	4.6 J	1.2 J	4.8 J	1.4 J	1.9 J	1.9 J
COPPER	MG/KG	11 =	1.8 J	15 =	10 J	4.7 J	4.4 J
IRON	MG/KG	15000 =	2500 =	9900 =	4800 J	4500 =	4100 =
MAGNESIUM	MG/KG	1300 =	6400 =	5100 =	3800 J	1600 =	1600 =
MANGANESE	MG/KG	340 =	60 =	170 =	110 J	55 =	57 =
LEAD	MG/KG	1.4 =	0.3 J	1.6 =	5.9 =	1.6 =	1.6 =
MERCURY	MG/KG	0.0048 J	0.0032 U	0.0087 J	0.015 J	0.0032 U	0.0032 U
NICKEL	MG/KG	2.5 J	0.77 J	7.7 J	1.6 J	1.2 J	1.2 J
POTASSIUM	MG/KG	820 J	500 J	1600 J	860 J	830 J	840 J
SELENIUM	MG/KG	1 J	0.59 U	0.66 U	0.65 U	0.6 U	0.59 U
SILVER	MG/KG	0.072 U	0.073 U	0.082 U	0.08 U	0.074 U	0.073 U
SODIUM	MG/KG	120 J	1600 =	6300 =	5300 =	3600 =	3700 =
THALLIUM	MG/KG	0.43 U	0.44 U	0.49 U	0.48 U	0.44 U	0.44 U
VANADIUM	MG/KG	40 =	9.8 J	36 =	17 J	19 =	17 =
ZINC	MG/KG	17 =	3.5 J	12 =	6.6 =	5.8 =	5.2 =

Appendix D

Analytical Data - Sediment

NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK	BACK	BACK
	StationID	QB-SED01	QB-SED02	QB-SED03	QB-SED03	QB-SED04	QS-SED01	QS-SED01	QS-SED02
	SampleID	BKG078	BKG079	BKG080FD1	BKG081	BKG082	BKG017	BKG019FD1	BKG018
	DateCollected	12/20/2000	12/20/2000	12/20/2000	12/20/2000	12/20/2000	12/06/2000	12/06/2000	12/06/2000
Parameter	**Units**								
TOTAL METALS									
ALUMINUM	MG/KG	10000 =	3300 =	11000 =	10000 =	2900 =	6400 =	7400 =	2600 =
ANTIMONY	MG/KG	0.52 UJ	0.37 UJ	0.5 UJ	0.49 UJ	0.36 UJ	1.3 U	1.3 U	0.59 J
ARSENIC	MG/KG	0.63 U	0.45 U	0.6 U	0.6 U	0.44 U	1.5 U	1.5 U	0.49 U
BARIUM	MG/KG	69 J	14 J	47 J	49 J	22 J	6.9 J	8.3 J	10 J
BERYLLIUM	MG/KG	0.071 U	0.051 U	0.23 J	0.24 J	0.17 J	0.17 U	0.17 U	0.24 J
CADMIUM	MG/KG	0.058 U	0.042 U	0.056 U	0.056 U	0.041 U	0.14 U	0.14 U	0.046 U
CALCIUM	MG/KG	66000 =	62000 =	57000 =	80000 =	100000 =	8900 =	9200 =	160000 =
CHROMIUM, TOTAL	MG/KG	5.4 =	2.3 J	5.4 =	5.1 =	3.1 =	7.8 J	8.6 J	3.5 =
COBALT	MG/KG	4.5 J	1.7 J	5.1 J	4.7 J	1 J	2.3 J	2.6 J	0.96 J
COPPER	MG/KG	18 =	6.9 J	29 =	26 =	6.5 J	23 J	24 J	3.3 J
IRON	MG/KG	12000 =	4500 =	15000 =	14000 =	3700 =	7300 =	7700 =	2300 =
MAGNESIUM	MG/KG	8900 =	5100 =	13000 =	12000 =	7700 =	14000 =	14000 =	2200 =
MANGANESE	MG/KG	150 =	61 =	390 =	350 =	74 =	49 =	51 =	24 =
LEAD	MG/KG	6.5 =	2.9 =	9.2 =	8 =	2.1 =	6.4 =	6 =	0.56 J
MERCURY	MG/KG	0.0054 U	0.0039 U	0.013 J	0.013 J	0.0038 U	0.052 J	0.043 J	0.0043 U
NICKEL	MG/KG	2 J	0.67 J	2.4 J	2 J	0.5 J	4.1 J	4.5 J	1.1 J
POTASSIUM	MG/KG	3700 J	1600 J	4300 J	4000 J	1300 J	5200 J	5600 J	1400 J
SELENIUM	MG/KG	0.99 U	0.72 U	1.1 J	1.1 J	0.78 J	2.4 U	2.4 U	0.78 U
SILVER	MG/KG	0.12 U	0.089 U	0.12 U	0.12 U	0.086 U	0.3 U	0.3 U	0.097 U
SODIUM	MG/KG	21000 =	9500 =	17000 =	17000 =	7800 =	67000 =	69000 =	11000 =
THALLIUM	MG/KG	0.73 U	0.53 U	0.71 U	0.7 U	0.51 U	1.8 U	1.8 U	0.58 U
VANADIUM	MG/KG	40 =	11 J	32 =	28 =	11 J	29 J	24 J	7.2 J
ZINC	MG/KG	30 J	13 J	55 J	48 J	12 J	24 =	24 =	4.9 J

Data Flags:

U = Undetected; analyte was analyzed but not detected above the method detection limit.

UJ = Detection limit was estimated; analyte was analyzed and qualified as undetected.

J = Estimated value; compounds detected at concentrations between the reporting limit and the method detection limit.

B = Analyte was detected in the associated method blank.

Analytical Data - Rock

NASD Background Investigation

	SiteID	BACK	BACK	BACK	BACK	BACK	BACK
	StationID	KTD-ROCK1	KTD-ROCK2	KTD-ROCK3	KTD-ROCK4	KTD-ROCK4	KTD-ROCK5
	SampleID	BKG072	BKG073	BKG074	BKG075	BKG076FD1	BKG077
	DateCollected	12/06/2000	12/06/2000	12/06/2000	12/05/2000	12/05/2000	12/05/2000
Parameter	**Units**						
TOTAL METALS							
ALUMINUM	MG/KG	5600 =	2000 =	4900 =	4400 =	4400 =	2800 =
ANTIMONY	MG/KG	0.25 UJ	0.24 UJ	0.24 UJ	0.24 UJ	0.24 UJ	0.24 UJ
ARSENIC	MG/KG	0.3 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U
BARIUM	MG/KG	160 =	23 J	68 =	62 =	87 =	18 J
BERYLLIUM	MG/KG	0.16 J	0.033 U	0.2 J	0.033 U	0.033 U	0.033 U
CADMIUM	MG/KG	0.028 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U
CALCIUM	MG/KG	3600 =	3200 =	3300 =	2200 =	2000 =	38000 =
CHROMIUM, TOTAL	MG/KG	0.86 J	2.5 =	1.6 J	2 J	1.5 J	1 J
COBALT	MG/KG	5.9 J	3.5 J	6.9 J	4.6 J	5.2 J	2.2 J
COPPER	MG/KG	13 =	2.5 J	7.4 =	13 =	59 =	4.4 J
IRON	MG/KG	9400 =	5600 =	10000 =	10000 =	10000 =	4800 =
MAGNESIUM	MG/KG	2300 =	910 J	3400 =	3300 =	3400 =	4300 =
MANGANESE	MG/KG	730 =	320 =	390 =	580 =	780 =	840 =
LEAD	MG/KG	2.1 =	0.96 =	3 =	1.3 =	0.16 U	1 =
MERCURY	MG/KG	0.0026 U	0.0025 U	0.0039 J	0.003 J	0.0025 U	0.0063 J
NICKEL	MG/KG	1.2 J	0.84 J	1 J	1.8 J	2.5 J	0.69 J
POTASSIUM	MG/KG	200 J	410 J	170 J	370 J	390 J	530 J
SELENIUM	MG/KG	0.47 UJ	0.46 UJ	0.46 UJ	0.46 UJ	0.46 UJ	0.46 UJ
SILVER	MG/KG	0.058 U	0.057 U	0.058 U	0.057 U	0.057 U	0.057 U
SODIUM	MG/KG	66 J	64 J	54 J	580 J	670 J	330 J
THALLIUM	MG/KG	0.35 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
VANADIUM	MG/KG	24 =	14 =	24 =	23 =	21 =	7 J
ZINC	MG/KG	30 =	12 =	39 =	42 =	43 =	23 =

Data Flags:

U = Undetected; analyte was analyzed but not detected above the method detection limit.

UJ = Detection limit was estimated; analyte was analyzed and qualified as undetected.

J = Estimated value; compounds detected at concentrations between the reporting limit and the method detection limit.

B = Analyte was detected in the associated method blank.

Statistical Evaluation of Background Levels for Vieques

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DATE: May 21, 2001

1. Introduction

In April and December 2000, areas of the Vieques facility were sampled in order to establish background levels of inorganics in environmental media. Matrices sampled include: surface and subsurface soils, groundwater, surface water, sediments, and raw rock material. Samples were collected in locations representative of different soil units, including: quarternary alluvial deposits [QA], beach and dune deposits [QB] and swamp and marsh deposits [QS], and Plutonic rocks [KTD]. The count of samples collected, by matrix and soil type is summarized in Table E-1 below:

TABLE E-1
Soil Samples from Various Soil Units for Background Analyses

Matrix	KTD	QA	QB	QA	TOTAL
Surface soil	10	8	-	8	26
Soil boring	3	4	-	4	11
Rock	5	-	-	-	5
Groundwater	3	3	-	2	8
Surface water	-	4	4	-	8
Sediment	-	4	4	-	8

Subsurface soils were collected at a subset of co-located surface soil sample locations. Sediment and surface water collections were made at common points within the QA and QB areas.

Background levels of 23 inorganics were quantified in collected samples, including:

Aluminum [AL]

Antimony [SB]

Arsenic [AS]

Barium [BA]

Beryllium [BE]

Cadmium [CD]

Calcium [CA]

Chromium [CR]

Cobalt [CO]

Copper [CU]

Iron [FE]

Lead [PB]

Magnesium [MG]

Manganese [MN]

Mercury [HG]

Nickel [NI]

Potassium [K]

Selenium [SE]

Silver [AG]

Sodium [NA]

Thallium [TL]

Vanadium [V]

Zinc [ZN]

Evaluation of resulting data has consisted of following steps:

Internal consistency has been evaluated through comparison of field duplicates.

Potential differences within matrix, between either sample depths or soil unit, have been identified using a non-parametric test for differences (e.g., Kruskall-Wallis Test, and Mann-Whitney Test).

Statistical distributions of appropriate subpopulations within individual matrices have been identified (e.g., Shapiro-Wilk Test, or W-test).

Best-estimates of Mean and the upper tolerance limit at 95th percentile (UTL95%) of each parameter in each of the matrix have been calculated.

Statistical methods applied are described in the following section and outlined in Appendix E-2. The section concludes with a recommended method to apply background estimates in the evaluation of results from samples collected in areas of the facility, which may have been impacted by onsite operations.

Following the methods description and application, results from the evaluation of internal consistency are described. The final section describes results from the data summaries, data groupings, distribution testing and background value point estimate, by environmental medium (matrix).

Summary tables that include statistical estimates of the background values by parameter for each matrix and the basis for the values included in these tables are presented in Appendix E-3 through E-10.

2. Statistical Methods

Parameter Summaries

The 23 inorganic parameters analyzed in each of the six matrices are presented in Appendix D. Data summaries, including number of samples, number of detects, minimum and maximum detected concentration, detection limits for non-detects, can be found in Appendixes E-3 through E-10.

Boxplots

Boxplots are graphical displays (often referred to as a descriptive statistic) which present the distribution of a set of observations. Individual components identified in the display include order statistics of median, upper and lower quartiles, interquartile distance, as well as outliers. Appendix F presents a detailed description of the components to the statistical graphic and briefly describes an interpretation. In evaluation of NASD at Vieques background data, these boxplots have been used to visually examine the distribution of individual parameters within each matrix and to compare distributions of the same parameter across various soil types and other matrices. Boxplots were used to qualitatively evaluate potential differences among soiltype units and, soil sample depth. Parameter and matrix specific boxplot results are included in Appendix F

Data Groupings: Mann-Whitney and Kruskal-Wallis Tests

Potential sub-populations within background sample results have been examined through boxplots and supplemented with explicit nonparametric tests, either the Mann-Whitney test, which compares two potential subgroups, and the Kruskal-Wallis [K-W] test, which compares more than two potential subgroups. While the two tests differ somewhat mechanically, conceptually, they are analogous. First, all observations are ranked by increasing concentration and assigned the relative "rank", independent of subgroup. Then the ranks assigned to each observation within each subgroup are compared to potential results, given all possible permutations of combinations of ranks for the number of samples within each sub-population. The probability of the distribution of ranks particular to the

observations is then determined [given the distribution of all possible rank distributions for the specific sample sizes in the subpopulations]. The probability of the test result basically says, "How often would this distribution occur, *assuming that the distribution of ranks is equally-likely in all subgroups*?" By convention, if the probability of the test statistic is less than 0.05, it is considered that the likelihood cannot support the null hypothesis of equality among subpopulations. Where null hypothesis fails, indicating populations are different, a separate value is estimated per soil type. However, because of the reasons listed below, a final recommendation to use one set of point estimate values for soil as background data set is included. The nonparametric methods are used for data sets where data sets did not fit normal or lognormal distribution types.

Distribution Testing: Shapiro-Wilk Goodness-of-Fit

The *Shapiro-Wilk* test is a *goodness-of-fit test,* which evaluates if the observed values fit hypothesized normal or lognormal distribution. The null hypothesis is tested assuming the observations follow the hypothesized distribution. A *low* p-value for the test statistic (the *W*-statistic) result indicates that the null hypothesis (that data fit the normal distribution) cannot be accepted given the differences between the observed and hypothetical distributions. As part of the distribution type determination, the calculated W-statistic in the Shapiro-Wilk test is compared against a critical value in the look-up tables from literature (Gilbert, 1987). These methods of determining distribution types are approved by EPA (EPA, 1989). When the W-statistic is lower than the criteria value in the look-up tables, the null hypothesis is rejected, and data is not normally distributed. Next step in the evaluation is to log-transform the data set and repeat the hypothesis testing. If the log-transformed data fit normal distribution, then data are considered lognormally distributed. When null hypothesis fails on log-transformed data, then data are recommended for non-parametric tests, as they are neither normal nor lognormal. Appendix G includes the results of this test as W-statistic, and type of distribution selected per each parameter.

Point Estimates for Background Values: Mean and UTL95% Calculations

Mean and UTL95% calculations have been performed using calculations appropriate to the distributions identified through the S-W test. When the data follow the normal distribution, a UTL95% was estimated using the normal equations for normal and log-transformed data (Appendix E-2). Where the data do not follow a theoretical distribution, the nonparametric calculation method was applied (Appendix E-2).

It is important to note the effects of sample size on the confidence of estimates, which are calculated from available data. When data follow a theoretical distribution, upper limits are calculated values, which may exceed the maximum observed. Exceedance of the maximum observed value is common when sample sizes are small, and concentration distributions are highly varied. However, nonparametric estimates are derived directly from the observed concentrations and cannot extend beyond the maximum measured values. For example, in the estimates which have relied upon the nonparametric statistics, the maximum concentration will be the UTL95% value for samples less than 50 in number. However, the relative confidence at 95th percentile can only be attained with large sample sizes (>50). That is, the minimum expected confidence level can only be guaranteed for sample sizes larger than 50 when using the maximum detected concentrations as the UTL.

Application of Background Estimates – Comparison to Onsite Results

The data summary tables produced from this evaluation provides a statistical background value per matrix and the chemical, which can be used as the point estimate for comparison with onsite data. If the site concentrations are lower than these background values, it can be concluded that there is no contamination at the site. However, when these point estimates are exceeded, additional evaluations such as observations for spatial correlation of exceedences, and statistical comparisons between site data population compared with background population can carried to determine if sample populations from background are similar or different from site sample population. Population-to-population comparisons using two population comparison t-tests or nonparametric Wilcoxon Rank Sum test may then be used to determine which parameter on-site levels overall exceed background levels.

Thus when a point estimate background value is exceeded in site samples several options exist prior to site remedial management decision.

3. Internal Consistency Evaluation

Internal consistency of reported measures is quantified through duplicate relative percent difference, RPD, calculated as the difference between the reported quantitations on the duplicate pair, normalized by the average of the two results [times 100]. While there is no regulatory constraint on acceptable limits of RPD, which is, in fact, a measure of small-scale spatial heterogeneity of sampled matrices, comparison to accepted laboratory duplicate RPDs is useful. Generally, RPDs on the order of 50 percent are acceptable quantitation reproducibility for inorganic metals. RPDs from field duplicates, which are on the same order are generally considered to represent internally consistent results.

Appendix H presents the results of this analysis for all the data by matrix for the NSD background samples. Twelve sets out of 344 sets (for lead in rock and cadmium in surface water), about 3% showed variability greater than 50%. The average (mean) variability per matrix is much less than 50%.

Appendix H documents the RPD paired results, by sample matrix (soil types combined) including: rock, subsurface and surface soils, sediments, groundwater and surface water. Table E-2 summarizes minimum and maximum calculated RPD across the inorganic metals quantified in the 6 matrices:

Table E-2

Minimum and Maximum Calculated RPD Across the Inorganic Metals

Matrix	Minimum Average RPD*	Maximum Average RPD*
Rock	11.6%	21.0%
Subsurface Soil	6.3%	13.8%
Surface Soil	-1.1%	10.1%
Sediment	0.3%	6.7%
Groundwater	-1.0%	5.9%
Surface Water	14.0%	41.1%

Note:
* See Appendix F-1 for details on this evaluation. This is a simplified summary of the RPD evaluation per chemical and matrix.

The theoretical expected value of mean RPD is zero, assuming there is no discrepancy between original and duplicate analytical results. However, considering high variability typically observed in sample and duplicate analysis, a conservative RPD of 50% is considered acceptable for this evaluation and as summarized in the table above, the averages of RPDs did not exceed this value. Some of the values are negative because of higher concentration levels in the duplicate than the normal sample. Overall, the results suggest that available data are internally consistent. Thus subsequent statistical evaluations and calculation of final background data sets include only normal samples.

4. Matrix-specific Results

Background sampling and rationale were presented in Section 3.0. Appendix D includes the analytical results by matrix and sample. Matrix-specific results are included in summary tables [described in Section 3], and descriptive statistics for data distributions are presented as boxplots (Appendix F). Data summary statistics, assumed population distributions, and background values based on the UTL for each parameter are listed by matrix in Appendix E-3 through E-10.

4.1 Soils

Soils results are summarized in Appendix E-3 through E-5. Box plots of comparisons among soil type units and depths within soil type units are included in Appendix F. Point estimates of mean and UTL95% are included in Tables E-3 through E-5.

Statistical Evaluation Summary: Results from the 26 **surface soil** samples, detailed in Appendix D and summarized in Appendix E-3 through E-5, indicates that two parameters, cadmium and silver, were not been detected in any of the 26 samples analyzed for them. A total of 11 **subsurface soil** samples were collected. The frequency of detections (FDs) per chemical within surface soil and subsurface soil were listed in Appendix E-3 and E-4. When FDs for surface soil and subsurface soils are compared, the relative values are very similar between these to soil depths. The same 15 parameters reported at detectable concentrations in all samples. The same 8 parameters exhibit FDs less than 100 percent, on roughly the

same FD range in surface and subsurface samples. Appendix E-5 provides statistical summaries for combined surface and subsurface soils.

Data Grouping based on Population Comparison Test Results: Given the spatial and vertical distributions of soil samples collected, potential differences among soil type units and sample depths have been evaluated to identify appropriate data groupings. Soil samples have been first compared across the soil type units, using the nonparametric Kruskal-Wallis test (Appendix E-11). Of the 23 parameters tested, 6 did not differ among soil units, including: Be, Hg, K, Mg, Pb and Sb. Since other chemicals differed a set of values per soil type are calculated and included in Appendix E-6. However, a value calculated based on pooled soil types and depths is suggested for future point comparisons as described below.

Although all other parameters indicated potentially significant difference in populations between different soil types, a separate point estimate of concentration for these chemicals is not recommended for site soil comparisons for the following reasons:

- The mean and UTL 95% concentrations between soiltypes are very close in concentration (Appendix E-6)
- The box plots indicate a wide range of concentration distributions of each parameter between soil types, with overlapping distribution ranges,
- The number of samples per soil type are very few (10 to 4) to conclusively accept the statistical results of the K-W test.

Therefore, the background concentration estimates for all the chemicals within surface soil and subsurface soil will be one set of values for all the soil types combined. For future reference purpose, a separate list per soil type will also be listed.

Distribution Testing/Point-Interval Estimation: Appendix E-6 lists the sample distribution type (normal, lognormal or non-parametric) used for the background value estimate, along with a mean and an UTL95% concentration. This table includes combined surface and subsurface soil point estimates (background values) for all soil types combined (pooled soil type) and also a listing per individual soil type. The surface and subsurface soils were combined because population comparisons indicated no significant differences with depth, with few exceptions described below.

Arsenic distribution indicated a significant difference in concentration distribution between surface and subsurface depths in KTD and QA soils (see Appendix E-11). Also, Hg was significantly different in surface soil and subsurface soil within KTD. However, because these are only 2 of the 23 chemicals detected, they were combined with the soils from different depths. Also, the concentration differences for arsenic and mercury between surface and subsurface soils are minimal. Thus a single set of soil values are recommended for point comparisons between background and site samples.

4.2 Native Rock

Native rock material results are summarized in Appendix E-7. Appendix F includes the box plots summarizing parameter distributions. Estimates of mean and UTL95% are included in and Appendix E-7.

Statistical Evaluation Summary: Six of the chemicals were not detected in any of the 5 rock samples analyzed for them. The chemicals that were detected with low FD in soil were the same in the rock. Fourteen parameters have been detected with 100% FD in soils, and they were also detected with 100% FD in rock, suggesting that the gross character of constituents in native rock materials corresponds to the surface and subsurface soils.

Data Grouping based on Population Comparison Test Results: Since all the rock samples were collected from a single type of material (KTD) it eliminated the need for the evaluation of potential subpopulation differences. All five rock samples are treated as one sample group.

Distribution Testing/Point Concentration Estimation: Appendix H includes the results from statistical evaluation that determine the type of data distribution and the resulting calculated UTL (normal, lognormal, or non-parametric) is summarized in Appendix E-7. The majority of chemical indicated to be normal in distribution, with 9 of them indicating a distribution that required non-parametric test methods for the UTL estimates.

4.3 Groundwater

Monitoring well sample results are summarized in Appendix E-8. Box plot graphical displays summarizing parameter distributions are found in Appendix F. The data distribution type is determined using W-statistic, and results are included in Appendix H and summarized in Appendix E-8. Upper tolerance limits of the 95th quantile (95UTL) are also found in Appendix E-8.

Statistical Evaluation Summary for Groundwater: Four total fraction parameters and 6 dissolved fraction inorganic parameters have been detected in no or a single groundwater sample collected on the facility. Three of the 4 total fraction parameters coincide with 6 dissolved fractions, including: Hg, Se and Ag. Arsenic, not detected in the total fraction was detected in one of the 8 groundwater samples quantified for the dissolved fraction. Similarly, at the other end of the detection frequency scale, 6 of the 9 total fraction parameters detected in all samples coincide with dissolved fractions detected in all samples, including: Ba, Ca, Mg, Mn, K and Na. The FDs for the remaining parameters range between 1 and 7 of the samples analyzed.

Data Grouping. Groundwater collections were made in three different soil type units: KTD, QA and QS, with 3, 3 and 2 samples, respectively. K-W test results indicate that soil type units differed significantly in 13 of the 46 parameter fractions quantified (Appendix E-12). These include dissolved and total fractions of BA, BE, CA, MG, NA and SB plus the dissolved fraction of CR. In all cases, inorganic levels were lowest in KTD soil monitoring wells and highest in QS locations.

Distribution Testing/Point-Interval Estimation. While statistically significant differences can be examined for the total sample of 8 in 3 groups, meaningful estimates of central tendency and/or upper bounds are not possible, based upon 2 or 3 observations. Additionally, 20 of the 46 values could not be tested for goodness-of-fit because reported values did not include 4 unique values. What has been provided in the groundwater table found in Appendix H and summarized in Appendix E-8 is based upon the pooled data set of 8 well samples. The estimates are inflated for KTD in most parameters and QA locations in some parameters. However, the sample sizes in individual soil type units preclude further differentiation,

beyond the observation that the limited samples indicate differences in at least a portion of the naturally-occurring parameters.

4.4 Sediments

Sediment samples collected on the Vieques facility are detailed in Appendix D. Graphical displays summarizing parameter distributions are found in Appendix F. Upper tolerance interval estimates for the 95th quantile (95UTL) and statistical summaries are included in Appendix E-9.

Summary. Of the 23 parameters quantified in the 8 sediment samples collected, 15 were detected in all samples and 3 [CD, AG and TL] were not detected in any samples. The remaining 5 parameters were detected in 1 through 5 of the 8 samples.

Data Grouping.. Sediment samples have been collected in beach and swamp areas, QB and QS, respectively. Statistically significant differences are not apparent in available data, as tested with the M-W nonparametric test.

Distribution Testing/Point-Interval Estimation. The majority [14 of 23] parameters exhibit a normal distribution.

4.5 Surface Water

Surface water samples collected on the Vieques facility are detailed in Appendix D. Graphical displays summarizing parameter distributions are found in Appendix F. Background estimates based on the 95UTL and statistical summaries can be found in Appendix E-10.

Summary. FDs for surface water results are zero for two parameters, mercury and selenium and 100 percent for 8 parameters. The remaining FDs range between 25 and 88 percent, or, between 2 and 7 of the 8 samples quantified.

Data Grouping. The 6 samples collected in of the QB and QS locations exhibit statistically significant differences in 16 of the 23 parameters quantified. In all cases, QB sample results were elevated as compared to the QS results. Poolable quantifications include: AG, CD, PB, SE and TL. The final two parameters [AL and HG] exhibited too few unique values to support the comparison.

Distribution Testing/Point-Interval Estimation. Similar to the groundwater situation, where statistically significant differences are apparent, limitations in point-interval estimation arise as the result of the limited sample sizes. What is provided, then, is a comparatively inflated level for QB locations. As a result, background estimates are provided based on the pooled QB and QS locations (Appendix E-10).

Appendix E3

SURFACE SOIL STATISTICAL SUMMARY AND BACKGROUND ESTIMATES

NASD Background Investigation

Parameter	Units	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetect Value	Maximum Nondetect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean	Geometric Mean	Standard Deviation	Dist	UTL		95% UCL	
ALUMINUM	MG/KG	26	26	100.0%			1,900	24,000	9,212	7,540	5,530	N	24,000		11064	
ANTIMONY	MG/KG	17	26	65.4%	0.26	0.35	0.35	2.3	0.65	0.56	0.44	L	2.3		0.76	
ARSENIC	MG/KG	21	26	80.8%	0.31	0.39	0.57	2.2	0.89	0.78	0.48	L	2.2		1	
BARIUM	MG/KG	26	26	100.0%			6.7	190	62	45	48	L	190		103	
BERYLLIUM	MG/KG	21	26	80.8%	0.034	0.041	0.13	0.41	0.19	0.16	0.10	N	0.43	*	0.23	
CADMIUM	MG/KG	0	26	0.0%	0.028	0.040			0.033	-3.42E+00	0.0034	NP	0.040	*	0.017	*
CALCIUM	MG/KG	25	25	100.0%			1,900	210,000	26,728	10,722	46,273	NP	210,000		41432	
CHROMIUM, TOTAL	MG/KG	26	26	100.0%			2.2	57	15	8.3	17	NP	57		19.9	
COBALT	MG/KG	26	26	100.0%			1.0	22	8.1	5.9	5.6	N	21		10	
COPPER	MG/KG	26	26	100.0%			2.6	68	24	18	16	N	68		29	
IRON	MG/KG	26	26	100.0%			3,000	38,000	16,385	13,640	8,605	N	35,983		19267	
LEAD**	MG/KG	25	25	100.0%			1.1	7	3.6	3.2	2.4	L	8	*	4.13	
MAGNESIUM	MG/KG	26	26	100.0%			1,200	16,000	4,112	3,311	3,254	L	16,000		5343	
MANGANESE	MG/KG	26	26	100.0%			48	1,200	507	377	326	N	1,250	*	616	
MERCURY	MG/KG	26	26	100.0%			0.0037	0.031	0.014	0.012	0.0077	N	0.031		0.017	
NICKEL	MG/KG	26	26	100.0%			0.67	31	6.7	3.5	8.5	NP	31		9.5	
POTASSIUM	MG/KG	26	26	100.0%			380	1,700	937	872	351	N	1,700		1055	
SELENIUM	MG/KG	5	26	19.2%	0.48	0.68	0.73	2.0	0.66	0.62	0.32	NP	2.0		0.57	
SILVER	MG/KG	0	26	0.0%	0.059	0.084			0.069	-2.67E+00	0.0072	NP	0.084	*	0.036	*
SODIUM	MG/KG	26	26	100.0%			25	4,000	762	240	1,275	NP	4,000		1165	
THALLIUM	MG/KG	3	26	11.5%	0.35	0.50	0.45	0.67	0.43	0.42	0.066	NP	0.67		0.28	
VANADIUM	MG/KG	26	26	100.0%			9.0	120	48	40	27	N	110		57	
ZINC	MG/KG	26	26	100.0%			6.0	71	32	26	18	N	72	*	38	

* Value exceeds maximum detected value

** Lead result from sample with Station ID QS-SS05 (sample ID BKG010) was not included in the analysis

Dist = assumed distribution

95th Utl = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)

95% UCL = 95 % upper confidence limit on the mean

NP = nonparametric

N = normal

L = lognormal

Appendix E4

SUBSURFACE SOIL STATISTICAL SUMMARY AND BACKGROUND ESTIMATES

NASD Background Investigation

Parameter	Units	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetect Value	Maximum Nondetect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean	Geometric Mean	Standard Deviation	Dist	UTL		95% UCL	
ALUMINUM	MG/KG	11	11	100.0%			1,600	29,000	10,427	7,676	8,208	N	29,000		14913	
ANTIMONY	MG/KG	9	11	81.8%	0.30	0.31	0.48	1.4	0.72	0.65	0.35	N	1.4		0.9	
ARSENIC	MG/KG	8	11	72.7%	0.31	0.37	0.71	2.5	1.0	0.85	0.67	N	2.5		1.4	
BARIUM	MG/KG	11	11	100.0%			6.4	320	71	35	93	L	320		317	
BERYLLIUM	MG/KG	10	11	90.9%	0.043	0.043	0.13	0.46	0.26	0.22	0.12	N	0.62	*	0.32	
CADMIUM	MG/KG		11		0.029	0.039			0.033	-3.41E+00	0.0038	NP	0.039	*	0.017	*
CALCIUM	MG/KG	10	10	100.0%			1,700	200,000	37,650	11,398	63,817	L	200,000		449168	*
CHROMIUM, TOTAL	MG/KG	11	11	100.0%			3.6	74	19	11	23	L	74		49	
COBALT	MG/KG	11	11	100.0%			1.2	25	8.4	5.7	7.2	N	25		12	
COPPER	MG/KG	11	11	100.0%			1.8	46	22	16	15	N	68	*	31	
IRON	MG/KG	11	11	100.0%			2,500	39,000	18,064	13,394	12,030	N	54,528	*	24638	
LEAD	MG/KG	11	11	100.0%			0.30	5.9	2.5	1.9	1.7	N	5.9		3.41	
MAGNESIUM	MG/KG	11	11	100.0%			1,300	8,300	4,227	3,754	1,988	N	10,253	*	5314	
MANGANESE	MG/KG	11	11	100.0%			55	970	409	282	311	N	1,350	*	578	
MERCURY	MG/KG	7	11	63.6%	0.0027	0.0032	0.0048	0.025	0.0089	0.0067	0.0071	L	0.025		0.028	*
NICKEL	MG/KG	11	11	100.0%			0.77	40	8.3	4.1	12	L	40		31	
POTASSIUM	MG/KG	11	11	100.0%			500	1,600	873	831	301	N	1,600		1037	
SELENIUM	MG/KG	3	11	27.3%	0.49	0.66	0.68	1.1	0.66	0.63	0.21	NP	1.1		0.61	
SILVER	MG/KG		11		0.061	0.082			0.070	-2.67E+00	0.0080	NP	0.082	*	0.037	*
SODIUM	MG/KG	11	11	100.0%			81	6,300	1,795	724	2,239	L	6,300		17253	*
THALLIUM	MG/KG		11		0.36	0.49			0.42	-8.82E-01	0.049	NP	0.49	*	0.22	*
VANADIUM	MG/KG	11	11	100.0%			9.8	130	54	42	38	N	130		75	
ZINC	MG/KG	11	11	100.0%			3.5	36	21	16	12	N	59	*	28	

* Value exceeds maximum detected value

Dist = assumed distribution

95th Utl = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)

95% UCL = 95% upper confidence limit of the mean

NP = nonparametric

N = normal

L = lognormal

Appendix E5

COMBINED SOILS STATISTICAL SUMMARY AND BACKGROUND ESTIMATES

NASD Background Investigation

Parameter	Units	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetect Value	Maximum Nondetect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean	Geometric Mean	Standard Deviation	Dist	UTL	95% UCL
ALUMINUM	MG/KG	37	37	100.0%			1,600	29,000	9,573	7,580	6,346	L	36,598 *	12821
ANTIMONY	MG/KG	26	37	70.3%	0.26	0.35	0.35	2.3	0.67	0.58	0.41	NP	2.3	0.75
ARSENIC	MG/KG	29	37	78.4%	0.31	0.39	0.57	2.5	0.93	0.80	0.54	L	2.7 *	1.05
BARIUM	MG/KG	37	37	100.0%			6.4	320	65	42	63	L	365 *	104
BERYLLIUM	MG/KG	31	37	83.8%	0.034	0.043	0.13	0.46	0.21	0.17	0.11	N	0.45	0.24
CADMIUM	MG/KG		37		0.028	0.040			0.033	-3.42E+00	0.0035	NP	0.040 *	0.017 *
CALCIUM	MG/KG	35	35	100.0%			1,700	210,000	29,849	10,911	51,132	NP	210,000	44232
CHROMIUM, TOTAL	MG/KG	37	37	100.0%			2.2	74	16	9.1	19	NP	74	21
COBALT	MG/KG	37	37	100.0%			1.0	25	8.2	5.8	6.0	NP	25	9.8
COPPER	MG/KG	37	37	100.0%			1.8	68	23	17	15	NP	68	27
IRON	MG/KG	37	37	100.0%			2,500	39,000	16,884	13,567	9,604	N	37,531	19549
LEAD**	MG/KG	36	36	100.0%			0.30	7	3.3	2.9	2.3	L	9 *	3.7
MAGNESIUM	MG/KG	37	37	100.0%			1,200	16,000	4,146	3,437	2,908	L	12,834	5087
MANGANESE	MG/KG	37	37	100.0%			48	1,200	478	346	321	N	1,167	567
MERCURY	MG/KG	33	37	89.2%	0.0027	0.0032	0.0037	0.031	0.013	0.010	0.0078	L	0.046 *	0.014
NICKEL	MG/KG	37	37	100.0%			0.67	40	7.2	3.6	9.4	NP	40	9.7
POTASSIUM	MG/KG	37	37	100.0%			380	1,700	918	860	334	L	1,908 *	1031
SELENIUM	MG/KG	8	37	21.6%	0.48	0.68	0.68	2.0	0.66	0.63	0.28	NP	2.0	0.54
SILVER	MG/KG		37		0.059	0.084			0.069	-2.67E+00	0.0073	NP	0.084 *	0.036 *
SODIUM	MG/KG	37	37	100.0%			25	6,300	1,069	333	1,658	NP	6,300	1519
THALLIUM	MG/KG	3	37	8.1%	0.35	0.50	0.45	0.67	0.42	0.42	0.061	NP	0.67	0.26
VANADIUM	MG/KG	37	37	100.0%			9.0	130	50	40	30	L	184 *	65.9
ZINC	MG/KG	37	37	100.0%			3.5	71	29	23	17	N	65	33

* Value exceeds maximum detected value

** Results from sample BKG010 were not included in the analysis

Dist = assumed distribution

95th Utl = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)

95% UCL = 95% upper confidence limit of the mean

NP = nonparametric

N = normal

L = lognormal

APPENDIX E6

COMBINED SOIL STATISTICAL SUMMARY AND BACKGROUND ESTIMATES FOR POOLED AND INDIVIDUAL SOIL TYPES

NASD Background Analysis

		Pooled Types								QS								KTD								QA							
Parameter	Units	Dist	N	Min	Max	Mean	UTL		UCL	Dist	N	Min	Max	Mean	UTL		UCL	Dist	N	Min	Max	Mean	UTL		UCL	Dist	N	Min	Max	Mean	UTL		UCL
ALUMINUM	MG/KG	L	37	1,600	29,000	9,573	36,598	*	12,821	L	12	1,600	11,000	3,875	11,000		5,416	N	13	6,900	18,000	11,346	21,066	*	13,053	N	12	5,000	29,000	13,350	35,477	*	17,291
ANTIMONY	MG/KG	NP	37	0.35	2.3	0.67	2.3		0.8	N	12	0.35	1.0	0.53	1.2	*	0.6	N	13	0.52	1.4	0.68	1.6	*	0.8	L	12	0.59	2.3	0.81	2.3		1.0
ARSENIC	MG/KG	L	37	0.57	2.5	0.93	2.7	*	1.1	N	12	0.70	2.5	1.3	3.0	*	1.6	N	13	0.57	1.2	0.72	1.5	*	0.9	L	12	0.66	2.2	0.78	2.2		1.7
ARSENIC (SUBSURFACE SOIL)	MG/KG	N	11	0.71	2.5	1.0	2.5		1.4	N	4	1.1	2.5	1.7	5.0	*	NA	NP	3	0.87	1.0	0.96	1.0		NA	N	4	0.71	0.71	0.43	1.4	*	NA
ARSENIC (SURFACE SOIL)	MG/KG	L	26	0.57	2.2	0.89	2.2		1.0	N	8	0.70	2.1	1.1	2.6	*	NA	N	10	0.57	1.2	0.65	1.6	*	0.9	N	8	0.66	2.2	0.95	3.0	*	NA
BARIUM	MG/KG	L	37	6.4	320	65	365	*	104	N	12	6.4	24	15	34	*	18	L	13	20	190	84	190		129	L	12	30	320	94	320		145
BERYLLIUM	MG/KG	N	37	0.13	0.46	0.21	0.45		0.24	N	12	0.13	0.41	0.23	0.63	*	0.30	N	13	0.13	0.27	0.17	0.41	*	0.02	N	12	0.13	0.46	0.24	0.52	*	0.29
CADMIUM	MG/KG	NP	37	ND	ND	0.033	0.040		0.017	NP	12			0.036	0.040	*	0.019	*	NP	13			0.031	0.036	*	0.016	*	NP	12			0.033	0.036	*	0.017	*
CALCIUM	MG/KG	NP	35	1,700	210,000	29,849	210,000		44,232	L	10	25,000	210,000	84,000	210,000		102,366	N	13	2,800	9,100	4,838	9,985	*	5,742	L	12	1,700	45,000	11,817	45,000		31,602
CHROMIUM, TOTAL	MG/KG	NP	37	2.2	74	16	74		21	NP	12	2.6	48	9.4	48		15	L	13	2.2	52	13	52		29	L	12	4.5	74	26	74		65
COBALT	MG/KG	NP	37	1.0	25	8.2	25		10	NP	12	1.0	13	2.9	13		5	N	13	6.7	13	9.1	15	*	10	N	12	4.3	25	13	33	*	16
COPPER	MG/KG	NP	37	1.8	68	23	68		27	L	12	1.8	35	9.8	35		20	N	13	15	47	28	58	*	34	N	12	9.1	68	31	80	*	40
IRON	MG/KG	N	37	2,500	39,000	16,884	37,531		19,549	L	12	2,500	18,000	6,475	18,000		9,350	N	13	14,000	28,000	20,692	34,501	*	23,118	N	12	12,000	39,000	23,167	48,931	*	27,755
LEAD	MG/KG	L	36	0.30	7	3.3	9	*	4	N	12	0.30	8.9	2.8	8.6	*	4	N	13	1.1	5.7	3.2	7.3	*	4	L	12	1.4	13	4.7	13		6
MAGNESIUM	MG/KG	L	37	1,200	16,000	4,146	12,834		5,087	L	12	1,300	11,000	3,842	11,000		6,192	N	13	1,500	7,200	3,985	8,688	*	4,810	L	12	1,200	16,000	4,625	16,000		8,354
MANGANESE	MG/KG	N	37	48	1,200	478	1,167		0,567	L	12	48	360	132	360		202	N	13	290	1,200	626	1,266	*	738	N	12	260	1,200	663	1,476	*	808
MERCURY	MG/KG	L	37	0.0037	0.031	0.013	0.046	*	0.014	N	12	0.0037	0.016	0.0091	0.022	*	0.011	N	13	0.0037	0.024	0.011	0.031	*	0.014	N	12	0.0048	0.031	0.018	0.044	*	0.022
NICKEL	MG/KG	NP	37	0.67	40	7.2	40		10	NP	12	0.67	26	3.9	26		7	L	13	1.3	18	5.1	18		10	L	12	1.8	40	13	40		38
POTASSIUM	MG/KG	L	37	380	1,700	918	1,908	*	1,031	L	12	380	1,700	859	1,700		1,150	N	13	520	1,400	875	1,695	*	1,019	N	12	570	1,400	1,023	1,872	*	1,174
SELENIUM	MG/KG	NP	37	0.68	2.0	0.66	2.0		0.5	NP	12			0.61	0.68	*	0.32	*	NP	13	0.73	0.73	0.54	0.73		0.35	L	12	0.68	2.0	0.85	2.0		0.99
SILVER	MG/KG	NP	37	ND	ND	0.069	0.084		0.036	NP	12			0.075	0.084	*	0.040	*	NP	13			0.065	0.076	*	0.034	*	NP	12			0.069	0.077	*	0.036	*
SODIUM	MG/KG	NP	37	25	6,300	1,069	6,300		1,519	N	12	300	6,300	2,803	8,607	*	3,836		L	13	25	310	116	310		0,204	L	12	50	1,200	367	1,200		0,881
THALLIUM	MG/KG	NP	37	0.45	0.67	0.42	0.67		0.26	NP	12			0.45	0.50	*	0.23	*	N	13	0.45	0.46	0.39	0.51	*	0.28	NP	12	0.87	0.87	0.43	0.67		0.30
VANADIUM	MG/KG	L	37	9.0	130	50	184	*	66	L	12	9.0	63	22	63		33		N	13	29	80	53	97	*	61	N	12	34	130	73	169	*	90
ZINC	MG/KG	N	37	3.5	71	29	65		33	L	12	3.5	31	12	31		19		N	13	23	53	36	62	*	40	N	12	17	71	38	90	*	47

* Value exceeds the maximum detected value

NA = not available -- sample size too small

ND--Not detected in background soil media

Range of detection limits for pooled samples without detects:

Cadmium: 0.028-0.04 mg/kg

Silver: 0.059-0.084 mg/kg

Dist = assumed distribution

95th Utl = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)

NP = nonparametric

N = normal

L = lognormal

Appendix E7
ROCK STATISTICAL SUMMARY AND BACKGROUND ESTIMATES
NASD Background Investigation

Parameter	Units	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetect Value	Maximum Nondetect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean	Geometric Mean	Standard Deviation	Dist	UTL		95% UCL
ALUMINUM	MG/KG	6	6	100.0%			2,000	5,600	4,017	3,792	1,351	N	9,025	*	NA
ANTIMONY	MG/KG		6		0.24	0.25			0.24	-1.42E+00	0.0041	NP	0.25	*	NA
ARSENIC	MG/KG		6		0.29	0.30			0.29	-1.23E+00	0.0041	NP	0.30	*	NA
BARIUM	MG/KG	6	6	100.0%			18	160	70	54	52	N	160		NA
BERYLLIUM	MG/KG	2	6	33.3%	0.033	0.033	0.16	0.20	0.082	0.058	0.077	NP	0.20		NA
CADMIUM	MG/KG		6		0.027	0.028			0.027	-3.61E+00	4.08E-04	NP	0.028	*	NA
CALCIUM	MG/KG	6	6	100.0%			2,000	38,000	8,717	4,304	14,360	NP	38,000		NA
CHROMIUM, TOTAL	MG/KG	6	6	100.0%			0.86	2.5	1.6	1.5	0.61	N	3.9	*	NA
COBALT	MG/KG	6	6	100.0%			2.2	6.9	4.7	4.4	1.7	N	11	*	NA
COPPER	MG/KG	6	6	100.0%			2.5	59	17	9.7	21	L	59		NA
IRON	MG/KG	6	6	100.0%			4,800	10,000	8,300	7,951	2,426	NP	10,000		NA
LEAD	MG/KG	5	6	83.3%	0.16	0.16	0.96	3.0	1.4	1.0	0.99	N	5.1	*	NA
MAGNESIUM	MG/KG	6	6	100.0%			910	4,300	2,935	2,646	1,178	N	7,300	*	NA
MANGANESE	MG/KG	6	6	100.0%			320	840	607	571	214	N	1,401	*	NA
MERCURY	MG/KG	3	6	50.0%	0.0025	0.0026	0.0030	0.0063	0.0035	0.0033	0.0015	L	0.0063		NA
NICKEL	MG/KG	6	6	100.0%			0.69	2.5	1.3	1.2	0.69	N	2.5		NA
POTASSIUM	MG/KG	6	6	100.0%			170	530	345	320	136	N	850	*	NA
SELENIUM	MG/KG		6		0.46	0.47			0.46	-7.73E-01	0.0041	NP	0.47	*	NA
SILVER	MG/KG		6		0.057	0.058			0.057	-2.86E+00	5.16E-04	NP	0.058	*	NA
SODIUM	MG/KG	6	6	100.0%			54	670	294	176	278	N	1,325	*	NA
THALLIUM	MG/KG		6		0.34	0.35			0.34	-1.07E+00	0.0041	NP	0.35	*	NA
VANADIUM	MG/KG	6	6	100.0%			7.0	24	19	17	6.9	N	44	*	NA
ZINC	MG/KG	6	6	100.0%			12	43	32	29	12	N	77	*	NA

* Value exceeds maximum detected value
Dist = assumed distribution
95th Utl = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)

NP = nonparametric
N = normal
L = lognormal

Appendix E8
GROUNDWATER STATISTICAL SUMMARY AND BACKGROUND ESTIMATES
NASD Background Investigation

Chemical	Units	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Avg Detect	Arithmetic Mean	Minimum Nondetect Value	Maximum Nondetect Value	Dist	UTL	UCL95
ALUMINUM	µg/L	4	4	100%	130	3,500	1,645	1,645	0	0	N	5,471 *	NA
ANTIMONY	µg/L	5	2	40%	5.1	5.2	5.2	2.8	1.2	1.2	NP	5.2	NA
ARSENIC	µg/L	5	0	0%	0	0	0	1.5	1.5	1.5	NP	0	NA
BARIUM	µg/L	5	5	100%	180	960	398	398	0	0	L	1,559 *	NA
BERYLLIUM	µg/L	5	2	40%	1.4	1.8	1.6	0.74	0.17	0.17	NP	1.8	NA
CADMIUM	µg/L	5	1	20%	1.0	1.0	1.0	0.31	0.14	0.14	NP	1.0	NA
CALCIUM	µg/L	5	5	100%	120,000	660,000	382,000	382,000	0	0	L	1.80E+06 *	NA
CHROMIUM, TOTAL	µg/L	5	4	80%	3.7	6.8	5.3	4.3	0.44	0.44	N	10 *	NA
COBALT	µg/L	5	4	80%	5.4	20	12	9.2	0.22	0.22	N	27 *	NA
COPPER	µg/L	5	4	80%	2.8	15	8.6	6.9	0.40	0.40	L	114 *	NA
IRON	µg/L	5	5	100%	480	4,800	2,616	2,616	0	0	N	6,740 *	NA
LEAD	µg/L	5	0	0%	0	0	0	0.80	0.80	0.80	NP	0	NA
MAGNESIUM	µg/L	3	3	100%	76,000	290,000	172,000	172,000	0	0	L	1.42E+06 *	NA
MANGANESE	µg/L	5	5	100%	400	17,000	6,022	6,022	0	0	L	103,732 *	NA
MERCURY	µg/L	5	0	0%	0	0	0	0.013	0.013	0.013	N;	0.013 *	NA
NICKEL	µg/L	5	5	100%	2.4	19	7.5	7.5	0	0	L	41 *	NA
POTASSIUM	µg/L	4	4	100%	6,000	490,000	140,500	140,500	0	0	L	6.70E+06 *	NA
SELENIUM	µg/L	5	0	0%	0	0	0	2.3	2.3	2.3	N;	2.3 *	NA
SILVER	µg/L	5	0	0%	0	0	0	0.29	0.29	0.29	NP	0	NA
SODIUM	µg/L	2	2	100%	210,000	350,000	280,000	280,000	0	0	NP	350,000	NA
THALLIUM	µg/L	5	4	80%	4.8	18	9.4	7.9	1.7	1.7	L	45 *	NA
VANADIUM	µg/L	5	5	100%	3.5	75	23	23	0	0	L	195 *	NA
ZINC	µg/L	3	1	33%	60	60	60	22	2.5	2.5	NP	60	NA
ALUMINUM, DISSOLVED	µg/L	5	0	0%	0	0	0	48	48	48	NP	0	NA
ANTIMONY, DISSOLVED	µg/L	5	2	40%	3.8	9.1	6.5	3.3	1.2	1.2	L	20 *	NA
ARSENIC, DISSOLVED	µg/L	5	1	20%	5.5	5.5	5.5	2.3	1.5	1.5	NP	5.5	NA
BARIUM, DISSOLVED	µg/L	5	5	100%	120	870	364	364	0	0	L	1,669 *	NA
BERYLLIUM, DISSOLVED	µg/L	5	2	40%	1.0	2.2	1.6	0.74	0.17	0.17	L	7.1 *	NA
CADMIUM, DISSOLVED	µg/L	5	1	20%	1.1	1.1	1.1	0.33	0.14	0.14	NP	1.1	NA
CALCIUM, DISSOLVED	µg/L	5	5	100%	110,000	660,000	386,000	386,000	0	0	L	1.95E+06 *	NA
CHROMIUM, TOTAL, DISSOLVED	µg/L	5	2	40%	2.9	4.6	3.8	1.8	0.44	0.44	N	6.2 *	NA
COBALT, DISSOLVED	µg/L	5	3	60%	5.5	11	7.4	4.5	0.22	0.22	N	15 *	NA
COPPER, DISSOLVED	µg/L	5	0	0%	0	0	0	0.40	0.40	0.40	NP	0	NA
IRON, DISSOLVED	µg/L	5	3	60%	410	490	440	269	13	13	N	821 *	NA
LEAD, DISSOLVED	µg/L	5	0	0%	0	0	0	0.80	0.80	0.80	NP	0	NA
MAGNESIUM, DISSOLVED	µg/L	3	3	100%	71,000	310,000	177,000	177,000	0	0	L	1.79E+06 *	NA
MANGANESE, DISSOLVED	µg/L	5	5	100%	190	18,000	6,218	6,218	0	0	L	164,667 *	NA
MERCURY, DISSOLVED	µg/L	5	0	0%	0	0	0	0.013	0.013	0.013	NP	0	NA
NICKEL, DISSOLVED	µg/L	5	4	80%	2.1	12	4.9	4.0	0.47	0.47	L	37 *	NA
POTASSIUM, DISSOLVED	µg/L	4	4	100%	5,800	400,000	119,700	119,700	0	0	L	4.95E+06 *	NA
SELENIUM, DISSOLVED	µg/L	5	0	0%	0	0	0	2.3	2.3	2.3	NP	0	NA
SILVER, DISSOLVED	µg/L	5	0	0%	0	0	0	0.28	0.28	0.29	NP	0	NA
SODIUM, DISSOLVED	µg/L	2	2	100%	200,000	360,000	280,000	280,000	0	0	NP	360,000	NA
THALLIUM, DISSOLVED	µg/L	5	3	60%	5.5	16	9.5	6.4	1.7	1.7	L	43 *	NA
VANADIUM, DISSOLVED	µg/L	5	5	100%	2.8	32	9.7	9.7	0	0	L	60 *	NA
ZINC, DISSOLVED	µg/L	3	1	33%	15	15	15	6.7	2.5	2.5	NP	15	NA

* Value exceeds the maximum detected value
Dist = assumed distribution
95th Utl = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)

NP = nonparametric
N = normal
L = lognormal
NA = Not applicable -- Sample size too small to calculate

Appendix E9
SEDIMENT STATISTICAL SUMMARY AND BACKGROUND ESTIMATES
NASD Background Investigation

Parameter	Units	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetect Value	Maximum Nondetect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean	Geometric Mean	Standard Deviation	Dist	UTL		95% UCL
ALUMINUM	MG/KG	6	6	100.0%			2,600	10,000	5,867	5,016	3,479	N	10,000		NA
ANTIMONY	MG/KG	1	6	16.7%	0.36	1.3	0.59	0.59	0.61	0.54	0.35	L	0.59		NA
ARSENIC	MG/KG	0	6	0.0%	0.44	1.5			0.69	-4.83E-01	0.41	NP	1.5	*	NA
BARIUM	MG/KG	6	6	100.0%			6.9	69	28	20	25	N	69		NA
BERYLLIUM	MG/KG	3	6	50.0%	0.051	0.17	0.17	0.24	0.16	0.13	0.081	N	0.46	*	NA
CADMIUM	MG/KG	0	6	0.0%	0.041	0.14			0.064	-2.86E+00	0.038	NP	0.14	*	NA
CALCIUM	MG/KG	6	6	100.0%			8,900	160,000	79,483	59,991	49,747	N	263,894	*	NA
CHROMIUM, TOTAL	MG/KG	6	6	100.0%			2.3	7.8	4.5	4.2	2.0	N	7.8		NA
COBALT	MG/KG	6	6	100.0%			0.96	4.7	2.5	2.1	1.7	N	4.7		NA
COPPER	MG/KG	6	6	100.0%			3.3	26	14	11	9.6	N	26		NA
IRON	MG/KG	6	6	100.0%			2,300	14,000	7,300	6,007	4,749	N	14,000		NA
LEAD	MG/KG	6	6	100.0%			0.56	8.0	4.4	3.2	3.0	N	15	*	NA
MAGNESIUM	MG/KG	6	6	100.0%			2,200	14,000	8,317	7,110	4,344	N	24,420	*	NA
MANGANESE	MG/KG	6	6	100.0%			24	350	118	81	121	L	350		NA
MERCURY	MG/KG	2	6	33.3%	0.0038	0.0054	0.013	0.052	0.014	0.0078	0.019	NP	0.052		NA
NICKEL	MG/KG	6	6	100.0%			0.50	4.1	1.7	1.3	1.3	N	4.1		NA
POTASSIUM	MG/KG	6	6	100.0%			1,300	5,200	2,867	2,465	1,651	N	8,988	*	NA
SELENIUM	MG/KG	2	6	33.3%	0.72	2.4	0.78	1.1	1.1	1.0	0.64	L	1.1		NA
SILVER	MG/KG	0	6	0.0%	0.086	0.30			0.14	-2.11E+00	0.082	NP	0.30	*	NA
SODIUM	MG/KG	6	6	100.0%			7,800	67,000	22,217	16,406	22,493	L	67,000		NA
THALLIUM	MG/KG	0	6	0.0%	0.51	1.8			0.81	-3.23E-01	0.49	NP	1.8	*	NA
VANADIUM	MG/KG	6	6	100.0%			7.2	40	21	17	13	N	40		NA
ZINC	MG/KG	6	6	100.0%			4.9	48	22	17	16	N	48		NA

* Exceeds the maximum detected value
Dist = assumed distribution
95th Utl = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)

NP = nonparametric
N = normal
L = lognormal
NA = Not available -- sample size too small to calculate

Appendix E10
SURFACE WATER STATISTICAL SUMMARY AND BACKGROUND ESTIMATES
NASD Background Investigation

Parameter	Units	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetect Value	Maximum Nondetect Value	Minimum Detected Value	Maximum Detected Value	Arithmetic Mean	Dist	UTL	95 % UCL
ALUMINUM	µg/L	2	2	100%	530	5000	0	0,000	2,765	NA	NA	NA
ANTIMONY	µg/L	1	2	50%	3.3	3.3	1.2	1	2.3	NA	NA	NA
ARSENIC	µg/L	1	2	50%	15.0	15.0	1.5	1	8	NA	NA	NA
BARIUM	µg/L	2	2	100%	17	37	0	0	27	NA	NA	NA
BERYLLIUM	µg/L	2	2	100%	1	3	0.0	0.0	1.8	NA	NA	NA
CADMIUM	µg/L	1	2	50%	1.10	1.10	0.1	0	0.6	NA	NA	NA
CALCIUM	µg/L	2	2	100%	390000	480000	0,000	0,000	435,000	NA	NA	NA
CHROMIUM, TOTAL	µg/L	1	2	50%	4.30	4.30	0.4	0	2	NA	NA	NA
COBALT	µg/L	1	2	50%	2.00	2.00	0.2	0	1	NA	NA	NA
COPPER	µg/L	1	2	50%	14.00	14.00	0	0	7	NA	NA	NA
IRON	µg/L	2	2	100%	590	4900	0	0,000	2,745	NA	NA	NA
LEAD	µg/L	0	2	0%	0.0	0.0	1	1	1	NA	NA	NA
MANGANESE	µg/L	2	2	100%	28	85	0	0,000	0,057	NA	NA	NA
MERCURY	µg/L	0	2	0%	0.000	0.000	0	0	0.013	NA	NA	NA
NICKEL	µg/L	2	2	100%	3	5	0.0	0	4	NA	NA	NA
SELENIUM	µg/L	0	2	0%	0.0	0.0	2	2	2.3	NA	NA	NA
SILVER	µg/L	0	2	0%	0.00	0.00	0.3	0.3	0.29	NA	NA	NA
THALLIUM	µg/L	2	2	100%	5.1	9.7	0.0	0.0	7.4	NA	NA	NA
VANADIUM	µg/L	2	2	100%	3	8	0.0	0	6	NA	NA	NA
ZINC	µg/L	0	2	0%	0.0	0.0	3	0,003	3	NA	NA	NA

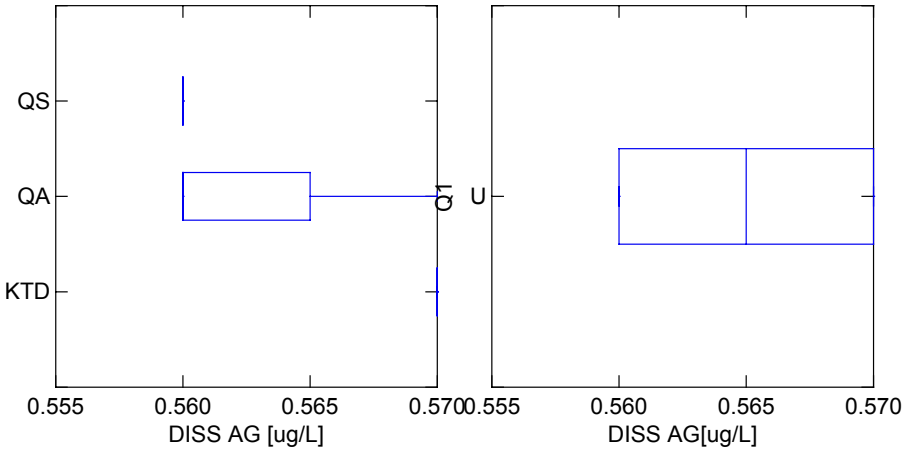
Dist = assumed distribution
95th Utl = 95/95 Upper Tolerance Limit (95% upper confidence bound of the 95th percentile)
NP = nonparametric
N = normal
L = lognormal
NA = Not applicable -- Sample size too small to calculate

APPENDIX E11
Vieques Soils Background
Kruskal-Wallis Test (KW) for Population Comparison between Soil Types and Soil Depths

				Combined Soils	Soil Depths and Soil Types Difference		
P	**Q**	**P**	**Units**	**KW [Soil]**	**Z [KTD]**	**Z [QA]**	**Z [QS]**
AG	Q1	01	mg/kg	0.001	0.19	0.49	0.61
AL	Q2	02	mg/kg	0.001	0.45	0.44	0.55
AS	Q3	03	mg/kg	0.005	0.02	0.03	0.12
BA	Q4	04	mg/kg	0.001	0.15	0.31	0.09
BE	Q5	05	mg/kg	0.21	0.39	0.27	0.55
CA	Q6	06	mg/kg	0.001	0.99	0.39	0.49
CD	Q7	07	mg/kg	0.003	0.19	0.44	0.55
CO	Q8	08	mg/kg	0.001	0.93	0.67	0.93
CR	Q9	09	mg/kg	0.011	0.39	0.73	0.61
CU	Q10	10	mg/kg	0.001	0.87	0.49	0.67
FE	Q11	11	mg/kg	0.001	0.27	0.19	0.44
HG	Q12	12	mg/kg	0.08	0.03	0.23	0.31
K	Q13	13	mg/kg	0.39	0.21	0.55	0.61
MG	Q14	14	mg/kg	0.85	0.31	0.93	0.31
MN	Q15	15	mg/kg	0.001	0.13	0.99	0.35
NA	Q16	16	mg/kg	0.001	0.06	0.27	0.09
NI	Q17	17	mg/kg	0.002	0.45	0.99	0.86
PB	Q18	18	mg/kg	0.11	0.11	0.13	0.39
SB	Q19	19	mg/kg	0.28	0.13	0.93	0.61
SE	Q20	20	mg/kg	0.02	0.23	0.73	0.21
TL	Q21	21	mg/kg	0.03	0.15	0.93	0.21
V	Q22	22	mg/kg	0.001	0.87	0.35	0.79
ZN	Q23	23	mg/kg	0.001	0.45	0.31	0.09

APPENDIX E12
Vieques Groundwater Background
Groundwater Data Comparisons Between Wells Finished in Different Soil Types
Mann-Whitney Test (MW)

P	Q	P	Units	P Value MW [Soil Type]	P Value MW [Soil]	Difference By Soil Type
AGd	Q1	01	µg/L	0.050	0.09	
AGt	Q2	02	µg/L	1.000	0.99	
ALd	Q3	03	µg/L	1.000	0.99	
ALt	Q4	04	µg/L	0.0459	0.34	
ASd	Q5	05	µg/L	0.287	0.22	
ASt	Q6	06	µg/L	1.000	0.99	
BAd	Q7	07	µg/L	0.069	0.04	KTD<QA<QS
BAt	Q8	08	µg/L	0.069	0.04	KTD<QA<QS
BEd	Q9	09	µg/L	0.054	0.03	KTD~QA<QS
BEt	Q10	10	µg/L	0.054	0.03	KTD~QA<QS
CAd	Q11	11	µg/L	0.069	0.04	KTD<QA<QS
CAt	Q12	12	µg/L	0.069	0.04	KTD<QA<QS
CDd	Q13	13	µg/L	0.287	0.22	
CDt	Q14	14	µg/L	0.287	0.22	
COd	Q15	15	µg/L	0.144	0.12	
COt	Q16	16	µg/L	0.304	0.19	
CRd	Q17	17	µg/L	0.054	0.03	KTD~QA<QS
CRt	Q18	18	µg/L	0.387	0.31	
CUd	Q19	19	µg/L	1.000	0.99	
CUt	Q20	20	µg/L	0.199	0.16	
FEd	Q21	21	µg/L	0.095	0.06	
FEt	Q22	22	µg/L	0.204	0.21	
HGd	Q23	23	µg/L	1.000	0.99	
HGt	Q24	24	µg/L	1.000	0.99	
Kd	Q25	25	µg/L	0.107	0.09	
Kt	Q26	26	µg/L	0.107	0.09	
MGd	Q27	27	µg/L	0.069	0.04	KTD<QA<<QS
MGt	Q28	28	µg/L	0.069	0.04	KTD<QA<<QS
MNd	Q29	29	µg/L	0.107	0.12	
MNt	Q30	30	µg/L	0.107	0.09	
NAd	Q31	31	µg/L	0.069	0.04	KTD<QA<<QS
NAt	Q32	32	µg/L	0.069	0.04	KTD<QA<<QS
Nld	Q33	33	µg/L	0.123	0.46	
Nlt	Q34	34	µg/L	0.507	0.26	
PBd	Q35	35	µg/L	1.000	0.99	
PBt	Q36	36	µg/L	0.513	0.44	
SBd	Q37	37	µg/L	0.054	0.03	KTD~QA<QS
SBt	Q38	38	µg/L	0.054	0.03	KTD~QA<QS
SEd	Q39	39	µg/L	1.000	0.99	
SEt	Q40	40	µg/L	1.000	0.99	
TLd	Q41		µg/L	0.700	0.98	
TLt	Q42	42	µg/L	0.187	0.42	
Vd	Q43	43	µg/L	0.274	0.19	
Vt	Q44	44	µg/L	0.145	0.11	
ZNd	Q45	45	µg/L	0.140	0.12	
ZNt	Q46	46	µg/L	0.897	0.56	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QA
KTD
Q1
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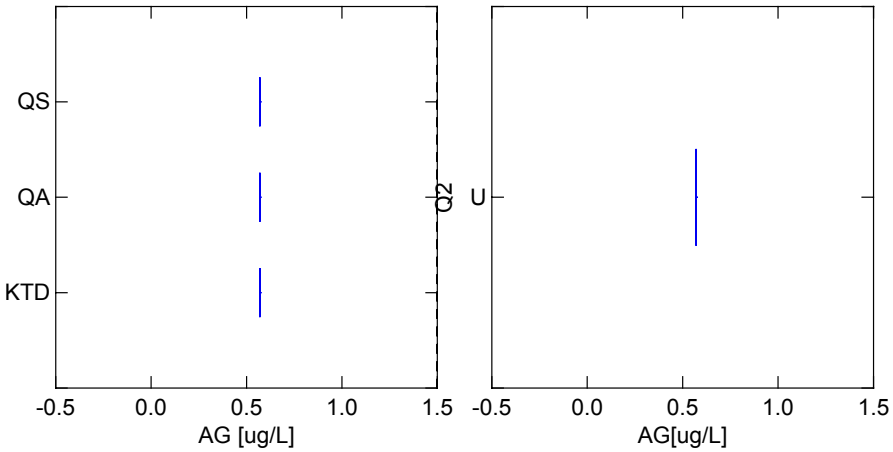
0.565
0.570
DISS AG [ug/L]
U
0.555
0.560
0.565
0.570
DISS AG[ug/L]


QS
QA
KTD
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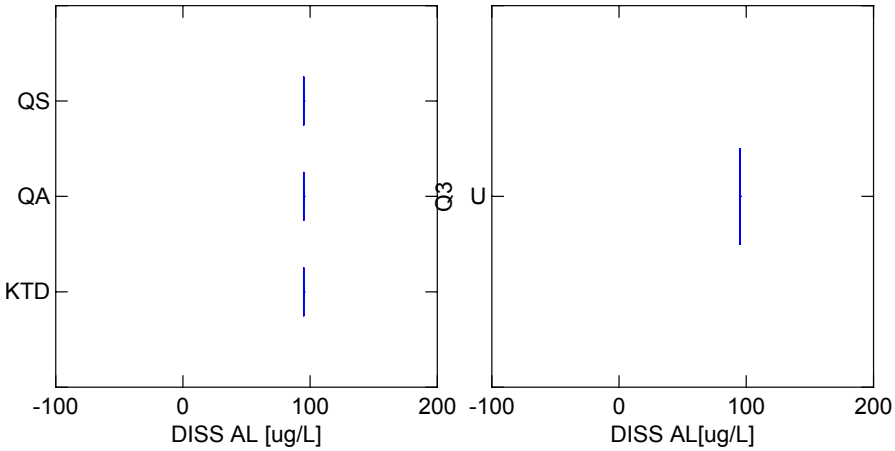
-0.5
0.0
0.5
1.0
1.5
AG [ug/L]
U
-0.5
0.0
0.5
1.0
1.5
AG[ug/L]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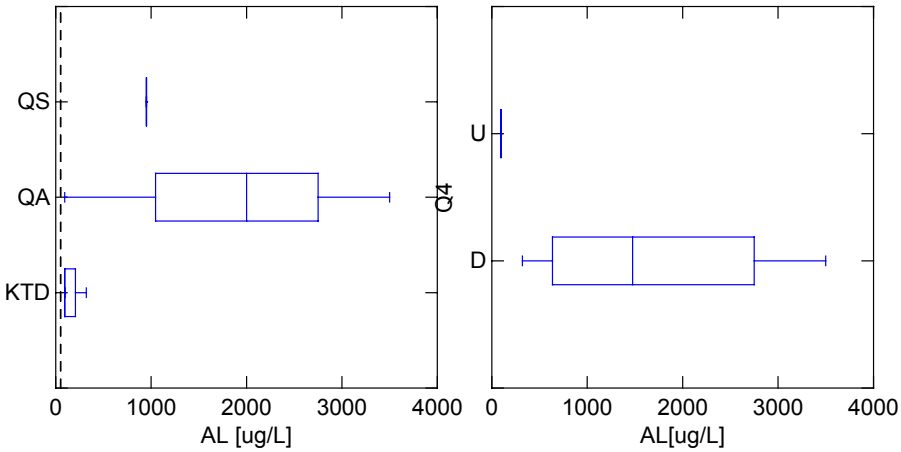
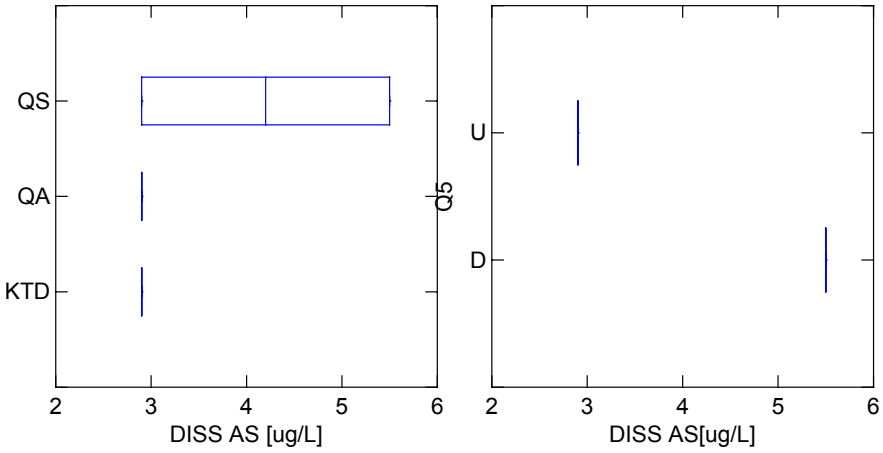
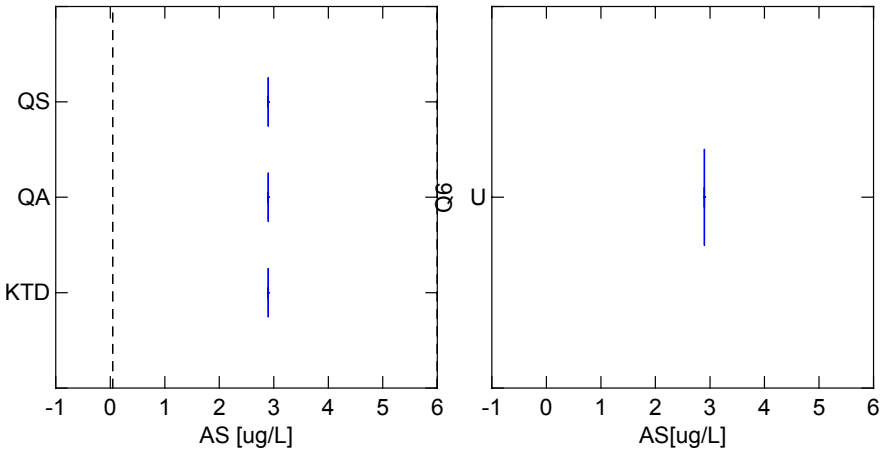
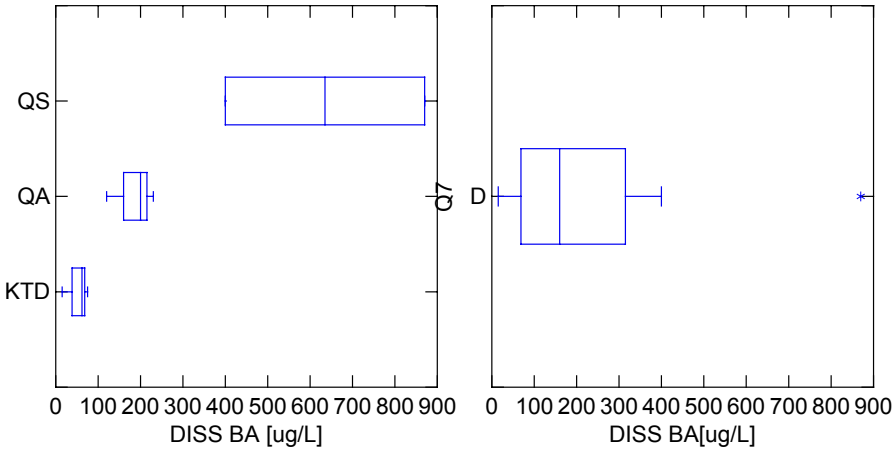
QA
KTD
-100
0
100
200
DISS AL [ug/L]
Q3
U
-100
0
100
200
DISS AL[ug/L]


QS
QA
KTD
0
1000
2000
3000
4000
AL [ug/L]
Q4
U
D
0
1000
2000
3000
4000
AL[ug/L]


QS
QA
KTD
2
3
4
5
6
DISS AS [ug/L]
Q5
U
D
2
3
4
5
6
DISS AS[ug/L]


QS
QA
KTD
-1
0
1
2
3
4
5
6
AS [ug/L]
Q6
U
-1
0
1
2
3
4
5
6
AS[ug/L]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QA
KTD
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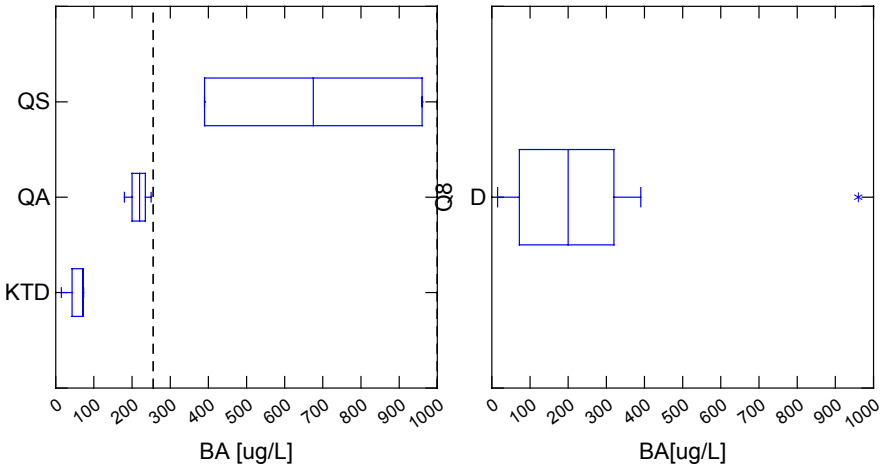
DISS BA [ug/L]
Q7
D
0 100 200 300 400 500 600 700 800 900
DISS BA[ug/L]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QA
KTD
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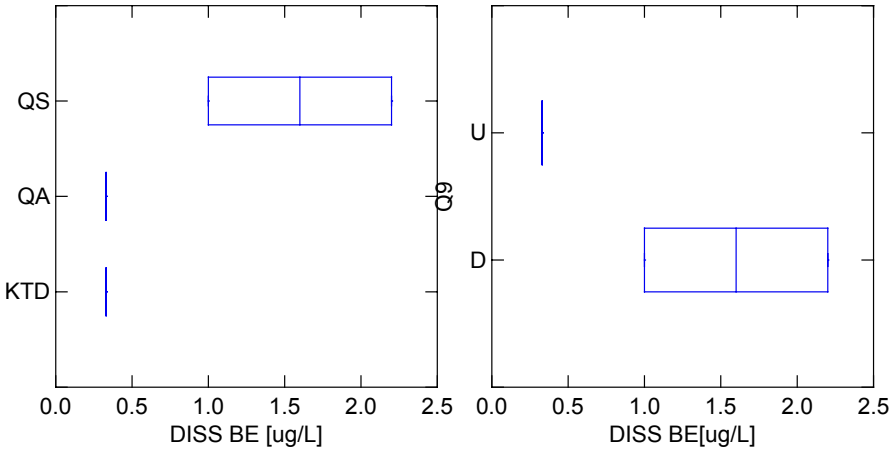
BA [ug/L]
Q8
D
0 100 200 300 400 500 600 700 800 900 1000
BA[ug/L]


QS
QA
KTD
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0.5
1.0
1.5
2.0
2.5
DISS BE [ug/L]
Q9
U
D
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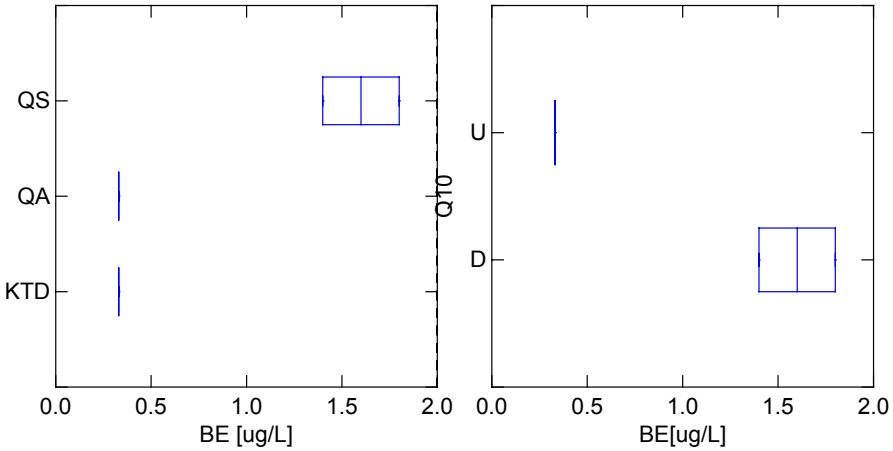
0.5
1.0
1.5
2.0
2.5
DISS BE[ug/L]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KTD
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U
D
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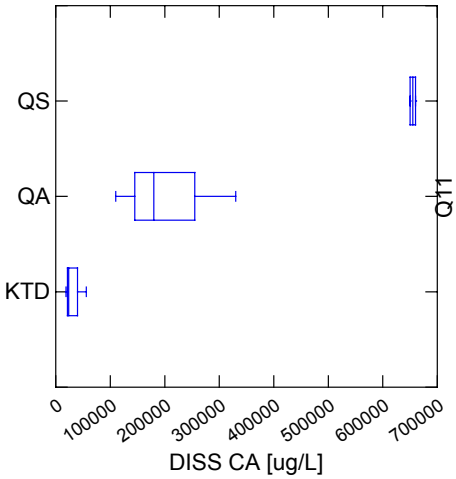
1.0
1.5
2.0
BE[ug/L]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QA
KTD
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400000
500000
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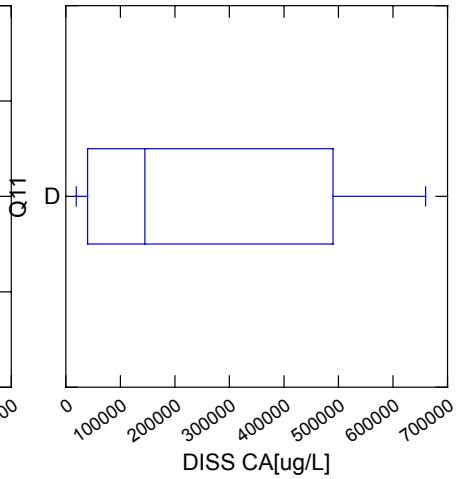
700000
DISS CA [ug/L]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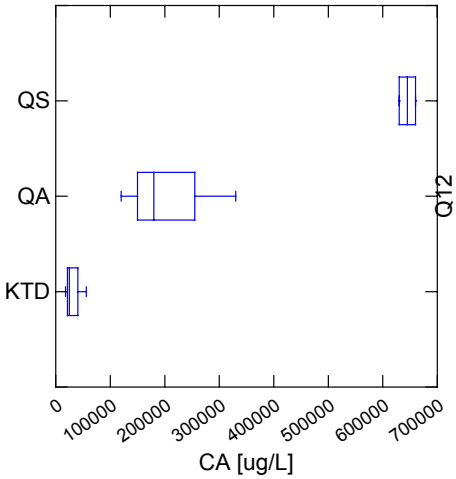
400000
500000
600000
700000
DISS CA[ug/L]


QS
QA
KTD
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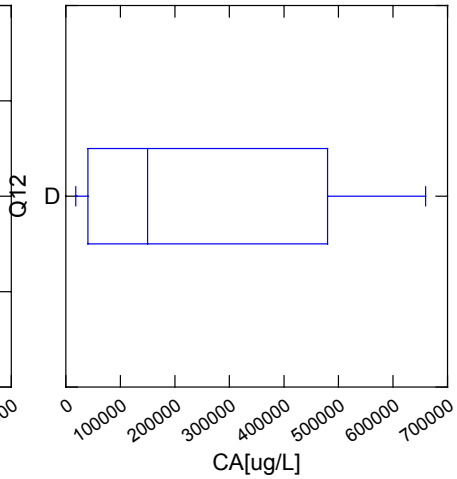
200000
300000
400000
500000
600000
700000
CA [ug/L]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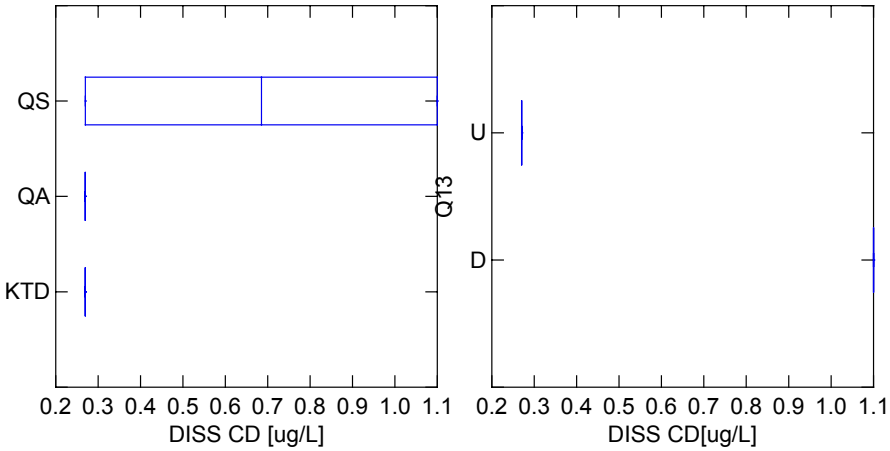
400000
500000
600000
700000
CA[ug/L]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QA
KTD
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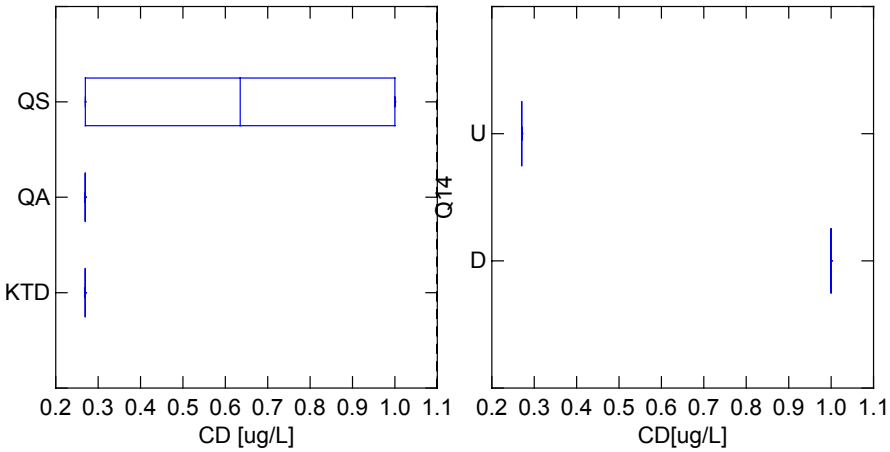
Q13
U
D
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1
DISS CD[ug/L]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KTD
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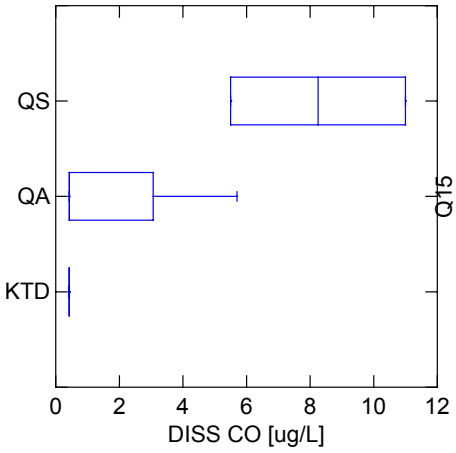
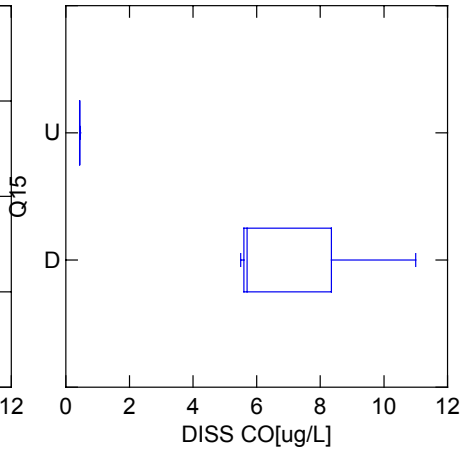
CD [ug/L]
Q14
U
D
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1
CD[ug/L]


QS
QA
KTD
0
2
4
6
8
10
12
DISS CO [ug/L]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2
4
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8
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12
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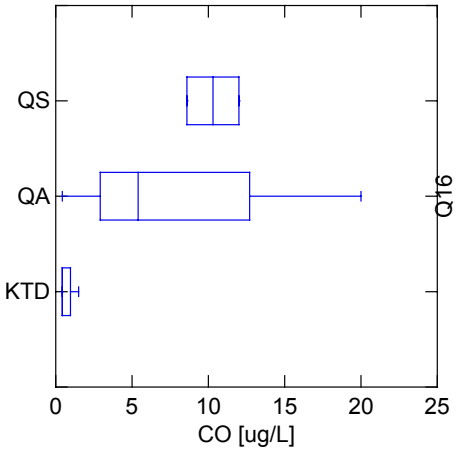
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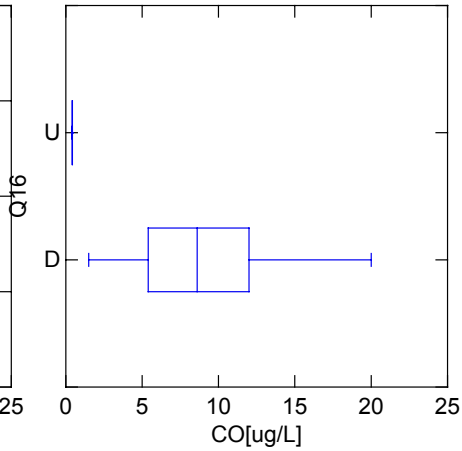
QA
KTD
0
5
10
15
20
25
CO [ug/L]


Q16
U
D
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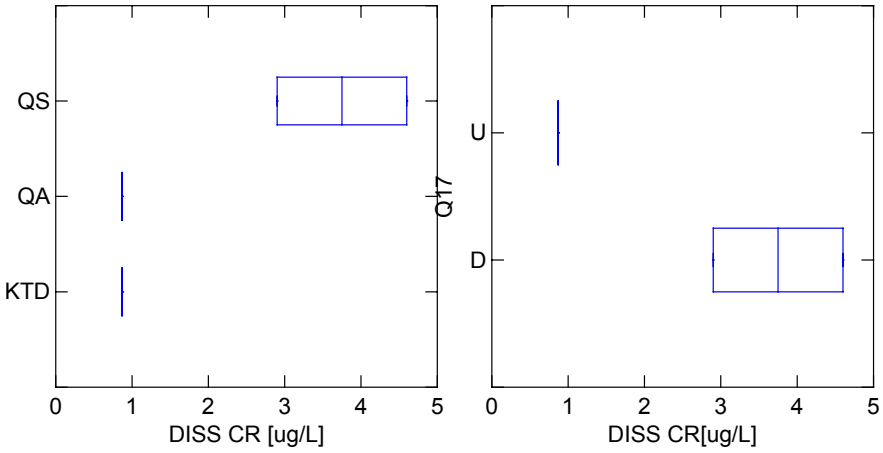
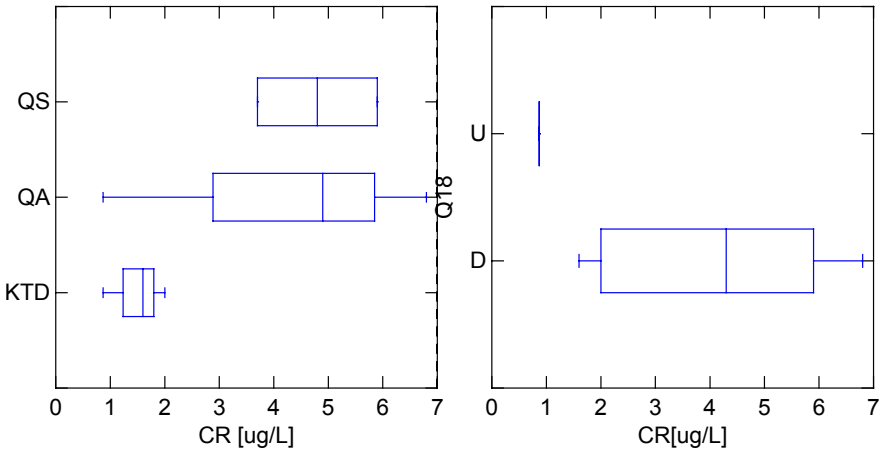
5
10
15
20
25
CO[ug/L]


QS
QA
KTD
0 1 2 3 4 5
DISS CR [ug/L]
Q17
U
D
0 1 2 3 4 5
DISS CR[ug/L]


QS
QA
KTD
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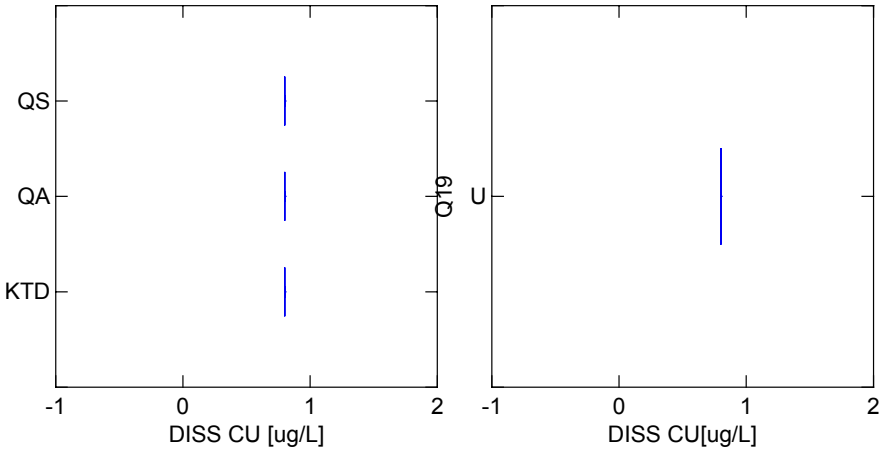
CR [ug/L]
Q18
U
D
0 1 2 3 4 5 6 7
CR[ug/L]


QS
QA
KTD
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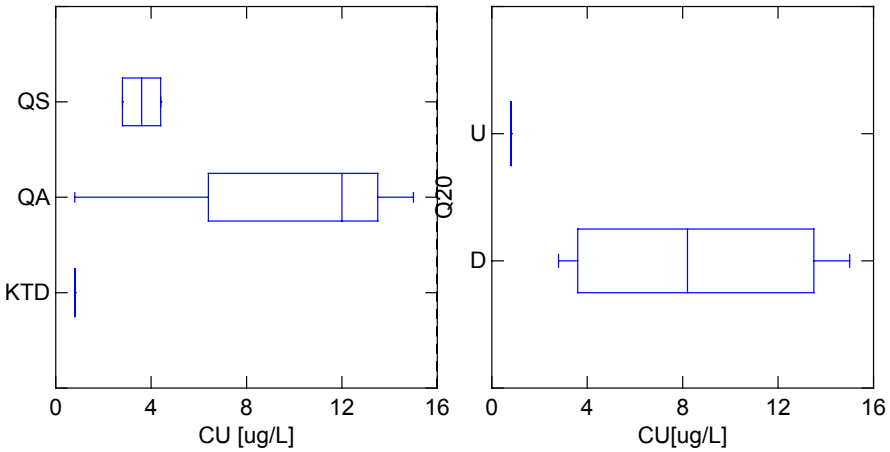
0
1
2
DISS CU [ug/L]
Q19
U
-1
0
1
2
DISS CU[ug/L]


QS
QA
KTD
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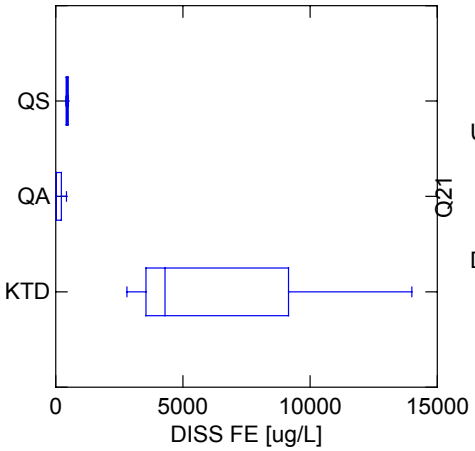
4
8
12
16
CU [ug/L]
Q20
U
D
0
4
8
12
16
CU[ug/L]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KTD
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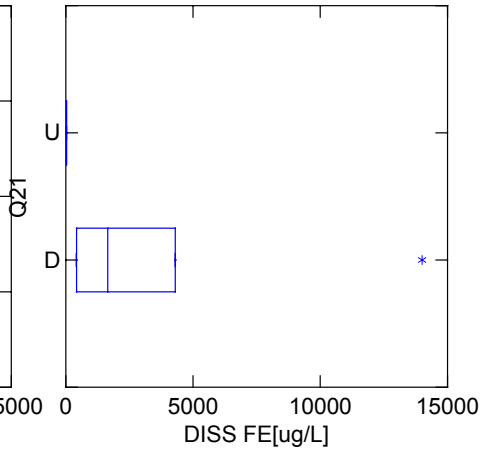
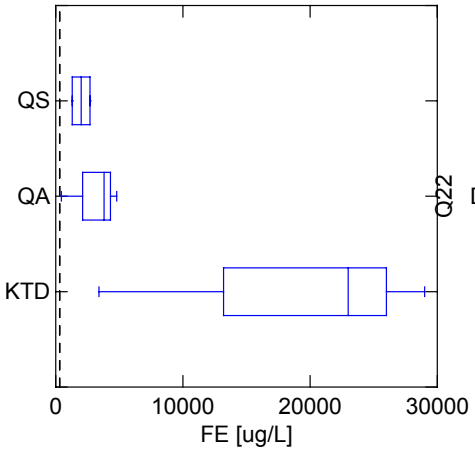
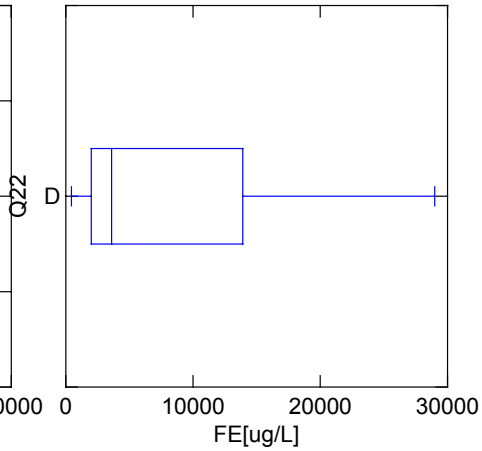
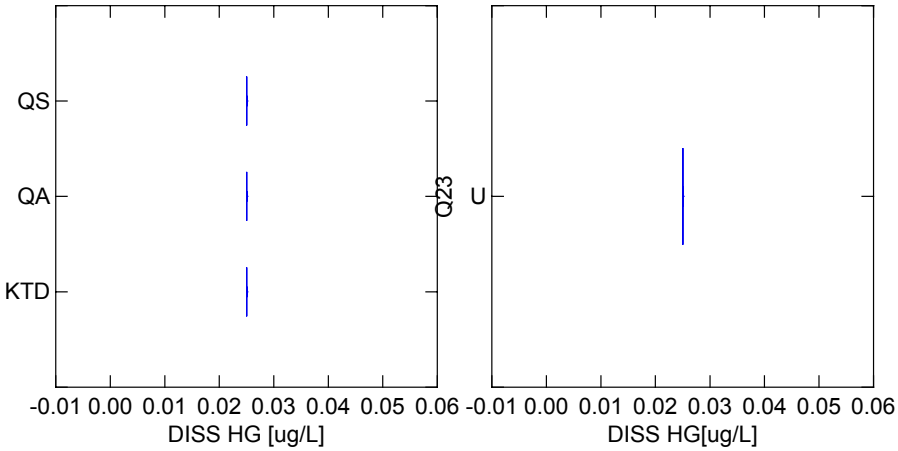
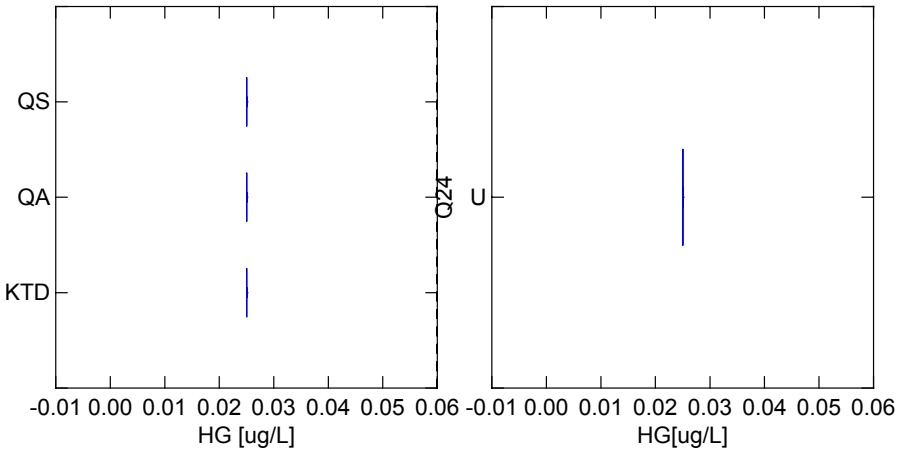
10000
15000
DISS FE [ug/L]

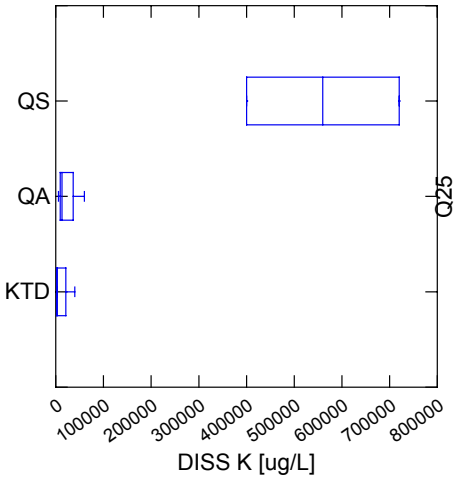

Q21
U
D
0
5000
10000
15000
DISS FE[ug/L]

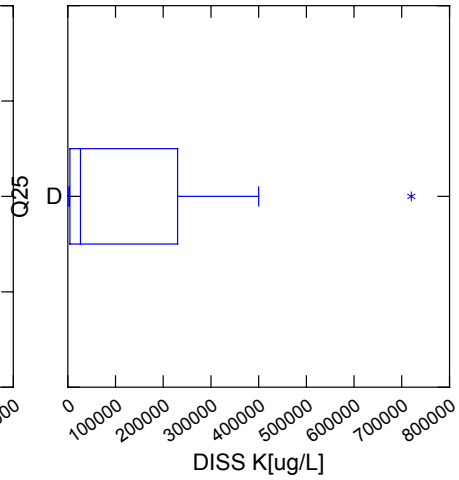

QS
QA
KTD
0
10000
20000
30000
FE [ug/L]

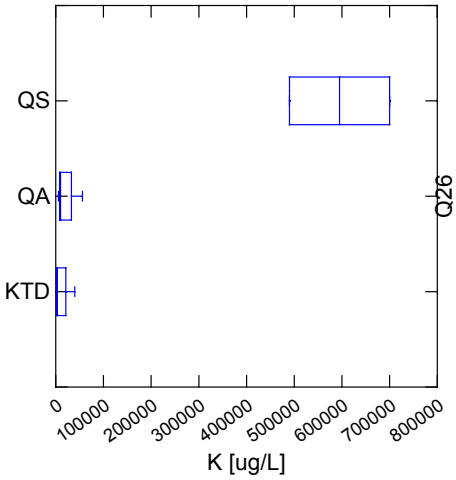

Q22
D
0
10000
20000
30000
FE[ug/L]

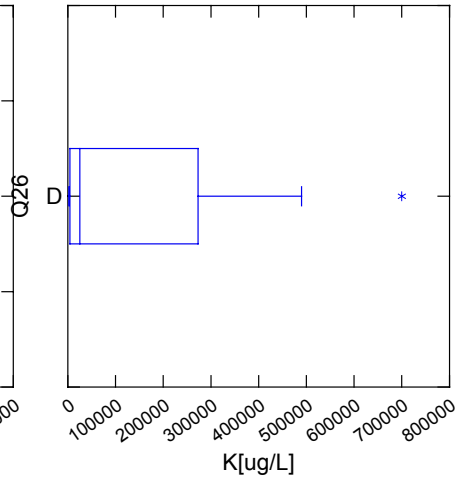

QS
QA
KTD
-0.01 0.00 0.01 0.02 0.03 0.04 0.05 0.06
DISS HG [ug/L]
Q23
U
-0.01 0.00 0.01 0.02 0.03 0.04 0.05 0.06
DISS HG[ug/L]

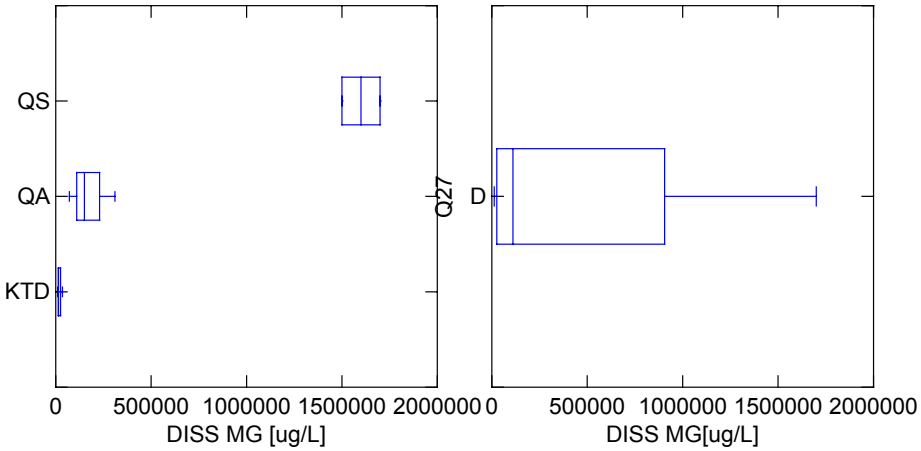

QS
QA
KTD
-0.01 0.00 0.01 0.02 0.03 0.04 0.05 0.06
HG [ug/L]
Q24
U
-0.01 0.00 0.01 0.02 0.03 0.04 0.05 0.06
HG[ug/L]

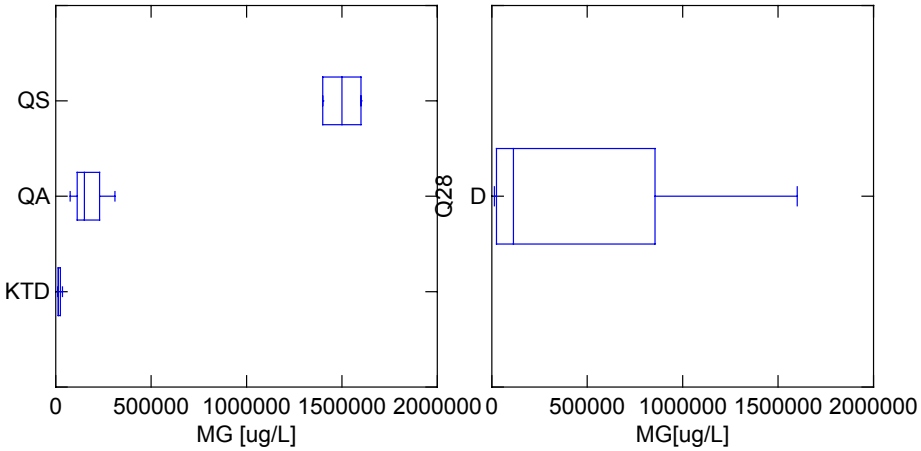

QS
QA
KTD
0
100000
200000
300000
400000
500000
600000
700000
800000
DISS K [ug/L]

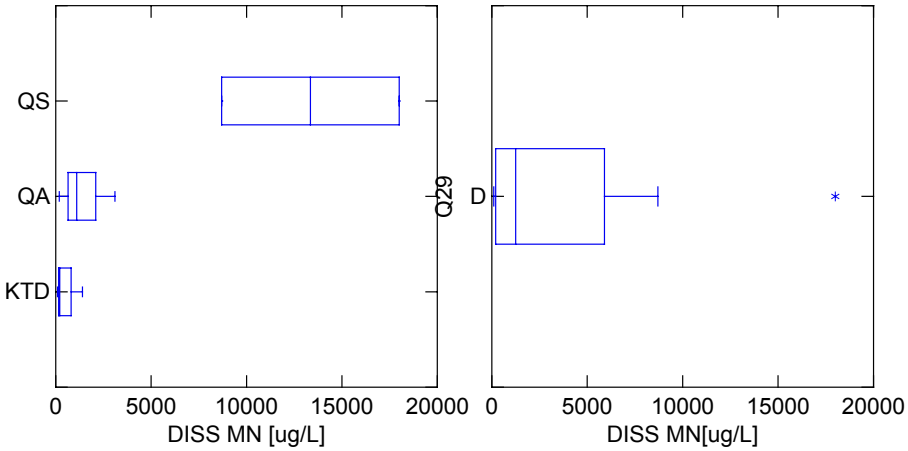

Q25
D
0
100000
200000
300000
400000
500000
600000
700000
800000
DISS K[ug/L]

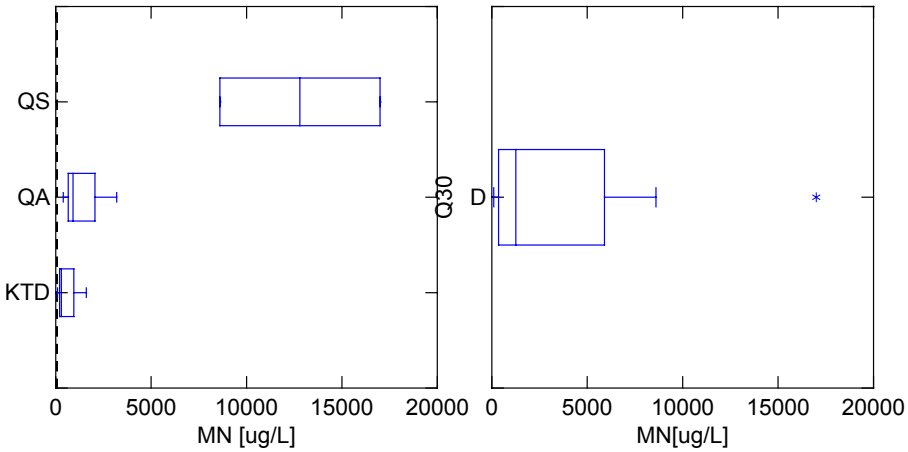

QS
QA
KTD
0
100000
200000
300000
400000
500000
600000
700000
800000
K [ug/L]

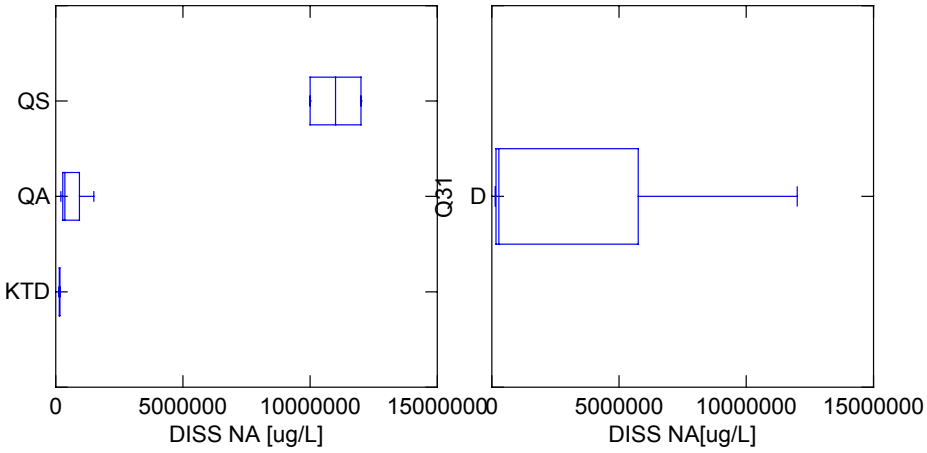

Q26
D
0
100000
200000
300000
400000
500000
600000
700000
800000
K[ug/L]

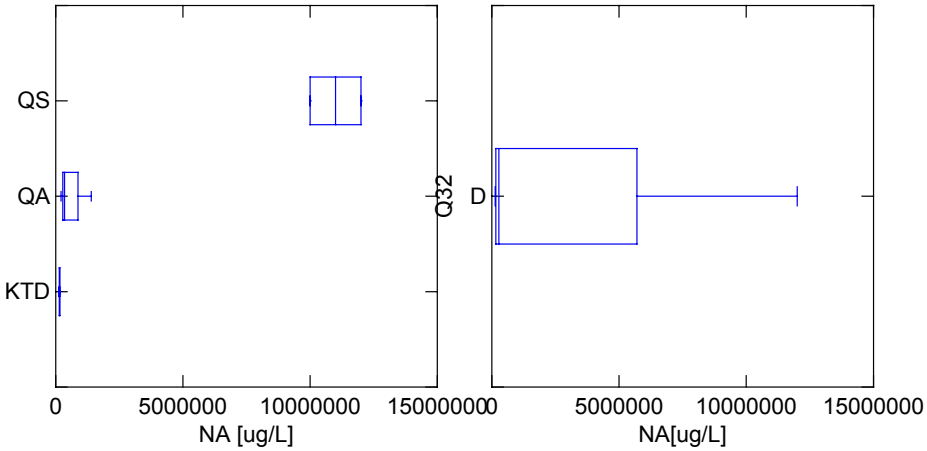

QS
QA
KTD
0
500000
1000000
1500000
2000000
DISS MG [ug/L]
Q27
D
0
500000
1000000
1500000
2000000
DISS MG[ug/L]

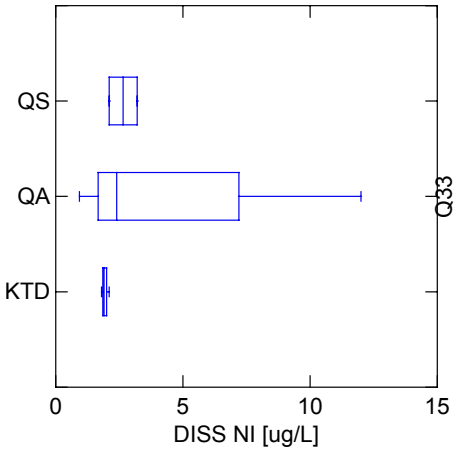

QS
QA
KTD
0
500000
1000000
1500000
2000000
MG [ug/L]
Q28
D
0
500000
1000000
1500000
2000000
MG[ug/L]

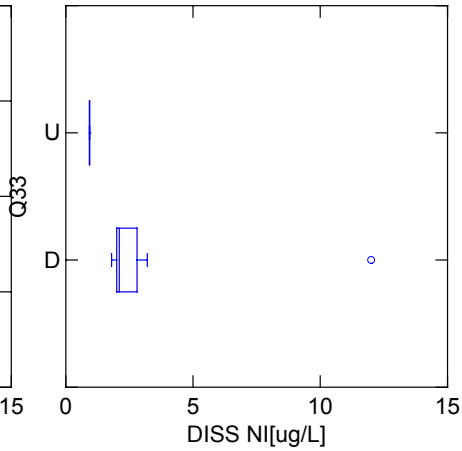

QS
QA
KTD
0
5000
10000
15000
20000
DISS MN [ug/L]
Q29
D
0
5000
10000
15000
20000
DISS MN[ug/L]

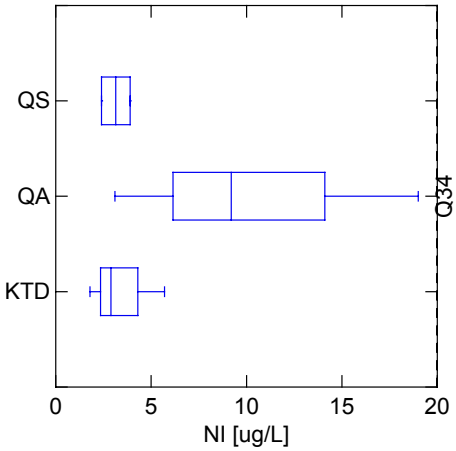

QS
QA
KTD
0
5000
10000
15000
20000
MN [ug/L]
Q30
D
0
5000
10000
15000
20000
MN[ug/L]

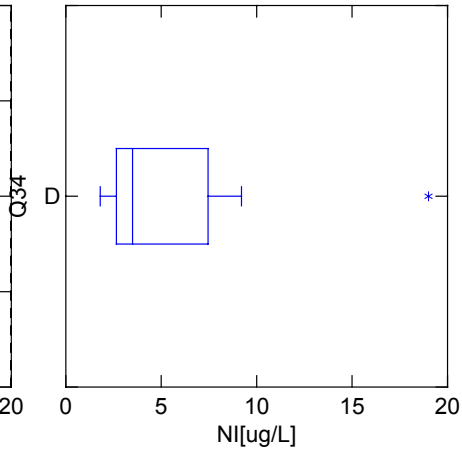

QS
QA
KTD
0
5000000
10000000
15000000
DISS NA [ug/L]
Q31
D
5000000
10000000
15000000
DISS NA[ug/L]

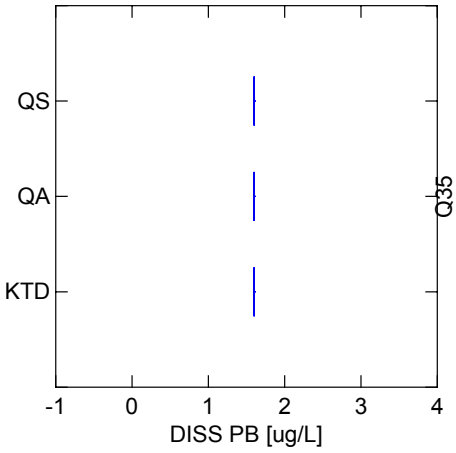

QS
QA
KTD
0
5000000
10000000
15000000
NA [ug/L]
Q32
D
5000000
10000000
15000000
NA[ug/L]

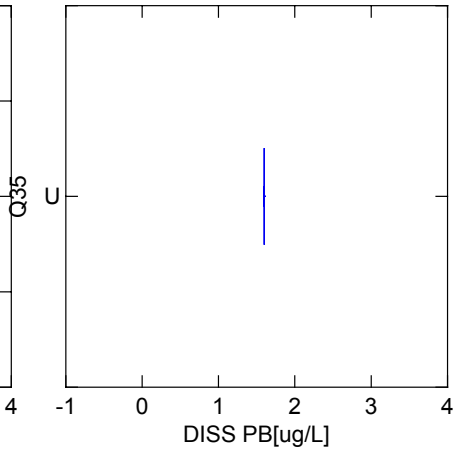

QS
QA
KTD
0
5
10
15
DISS NI [ug/L]

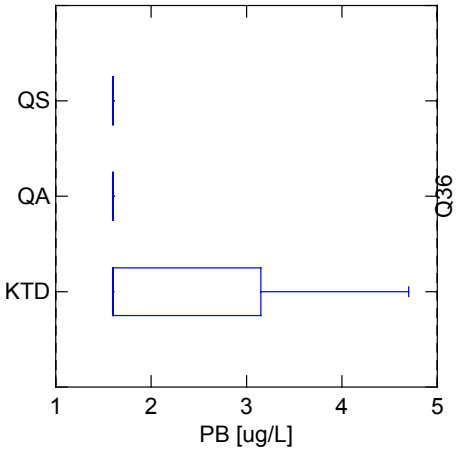

Q33
U
D
0
5
10
15
DISS NI[ug/L]

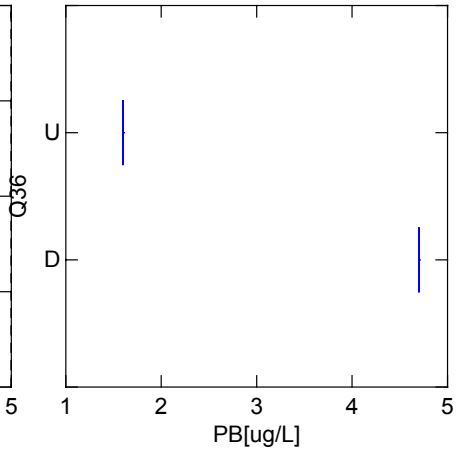

QS
QA
KTD
0
5
10
15
20
NI [ug/L]

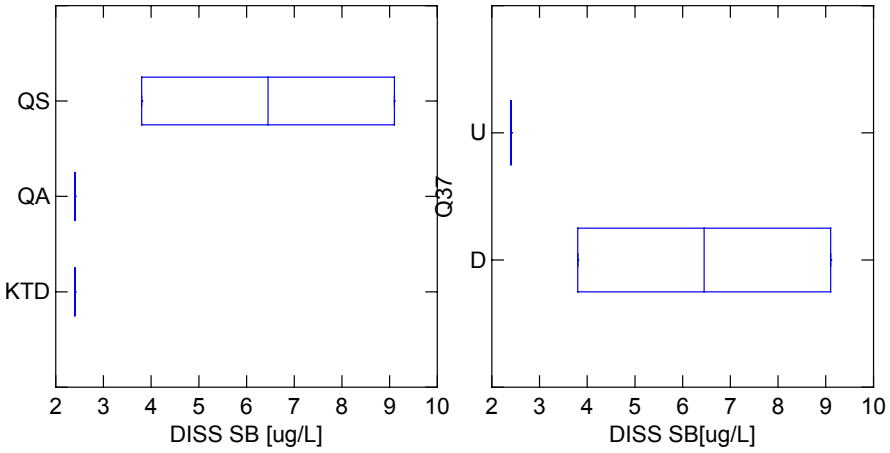

Q34
D
0
5
10
15
20
NI[ug/L]

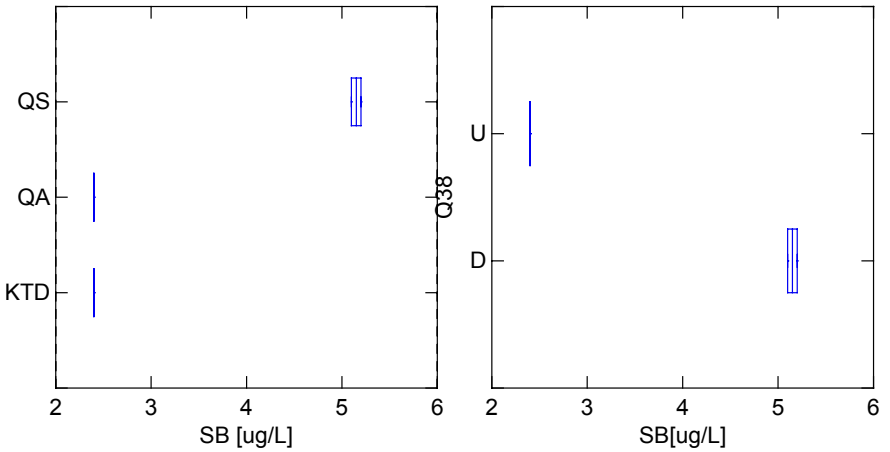

QS
QA
KTD
-1
0
1
2
3
4
DISS PB [ug/L]

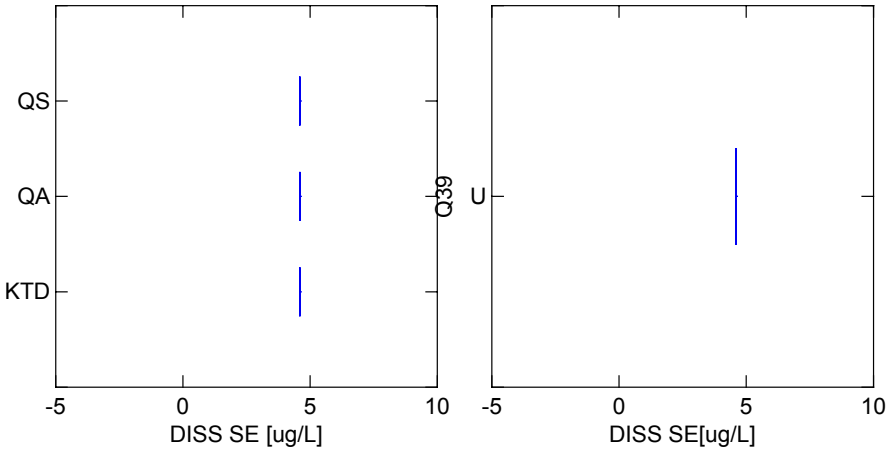

Q35
U
-1
0
1
2
3
4
DISS PB[ug/L]

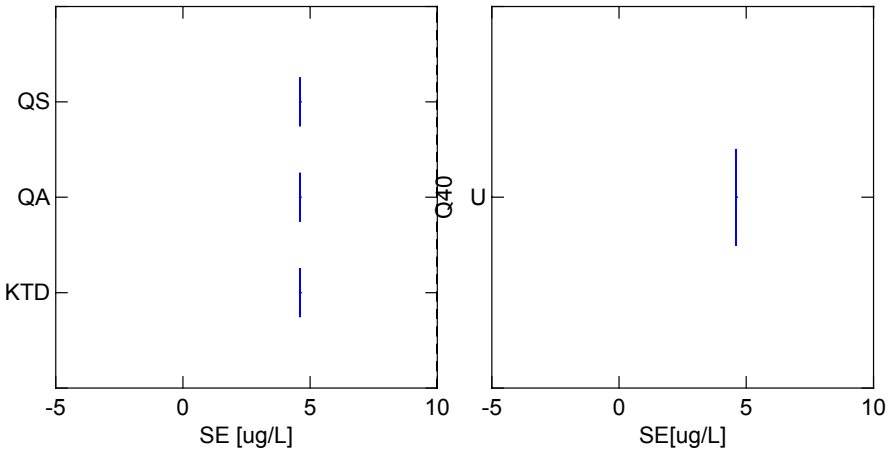

QS
QA
KTD
1
2
3
4
5
PB [ug/L]

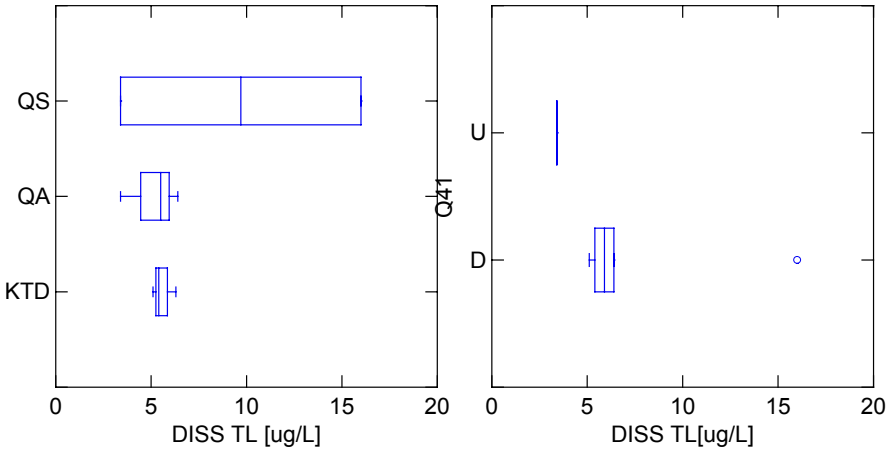

Q36
U
D
1
2
3
4
5
PB[ug/L]

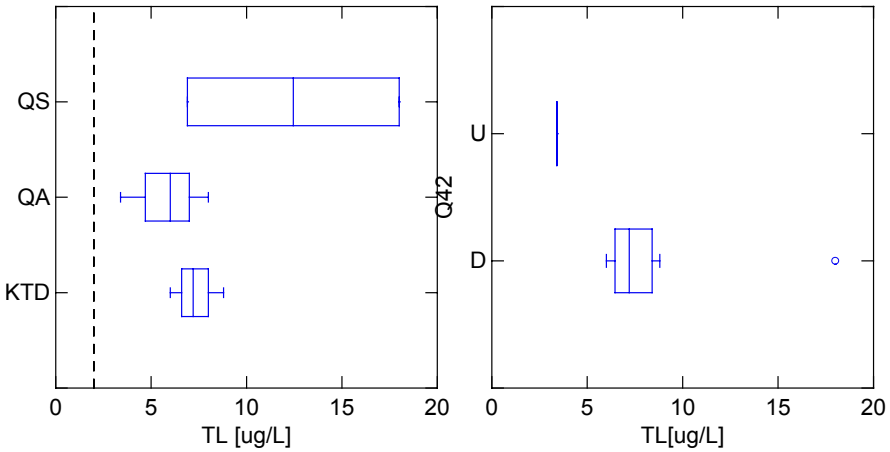

QS
QA
KTD
2 3 4 5 6 7 8 9 10
DISS SB [ug/L]
Q37
U
D
2 3 4 5 6 7 8 9 10
DISS SB[ug/L]

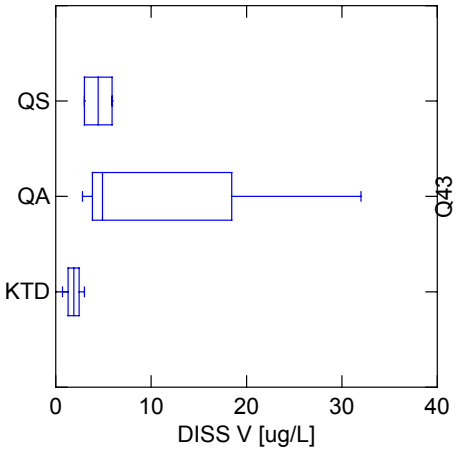

QS
QA
KTD
2 3 4 5 6
SB [ug/L]
Q38
U
D
2 3 4 5 6
SB[ug/L]

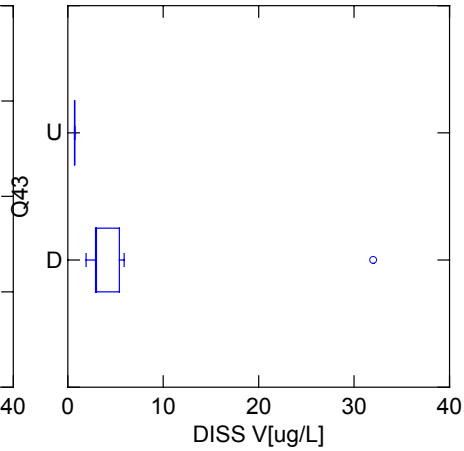

QS
QA
KTD
-5
0
5
10
DISS SE [ug/L]
Q39
U
-5
0
5
10
DISS SE[ug/L]

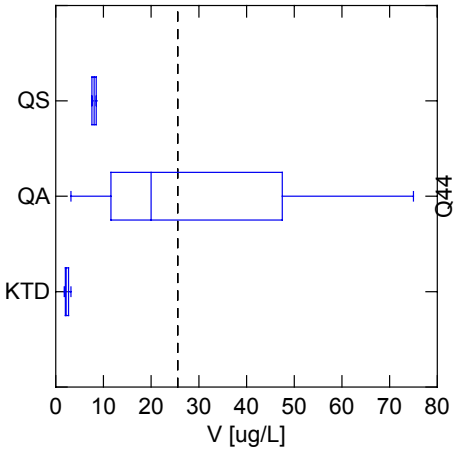

QS
QA
KTD
-5
0
5
10
SE [ug/L]
Q40
U
-5
0
5
10
SE[ug/L]

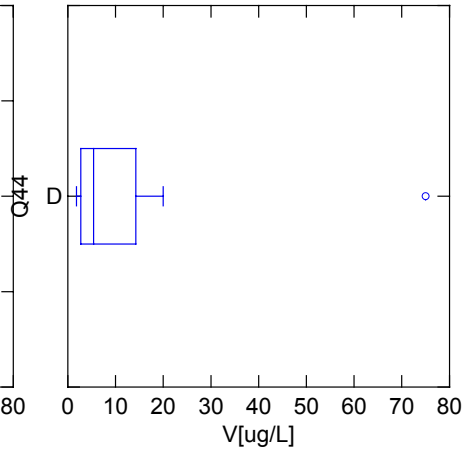

QS
QA
KTD
0
5
10
15
20
DISS TL [ug/L]
Q41
U
D
0
5
10
15
20
DISS TL[ug/L]

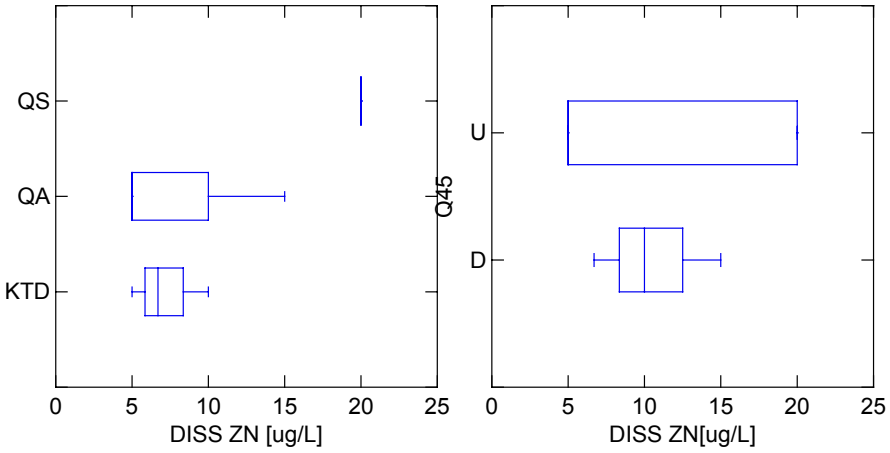

QS
QA
KTD
0
5
10
15
20
TL [ug/L]
Q42
U
D
0
5
10
15
20
TL[ug/L]

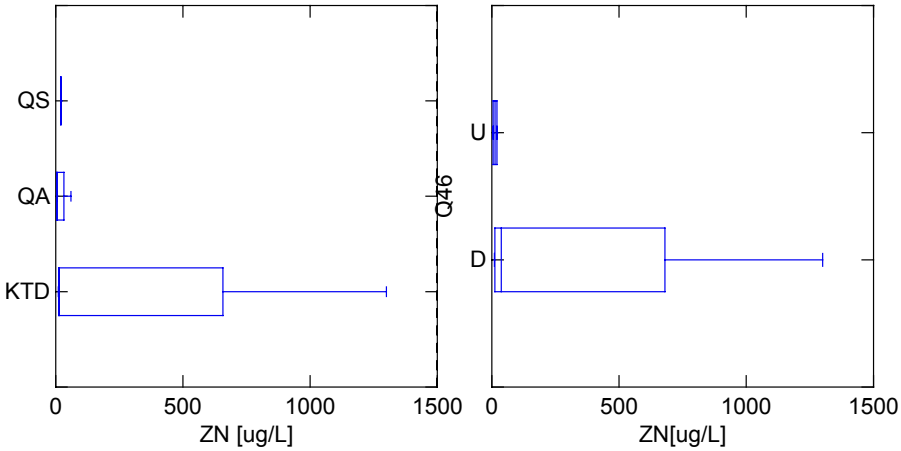

QS
QA
KTD
0
10
20
30
40
DISS V [ug/L]


Q43
U
D
0
10
20
30
40
DISS V[ug/L]

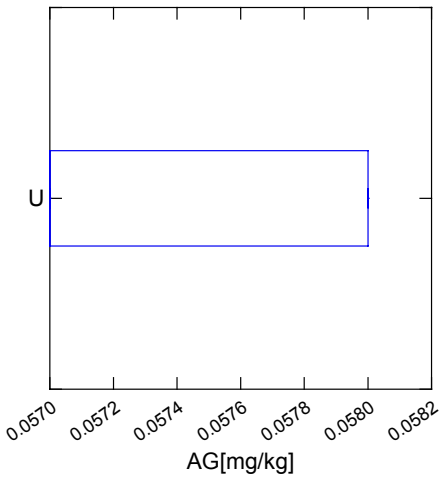

QS
QA
KTD
0
10
20
30
40
50
60
70
80
V [ug/L]

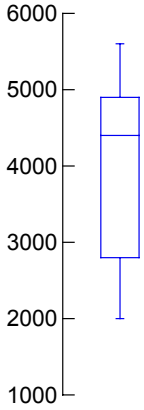

Q44
D
0
10
20
30
40
50
60
70
80
V[ug/L]

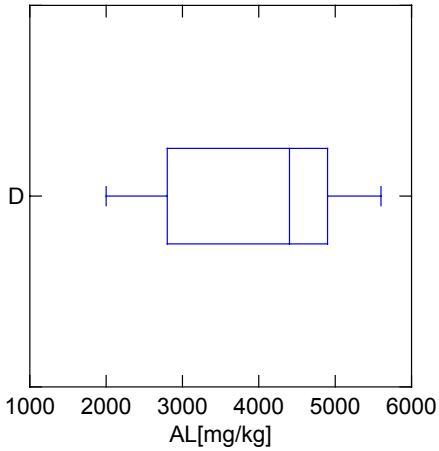

QS
QA
KTD
0
5
10
15
20
25
DISS ZN [ug/L]
Q45
U
D
0
5
10
15
20
25
DISS ZN[ug/L]

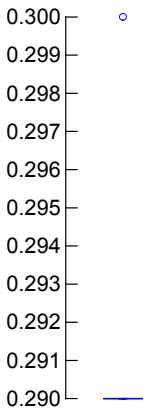

QS
QA
KTD
0
500
1000
1500
ZN [ug/L]
Q46
U
D
0
500
1000
1500
ZN[ug/L]

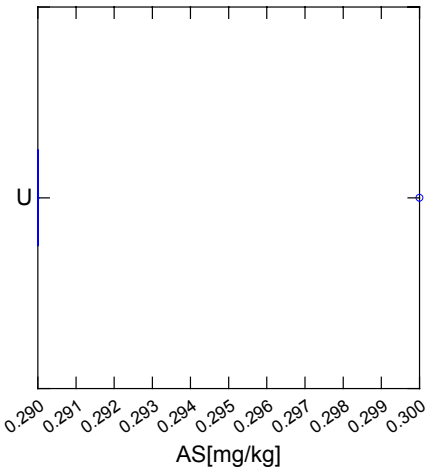
0.0582
0.0580
0.0578
0.0576
0.0574
0.0572
0.0570

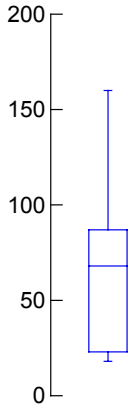

U
0.0570
0.0572
0.0574
0.0576
0.0578
0.0580
0.0582
AG[mg/kg]

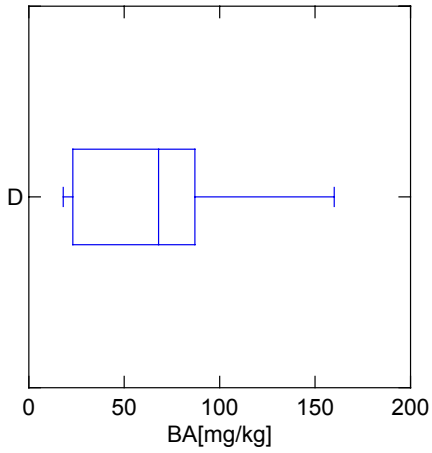

6000
5000
4000
3000
2000
1000

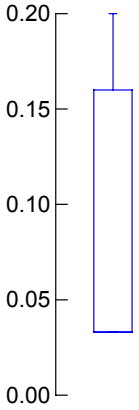

D
1000
2000
3000
4000
5000
6000
AL[mg/kg]

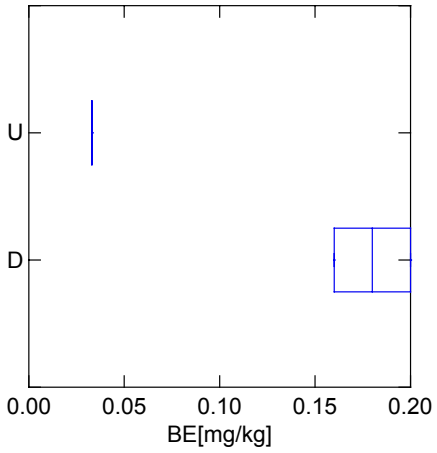

0.300
0.299
0.298
0.297
0.296
0.295
0.294
0.293
0.292
0.291
0.290

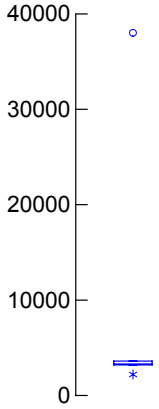

U
0.290
0.291
0.292
0.293
0.294
0.295
0.296
0.297
0.298
0.299
0.300
AS[mg/kg]

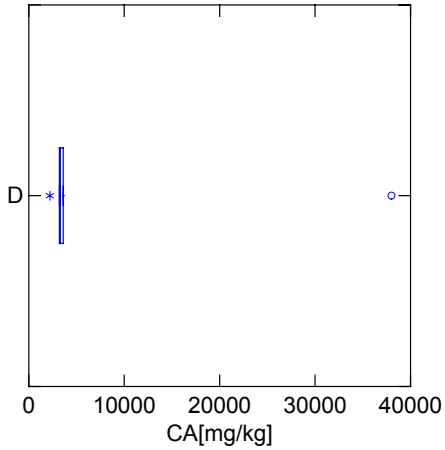

200
150
100
50
0

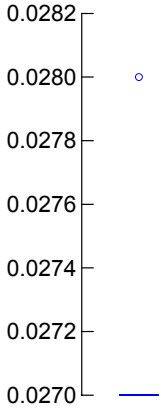

D
0
50
100
150
200
BA[mg/kg]

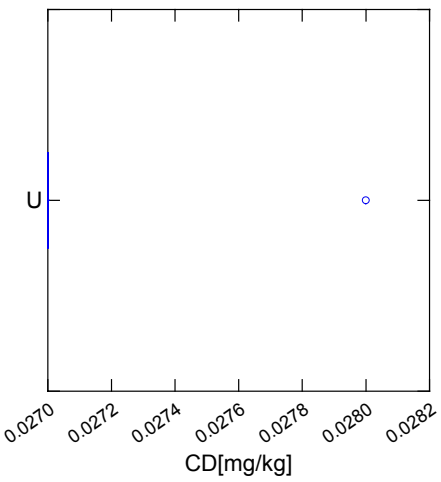

0.20
0.15
0.10
0.05
0.00

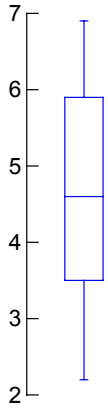

U
D
0.00
0.05
0.10
0.15
0.20
BE[mg/kg]

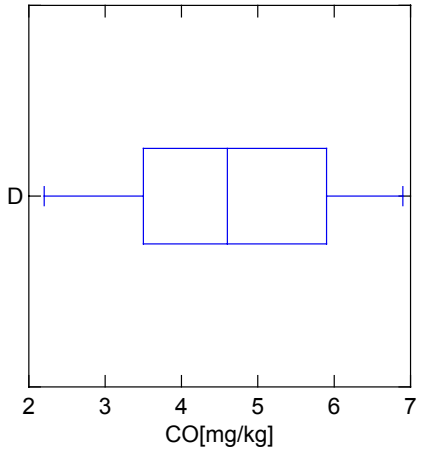

40000
30000
20000
10000
0

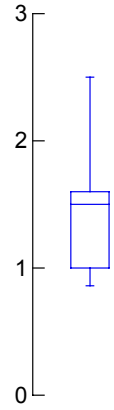

D
0
10000
20000
30000
40000
CA[mg/kg]

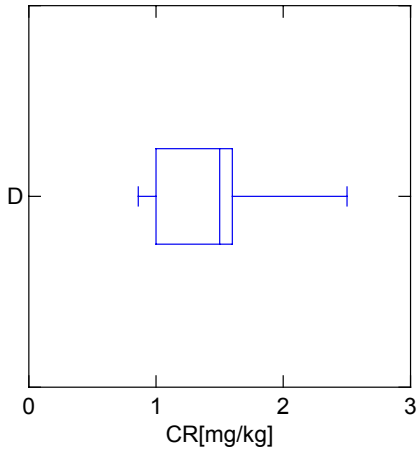

0.0282
0.0280
0.0278
0.0276
0.0274
0.0272
0.0270

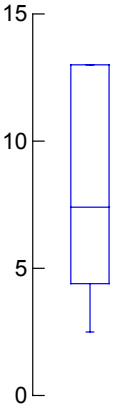

U
0.0270
0.0272
0.0274
0.0276
0.0278
0.0280
0.0282
CD[mg/kg]

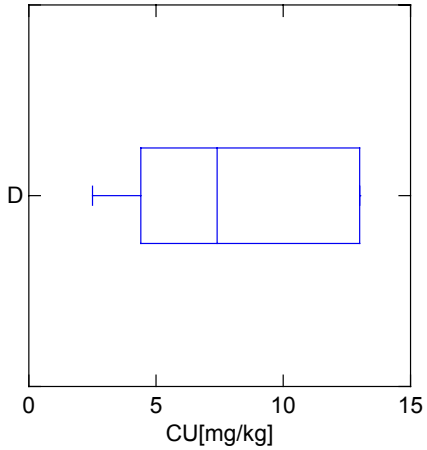

7
6
5
4
3
2

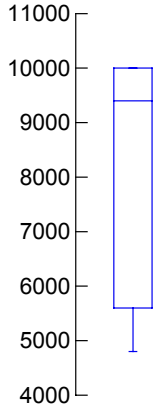

D
2
3
4
5
6
7
CO[mg/kg]

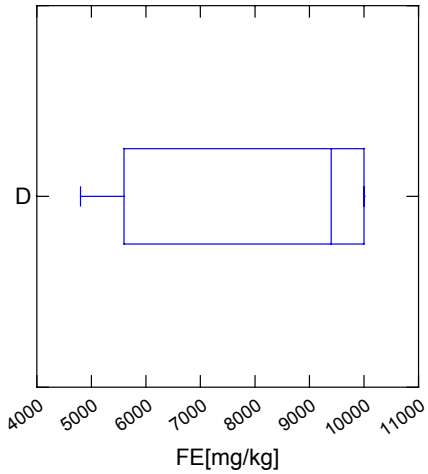

3
2
1
0

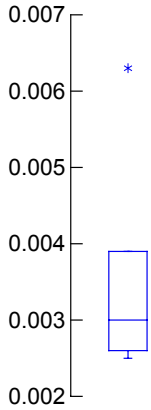

D
0
1
2
3
CR[mg/kg]

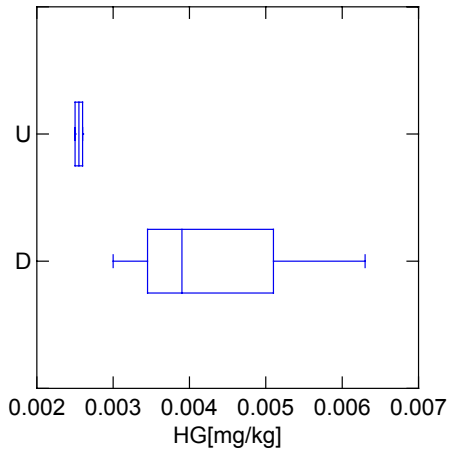

15
10
5
0

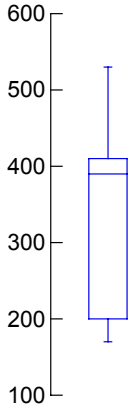

D
0
5
10
15
CU[mg/kg]

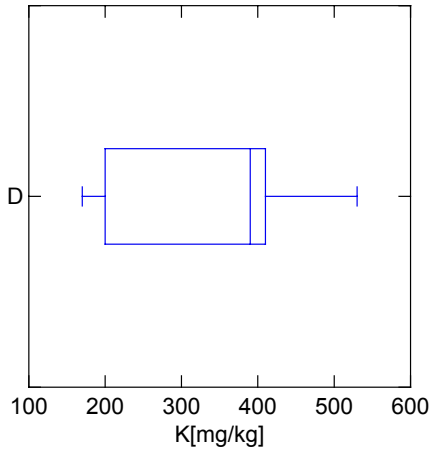

11000
10000
9000
8000
7000
6000
5000
4000

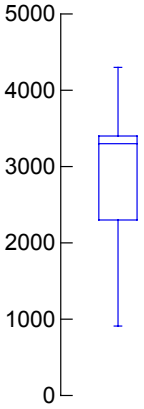

D
4000
5000
6000
7000
8000
9000
10000
11000
FE[mg/kg]

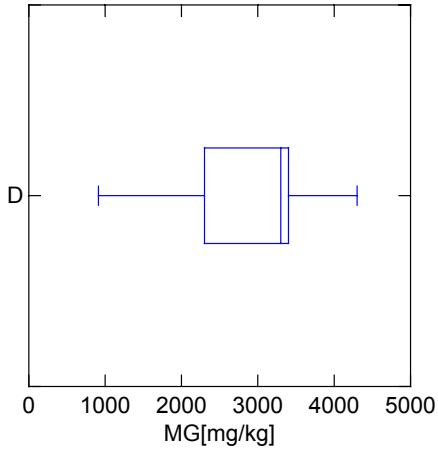

0.007
0.006
0.005
0.004
0.003
0.002

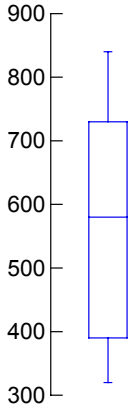

U
D
0.002
0.003
0.004
0.005
0.006
0.007
HG[mg/kg]

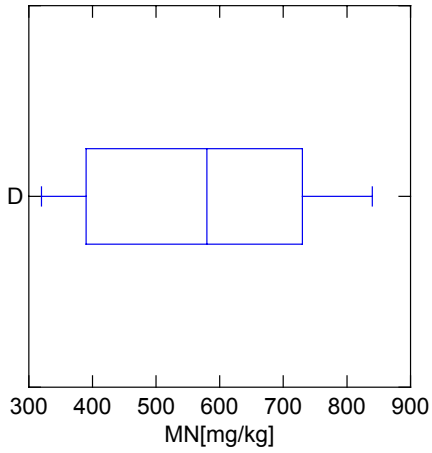

600
500
400
300
200
100

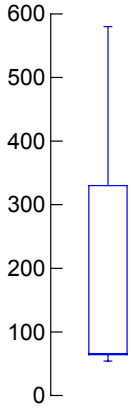

D
100
200
300
400
500
600
K[mg/kg]

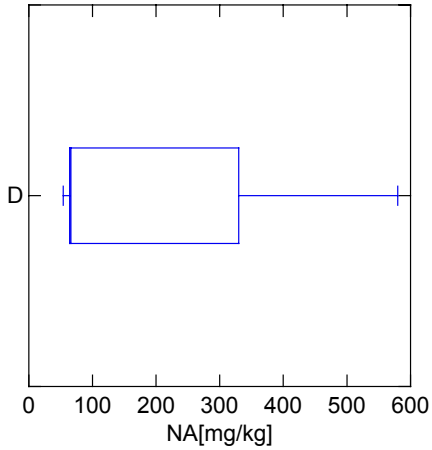

5000
4000
3000
2000
1000
0

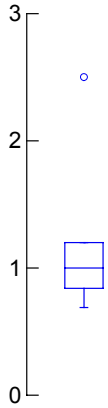

D
0
1000
2000
3000
4000
5000
MG[mg/kg]

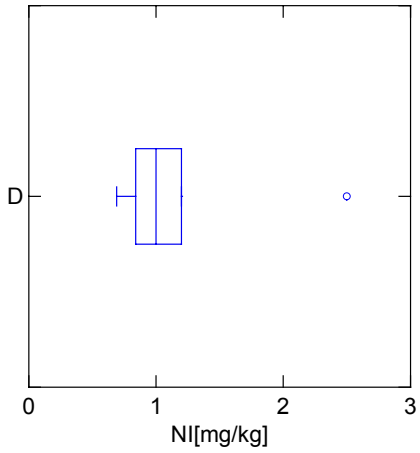

900
800
700
600
500
400
300

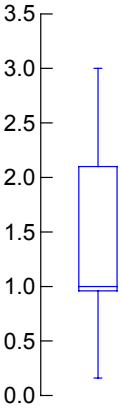

D
300 400 500 600 700 800 900
MN[mg/kg]

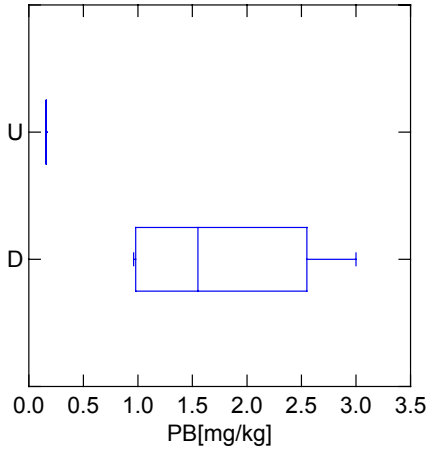

600
500
400
300
200
100
0

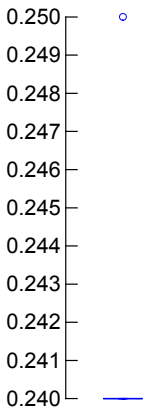

D
0 100 200 300 400 500 600
NA[mg/kg]

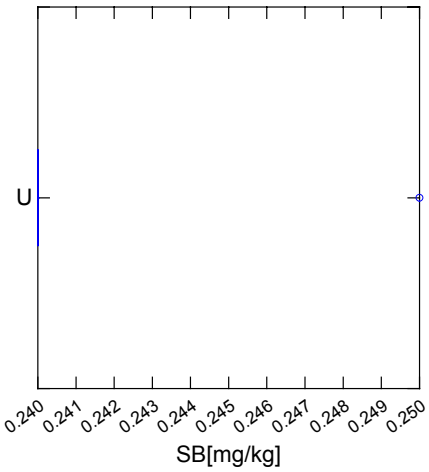

3
2
1
0

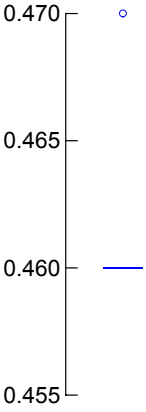

D
0
1
2
3
NI[mg/kg]

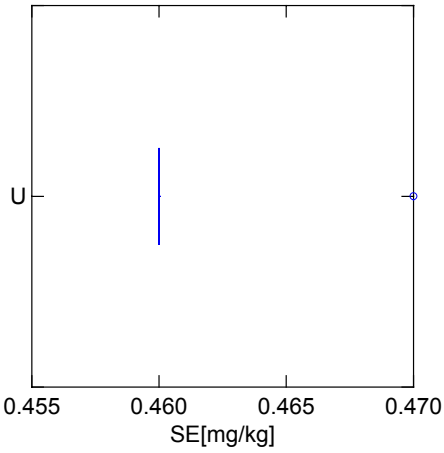

3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

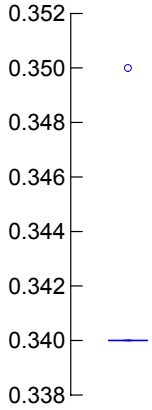

U
D
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
PB[mg/kg]

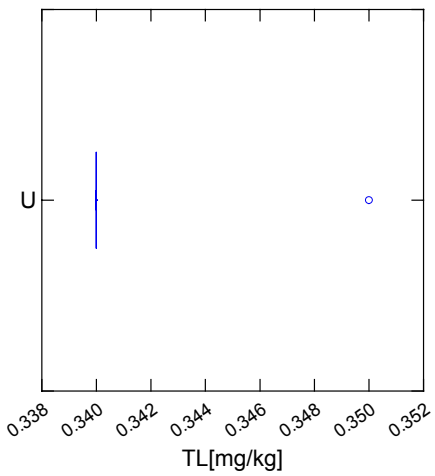

0.250
0.249
0.248
0.247
0.246
0.245
0.244
0.243
0.242
0.241
0.240

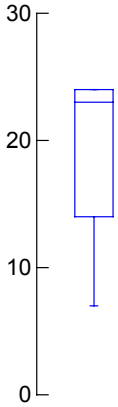

U
0.240
0.241
0.242
0.243
0.244
0.245
0.246
0.247
0.248
0.249
0.250
SB[mg/kg]

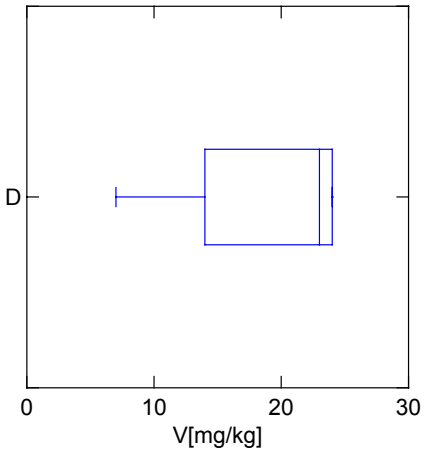

0.470
0.465
0.460
0.455

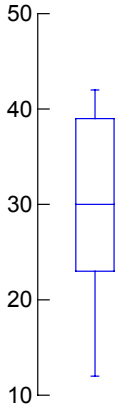

U
0.455
0.460
0.465
0.470
SE[mg/kg]

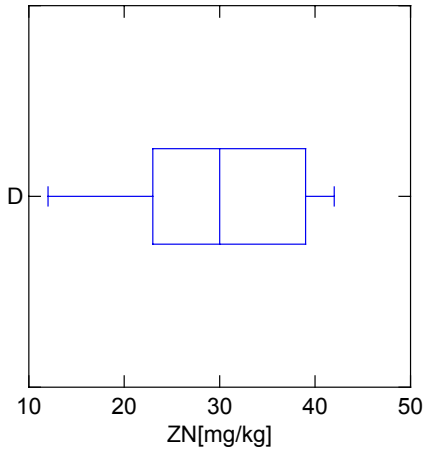

0.352
0.350
0.348
0.346
0.344
0.342
0.340
0.338

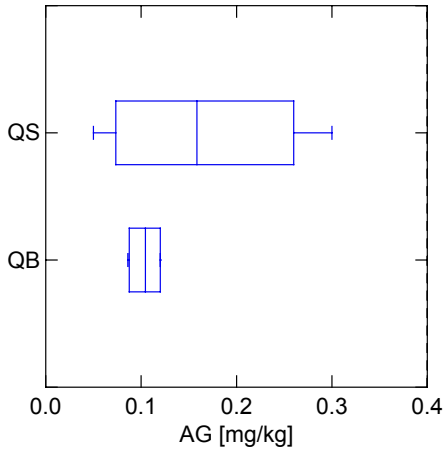

U
0.338
0.340
0.342
0.344
0.346
0.348
0.350
0.352
TL[mg/kg]

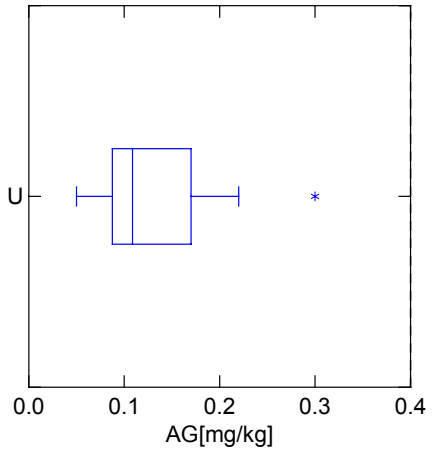

30
20
10
0

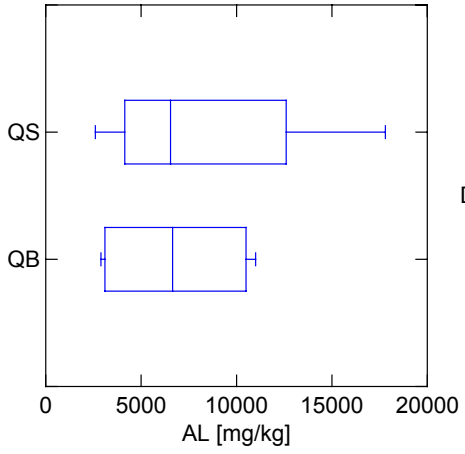

D
0
10
20
30
V[mg/kg]

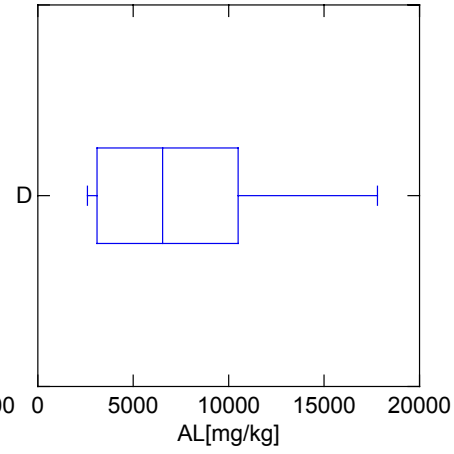

50
40
30
20
10

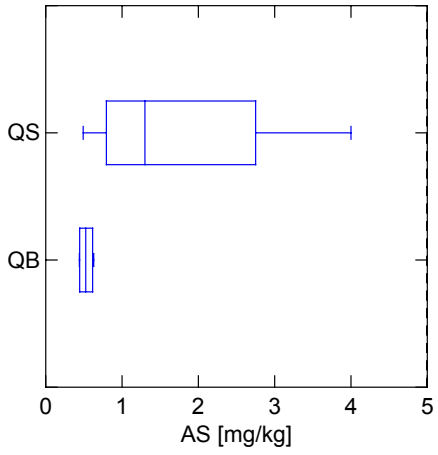

D
10
20
30
40
50
ZN[mg/kg]

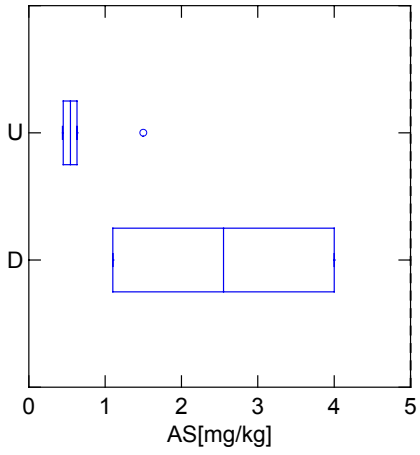

QS
QB
0.0
0.1
0.2
0.3
0.4
AG [mg/kg]

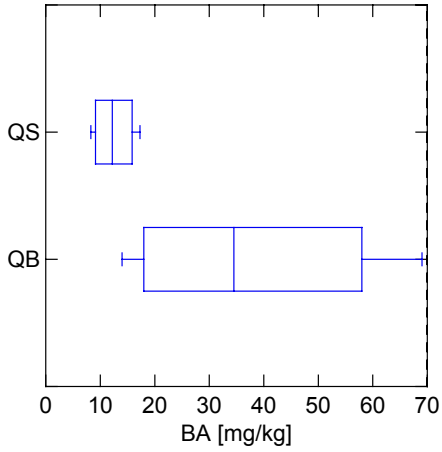

U
0.0
0.1
0.2
0.3
0.4
AG[mg/kg]

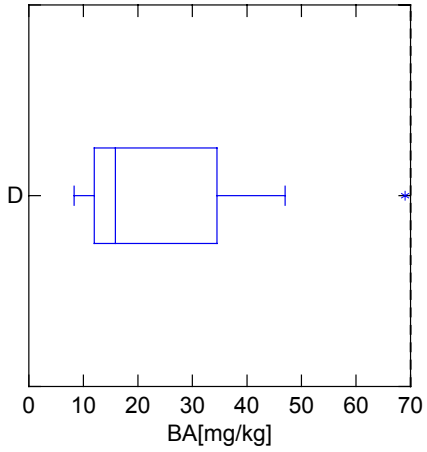

QS
QB
0
5000
10000
15000
20000
AL [mg/kg]

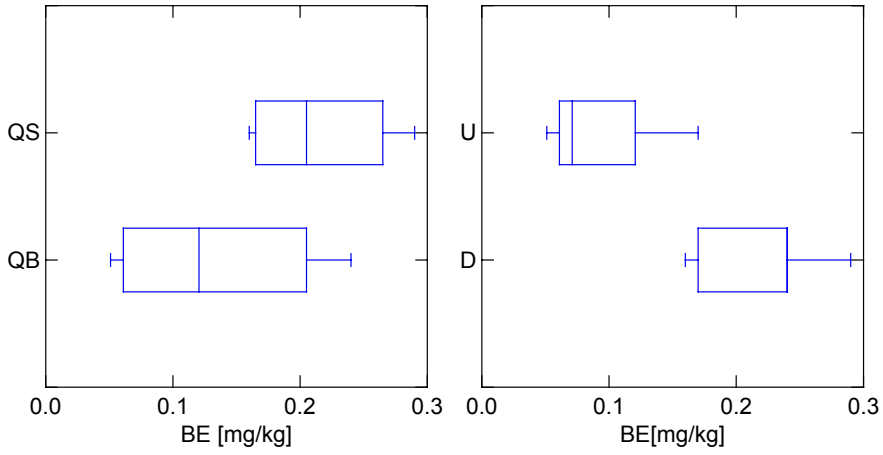

D
0
5000
10000
15000
20000
AL[mg/kg]

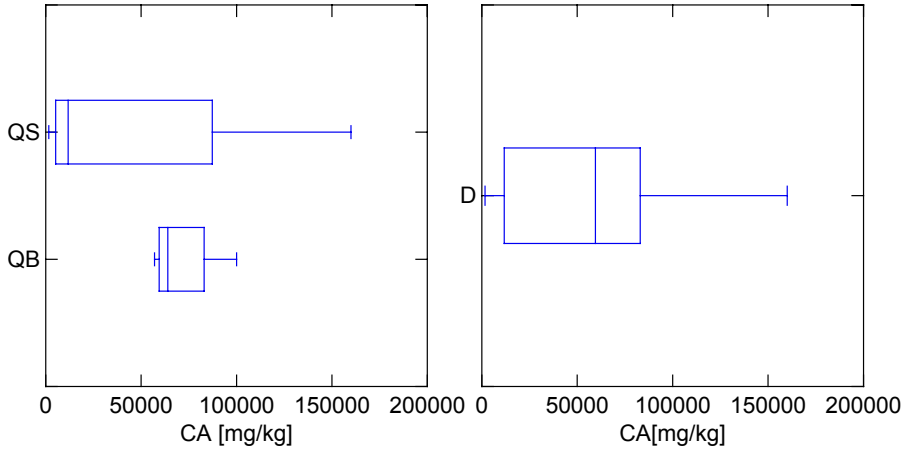

QS
QB
0
1
2
3
4
5
AS [mg/kg]

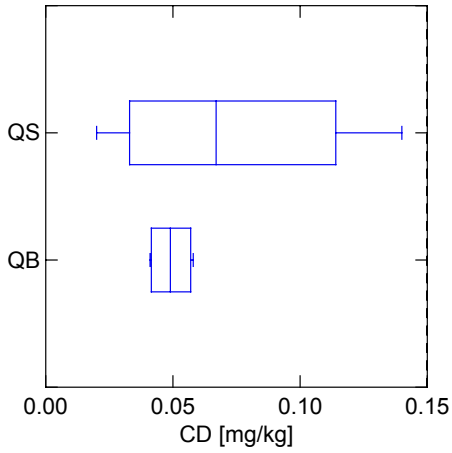

U
D
0
1
2
3
4
5
AS[mg/kg]

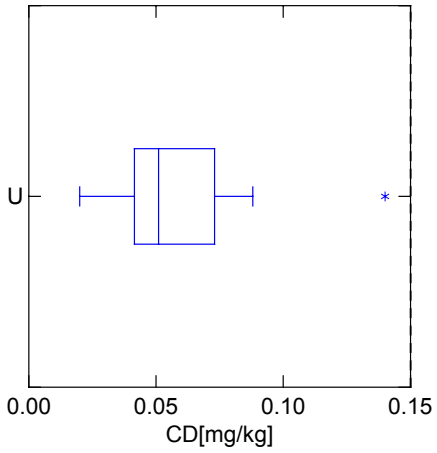

QS
QB
0
10
20
30
40
50
60
70
BA [mg/kg]

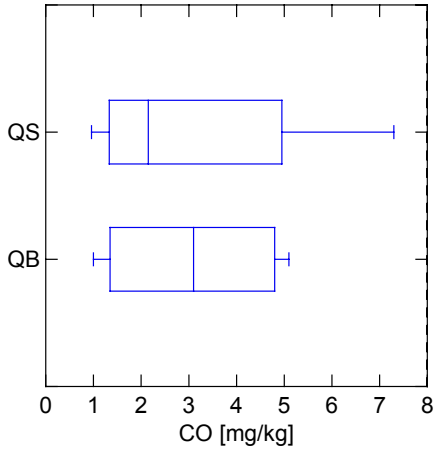

D
0
10
20
30
40
50
60
70
BA[mg/kg]

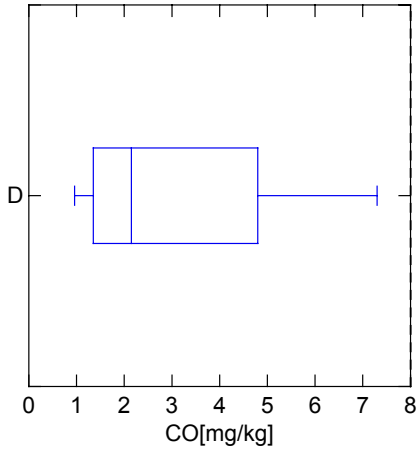

QS
QB
0.0
0.1
0.2
0.3
BE [mg/kg]
U
D
0.0
0.1
0.2
0.3
BE[mg/kg]

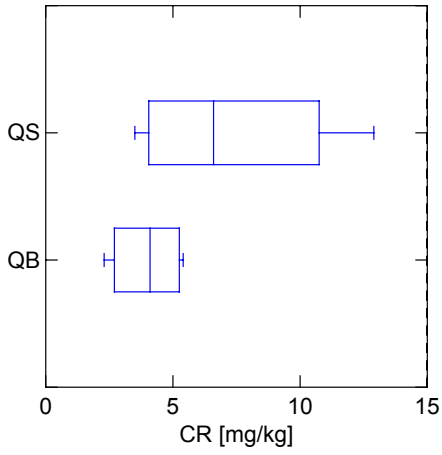

QS
QB
0
50000
100000
150000
200000
CA [mg/kg]
D
0
50000
100000
150000
200000
CA[mg/kg]

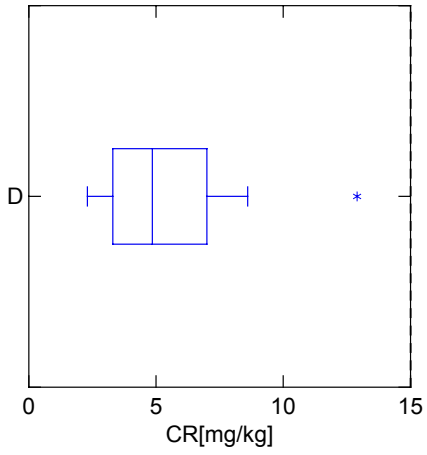

QS
QB
0.00
0.05
0.10
0.15
CD [mg/kg]

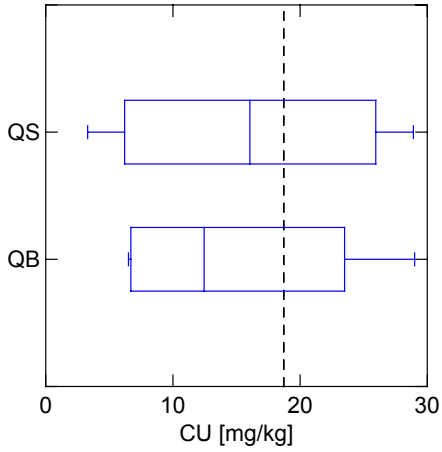

U
0.00
0.05
0.10
0.15
CD[mg/kg]

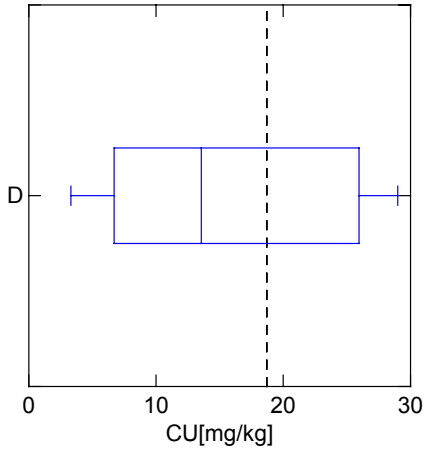

QS
QB
0
1
2
3
4
5
6
7
8
CO [mg/kg]

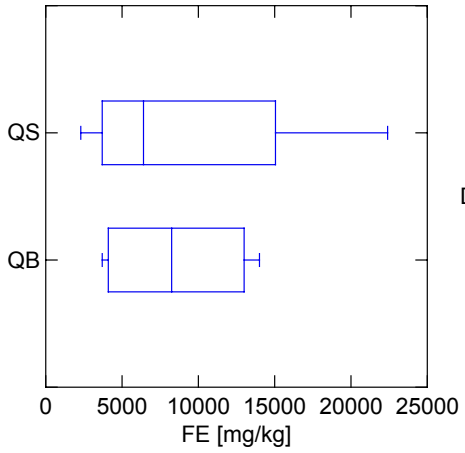

D
0
1
2
3
4
5
6
7
8
CO[mg/kg]

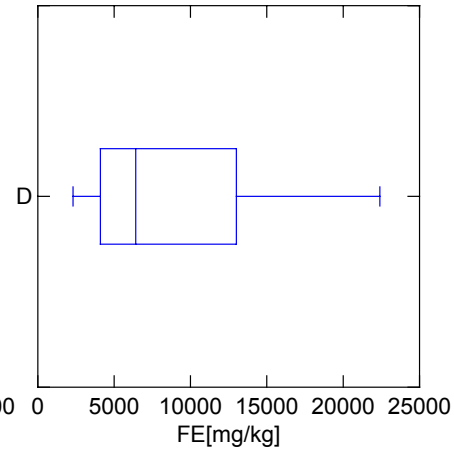

QS
QB
0
5
10
15
CR [mg/kg]

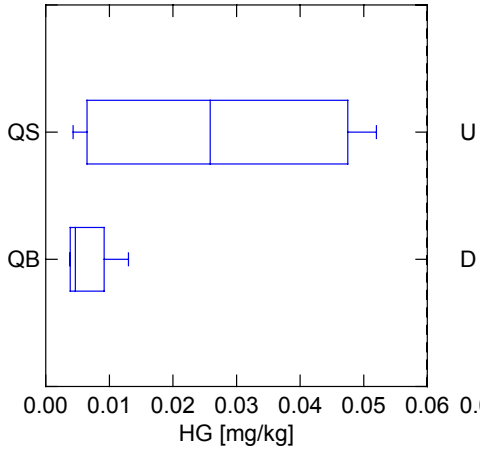

D
0
5
10
15
CR[mg/kg]

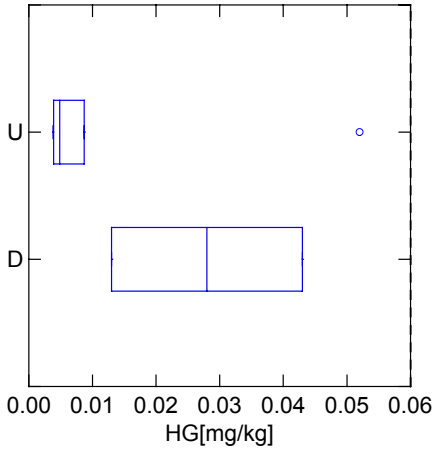

QS
QB
0
10
20
30
CU [mg/kg]

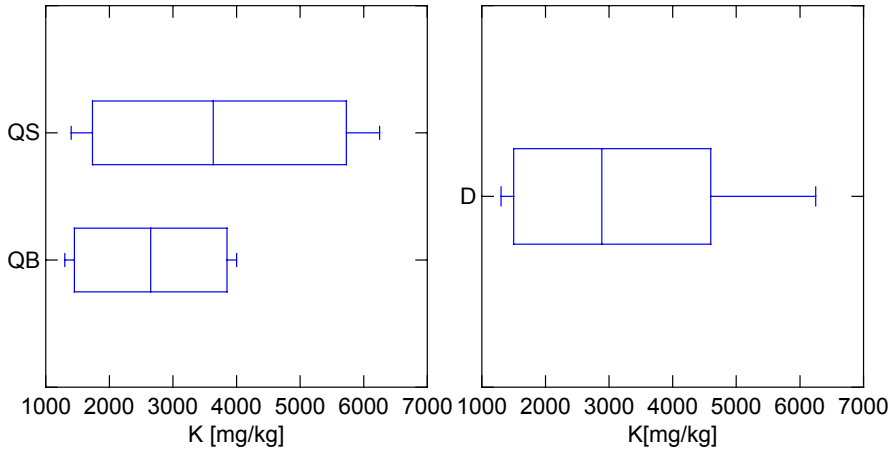

D
0
10
20
30
CU[mg/kg]

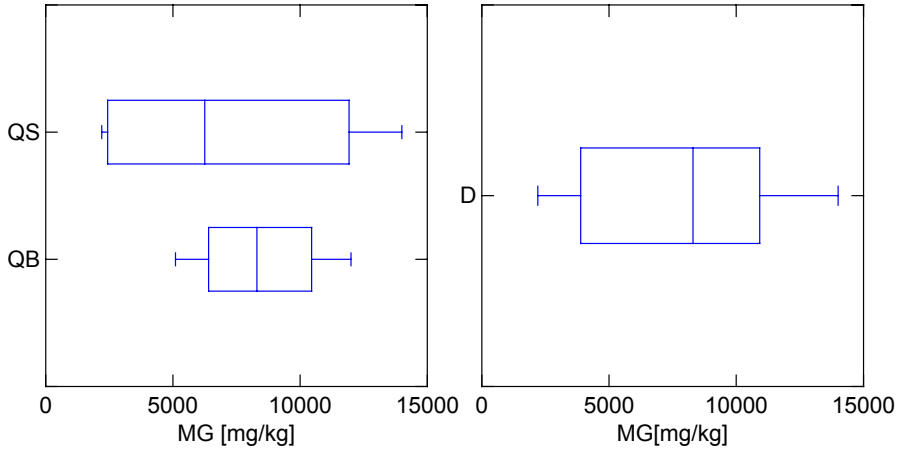

QS
QB
0
5000
10000
15000
20000
25000
FE [mg/kg]

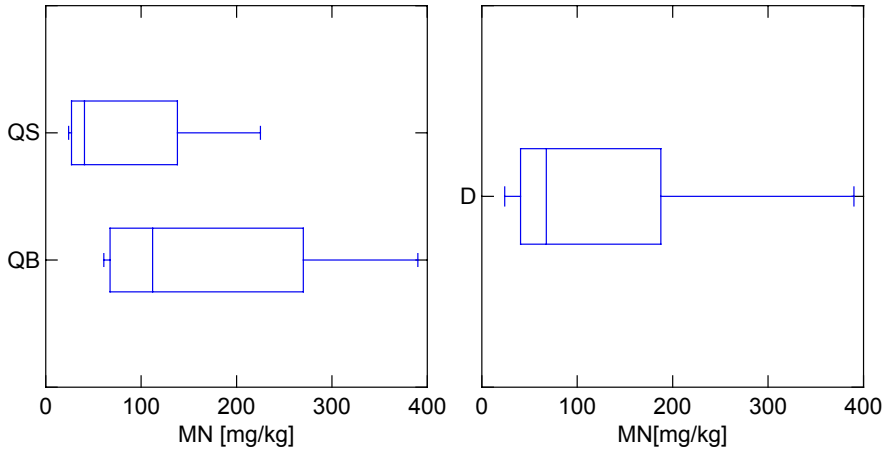

D
0
5000
10000
15000
20000
25000
FE[mg/kg]

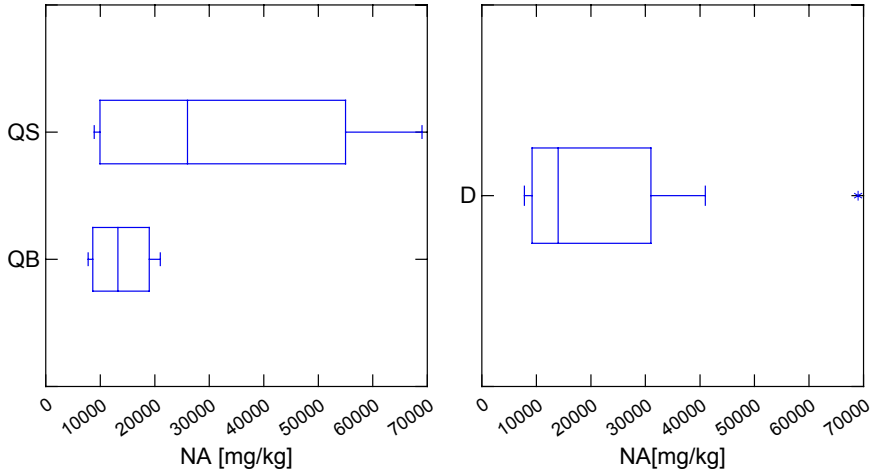

QS
QB
0.00
0.01
0.02
0.03
0.04
0.05
0.06
HG [mg/kg]

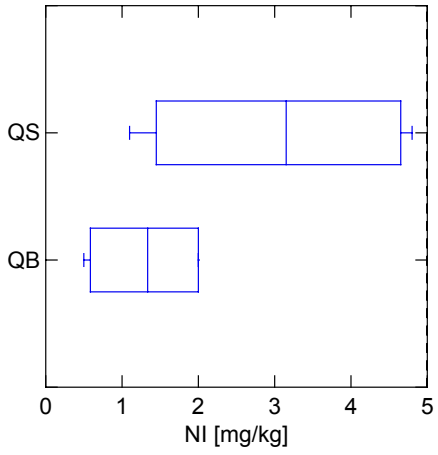

U
D
0.00
0.01
0.02
0.03
0.04
0.05
0.06
HG[mg/kg]

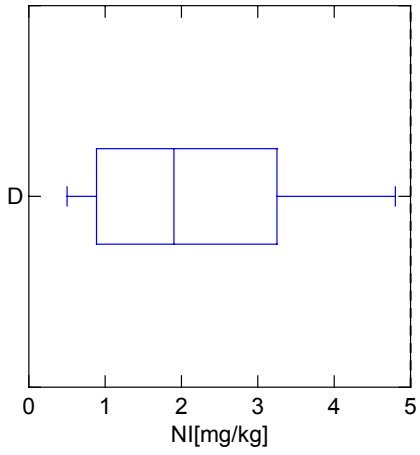

QS
QB
1000 2000 3000 4000 5000 6000 7000
K [mg/kg]
D
1000 2000 3000 4000 5000 6000 7000
K[mg/kg]

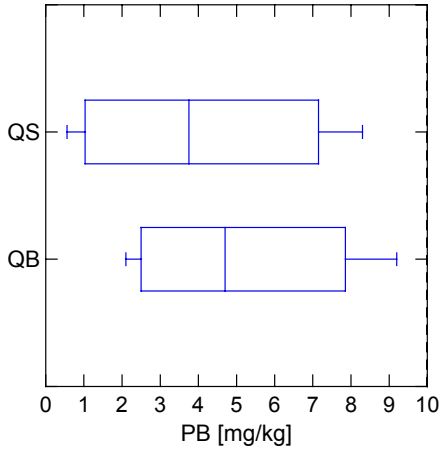

QS
QB
0 5000 10000 15000
MG [mg/kg]
D
0 5000 10000 15000
MG[mg/kg]

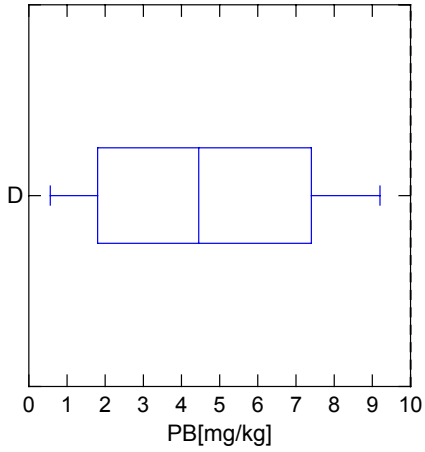

QS
QB
0
100
200
300
400
MN [mg/kg]
D
0
100
200
300
400
MN[mg/kg]

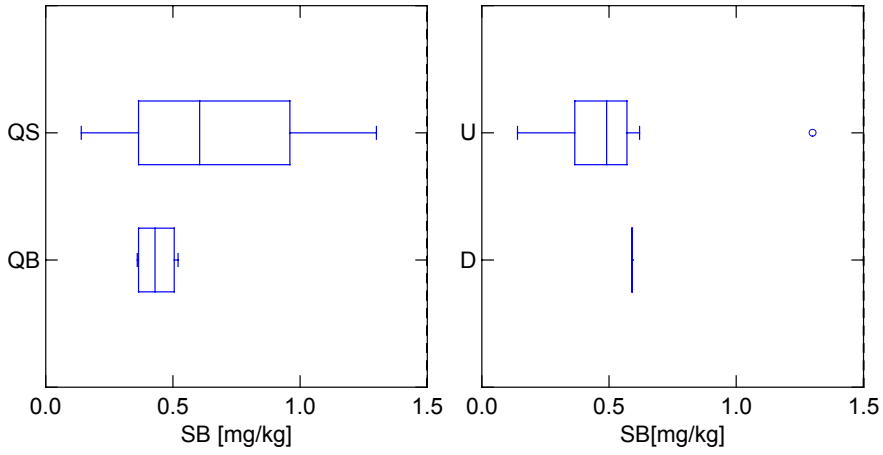

QS
QB
0
10000
20000
30000
40000
50000
60000
70000
NA [mg/kg]
D
0
10000
20000
30000
40000
50000
60000
70000
NA[mg/kg]

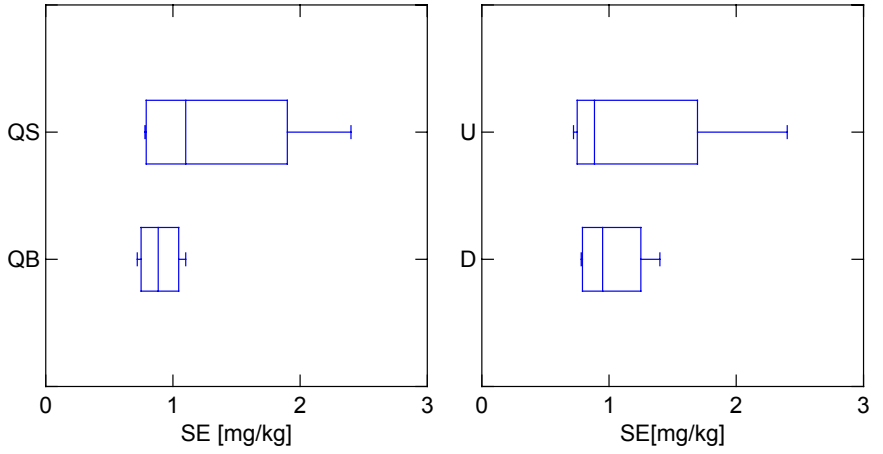

QS
QB
0
1
2
3
4
5
NI [mg/kg]

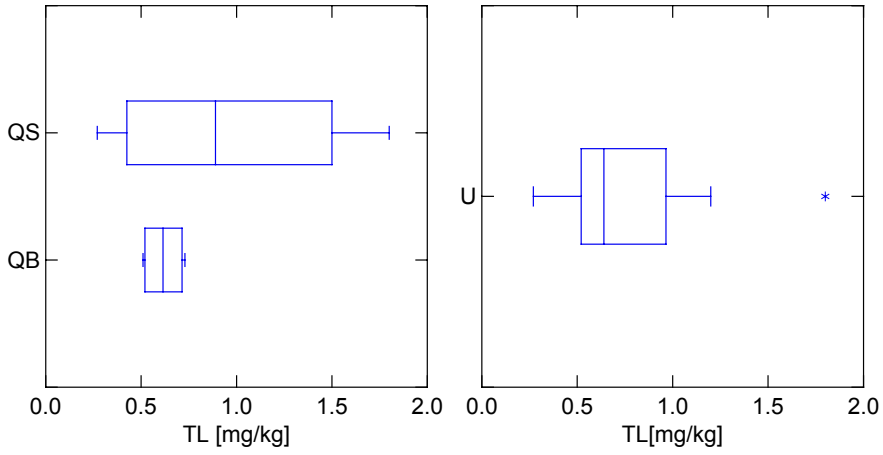

D
0
1
2
3
4
5
NI[mg/kg]

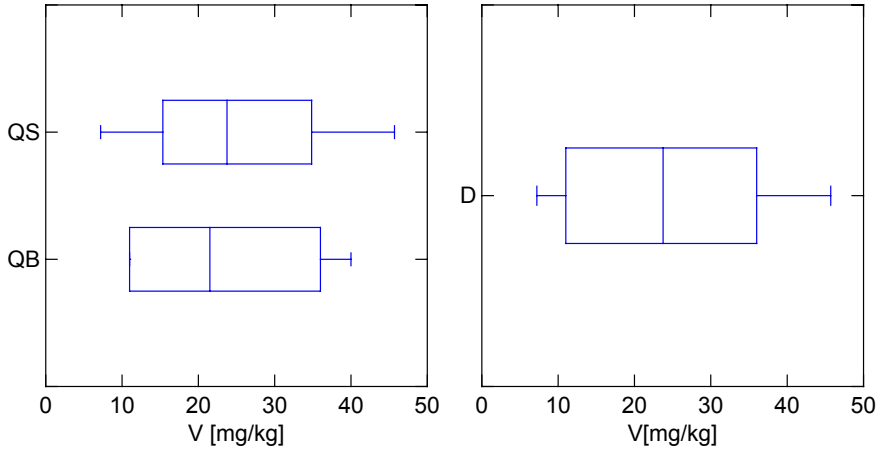

QS
QB
0
1
2
3
4
5
6
7
8
9
10
PB [mg/kg]

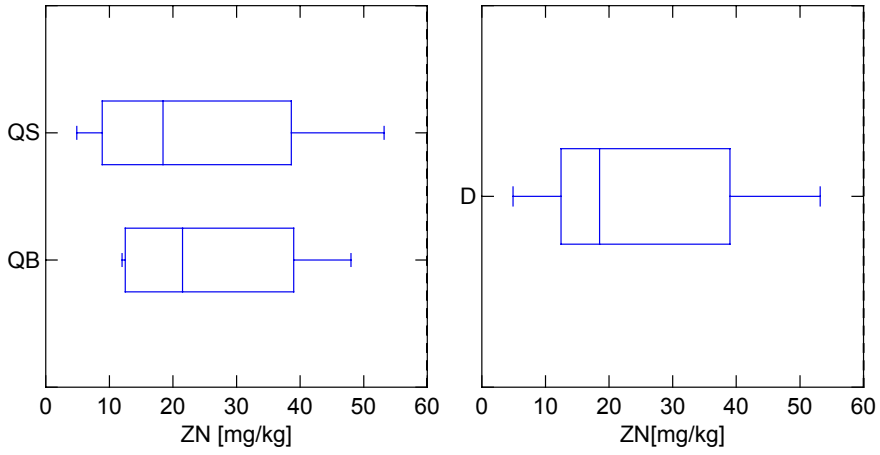

D
0
1
2
3
4
5
6
7
8
9
10
PB[mg/kg]

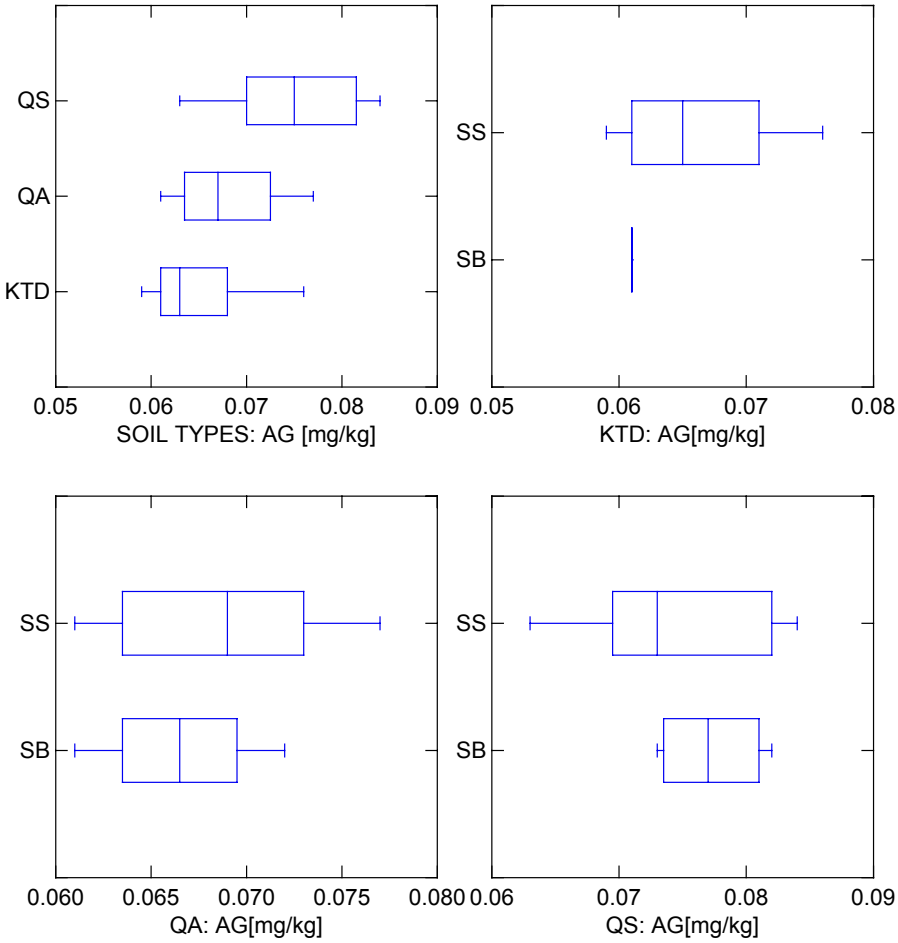

QS
QB
0.0
0.5
1.0
1.5
SB [mg/kg]
U
D
0.0
0.5
1.0
1.5
SB[mg/kg]

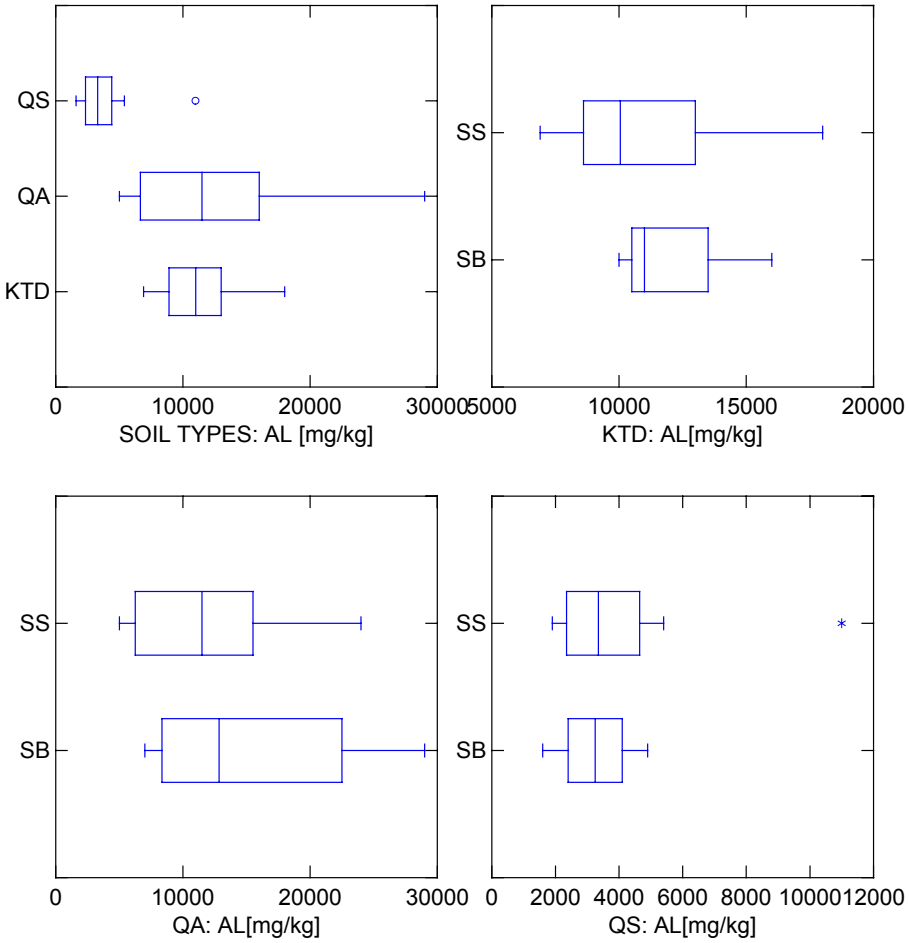

QS
QB
0
1
2
3
SE [mg/kg]
U
D
0
1
2
3
SE[mg/kg]

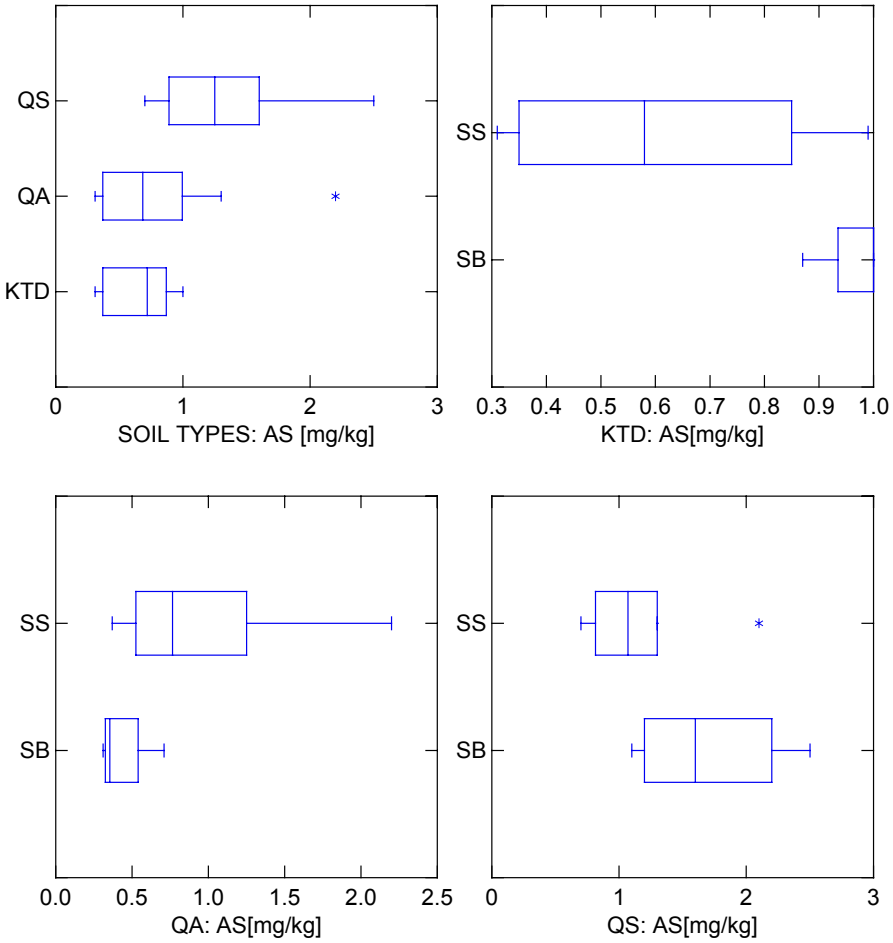

QS
QB
0.0
0.5
1.0
1.5
2.0
TL [mg/kg]
U
0.0
0.5
1.0
1.5
2.0
TL[mg/kg]

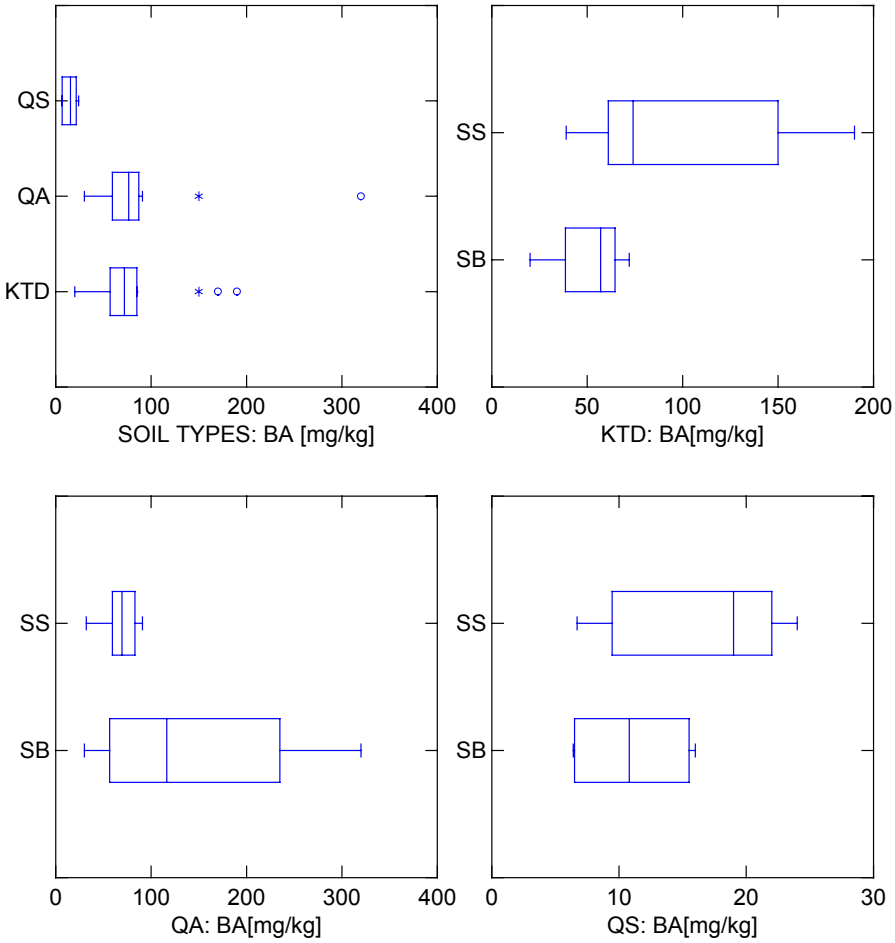

QS
QB
0
10
20
30
40
50
V [mg/kg]
D
0
10
20
30
40
50
V[mg/kg]

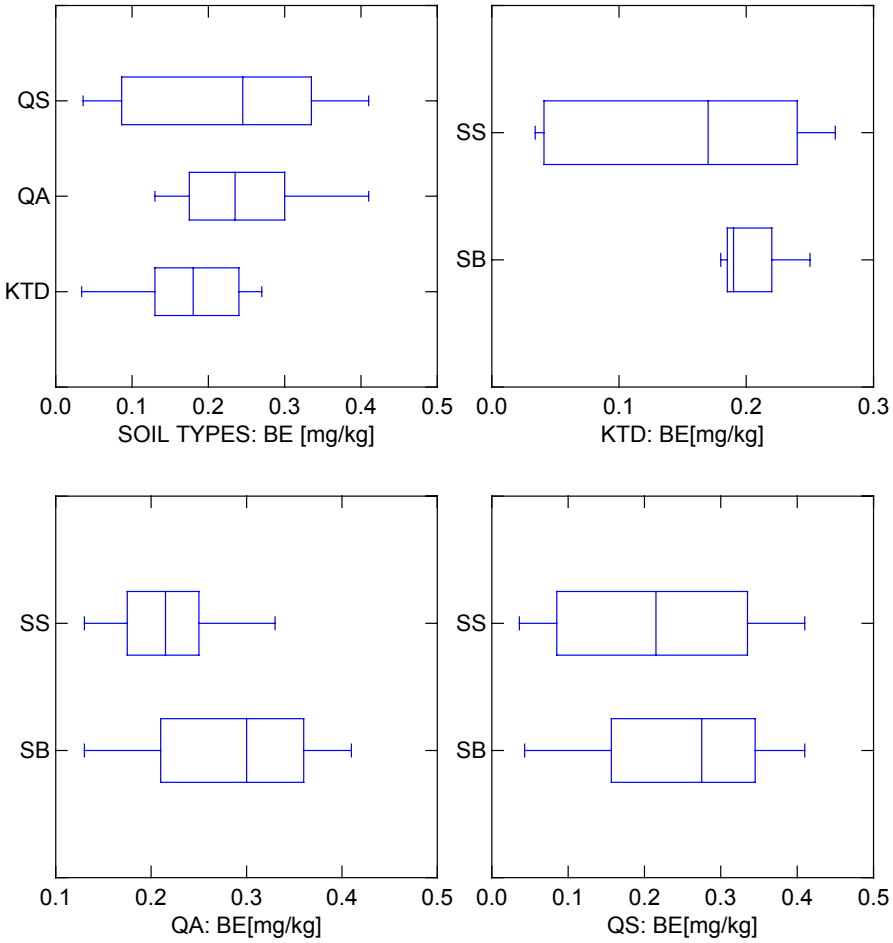

QS
QB
0
10
20
30
40
50
60
ZN [mg/kg]
D
0
10
20
30
40
50
60
ZN[mg/kg]

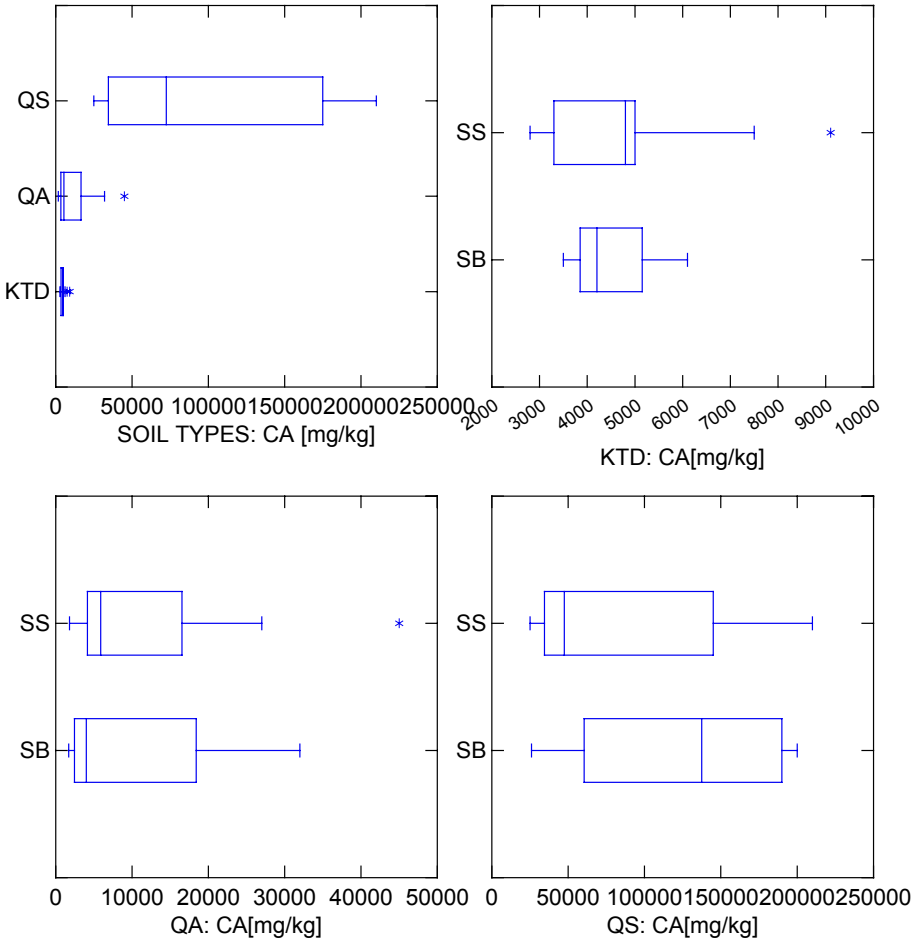

QS
QA
KTD
0.05
0.06
0.07
0.08
0.09
SOIL TYPES: AG [mg/kg]
SS
SB
0.05
0.06
0.07
0.08
KTD: AG[mg/kg]
SS
SB
0.060
0.065
0.070
0.075
0.080
QA: AG[mg/kg]
SS
SB
0.06
0.07
0.08
0.09
QS: AG[mg/kg]

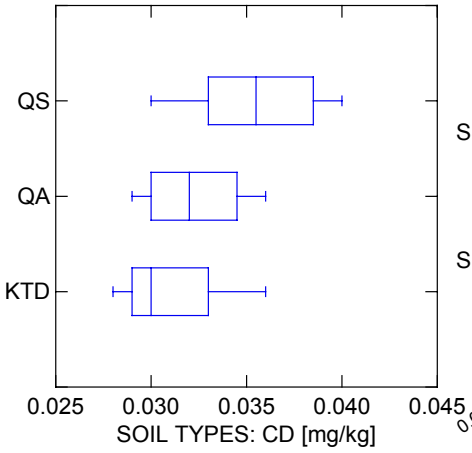

QS
QA
KTD
0
10000
20000
30000
SOIL TYPES: AL [mg/kg]
SS
SB
5000
10000
15000
20000
KTD: AL[mg/kg]
SS
SB
0
10000
20000
30000
QA: AL[mg/kg]
SS
SB
0
2000
4000
6000
8000
10000
12000
QS: AL[mg/kg]

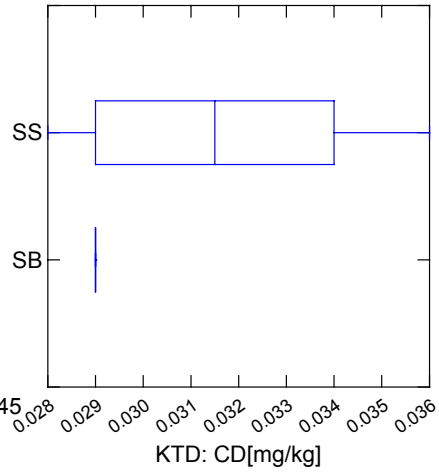

QS
QA
KTD
0
1
2
3
SOIL TYPES: AS [mg/kg]
SS
SB
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
KTD: AS[mg/kg]
SS
SB
0.0
0.5
1.0
1.5
2.0
2.5
QA: AS[mg/kg]
SS
SB
0
1
2
3
QS: AS[mg/kg]

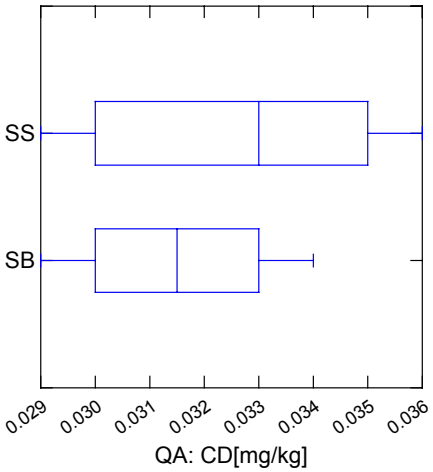

QS
QA
KTD
0
100
200
300
400
SOIL TYPES: BA [mg/kg]
SS
SB
0
50
100
150
200
KTD: BA[mg/kg]
SS
SB
0
100
200
300
400
QA: BA[mg/kg]
SS
SB
0
10
20
30
QS: BA[mg/kg]

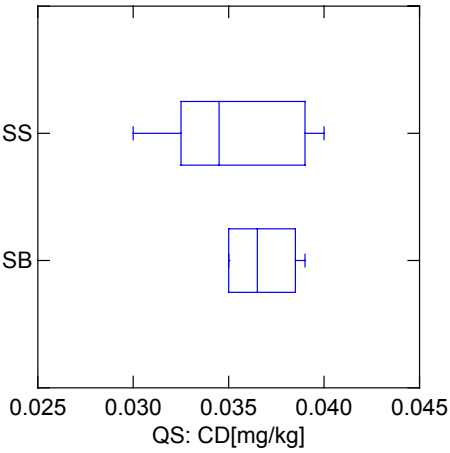

QS
QA
KTD
0.0
0.1
0.2
0.3
0.4
0.5
SOIL TYPES: BE [mg/kg]
SS
SB
0.0
0.1
0.2
0.3
KTD: BE[mg/kg]
SS
SB
0.1
0.2
0.3
0.4
0.5
QA: BE[mg/kg]
SS
SB
0.0
0.1
0.2
0.3
0.4
0.5
QS: BE[mg/kg]

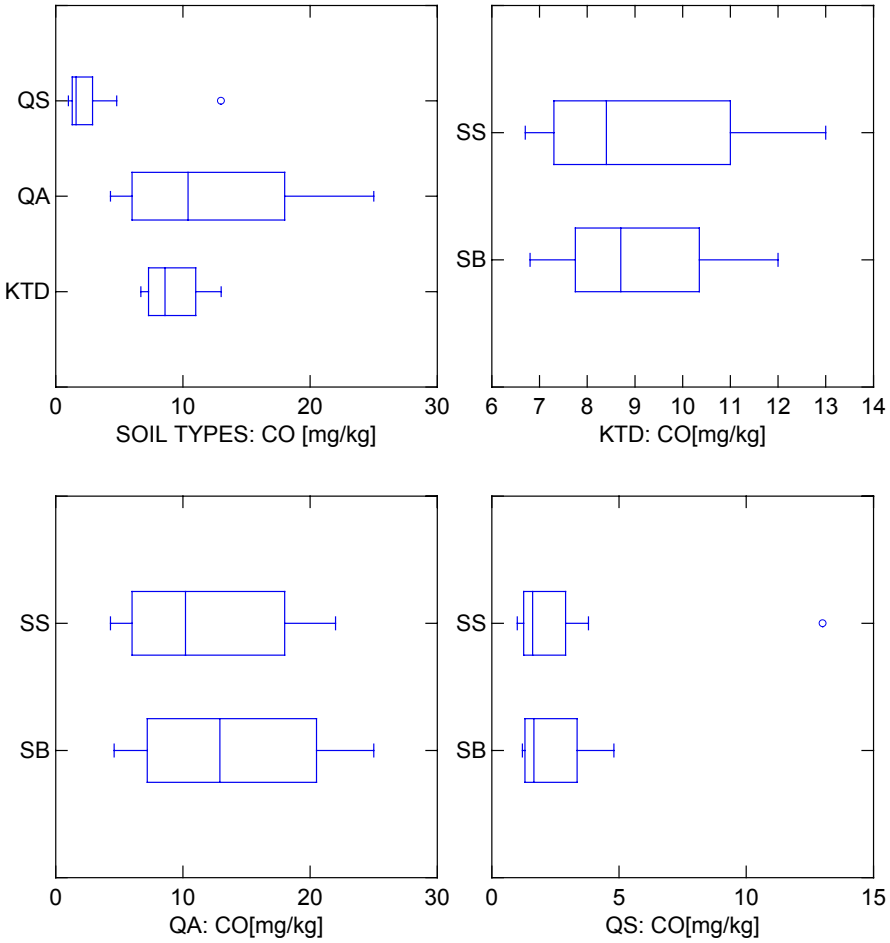

QS
QA
KTD
0
50000
100000
150000
200000
250000
SOIL TYPES: CA [mg/kg]
SS
SB
2000
3000
4000
5000
6000
7000
8000
9000
10000
KTD: CA[mg/kg]
SS
SB
0
10000
20000
30000
40000
50000
QA: CA[mg/kg]
SS
SB
0
50000
100000
150000
200000
250000
QS: CA[mg/kg]

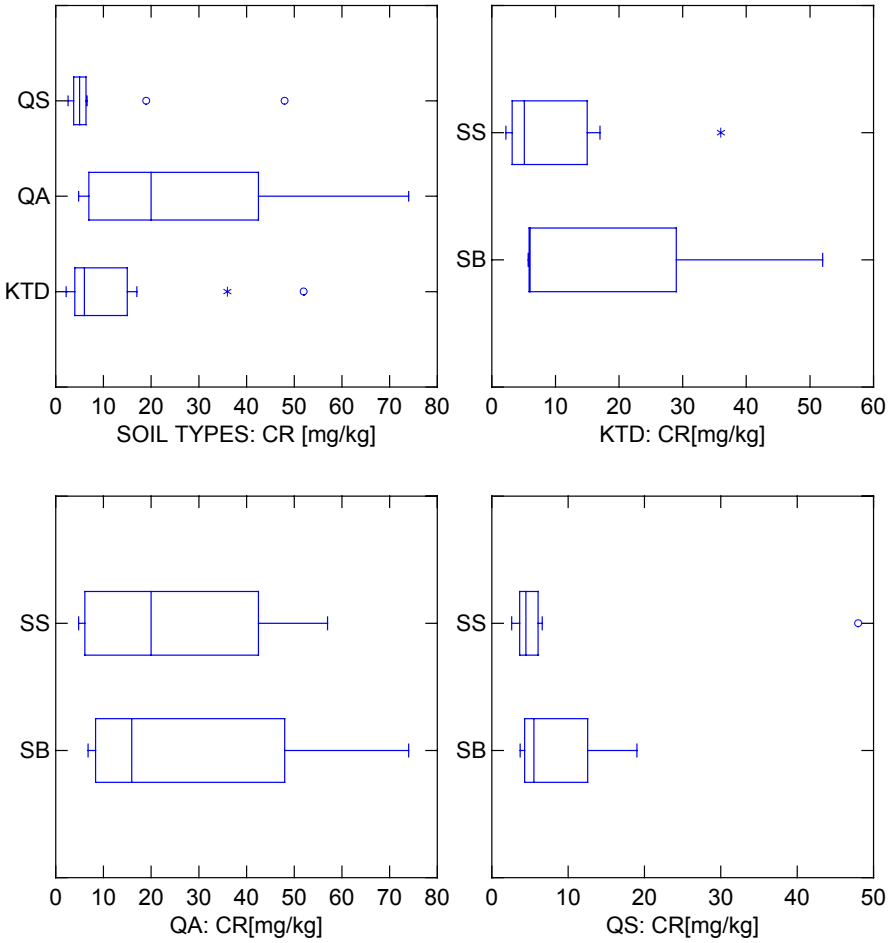

QS
QA
KTD
0.025
0.030
0.035
0.040
0.045
SOIL TYPES: CD [mg/kg]

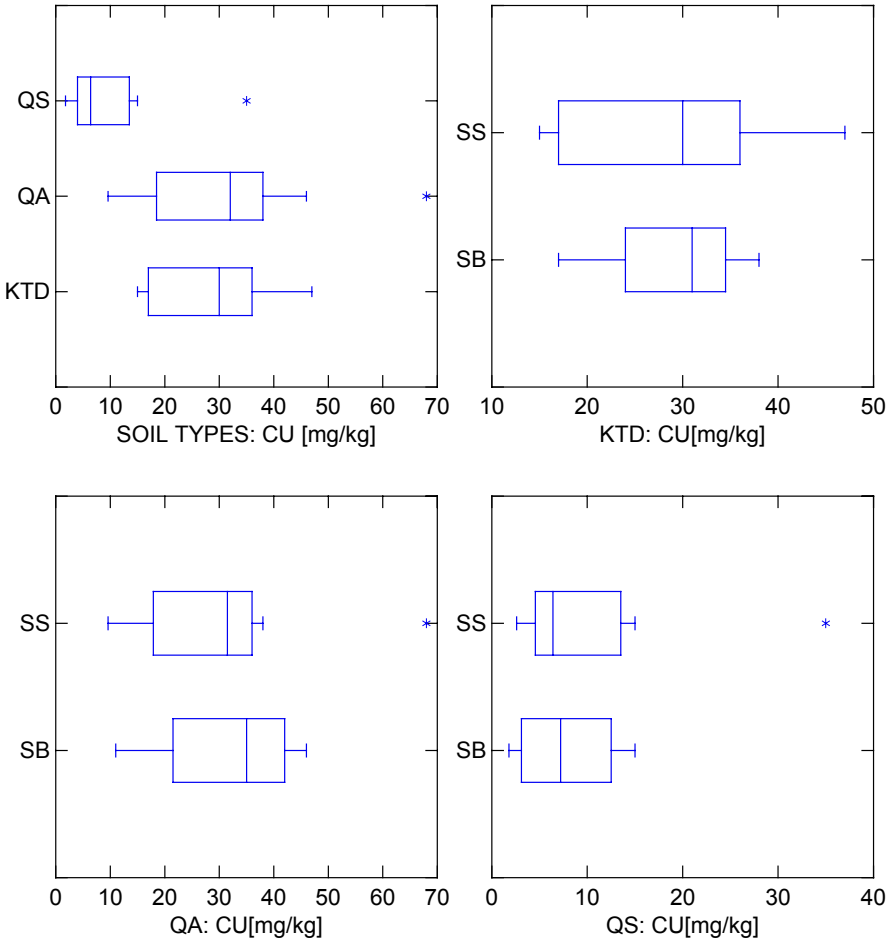

SS
SB
0.028
0.029
0.030
0.031
0.032
0.033
0.034
0.035
0.036
KTD: CD[mg/kg]

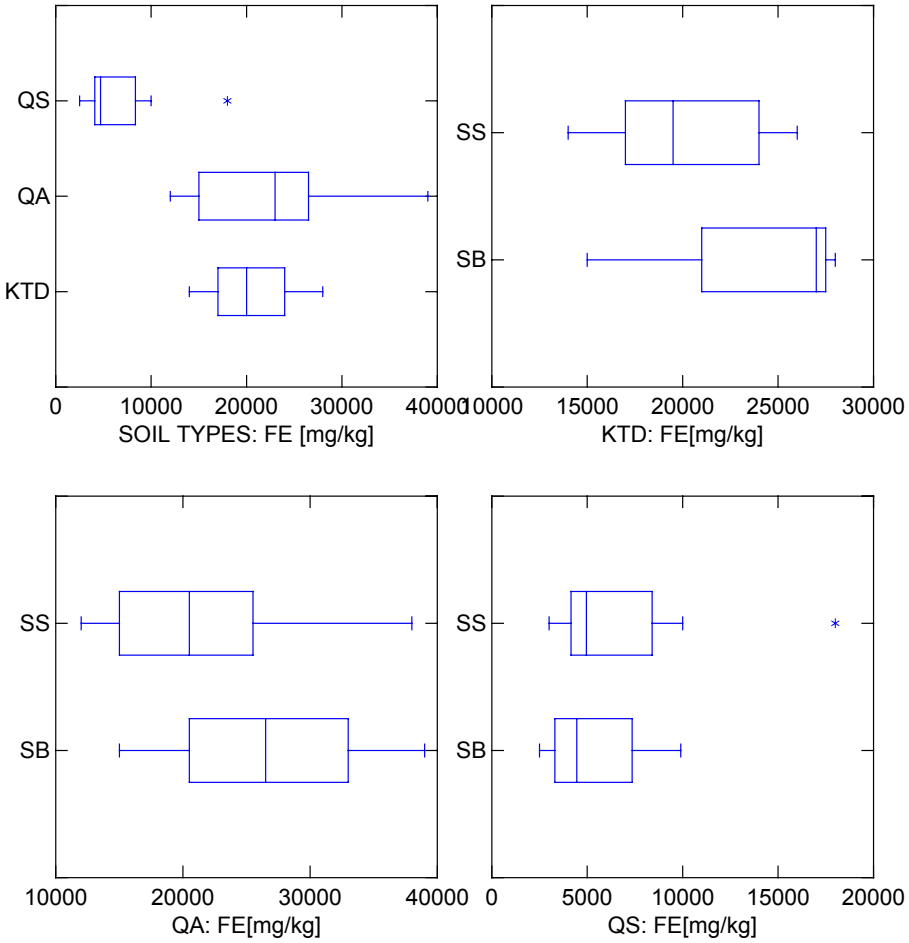

SS
SB
0.029
0.030
0.031
0.032
0.033
0.034
0.035
0.036
QA: CD[mg/kg]

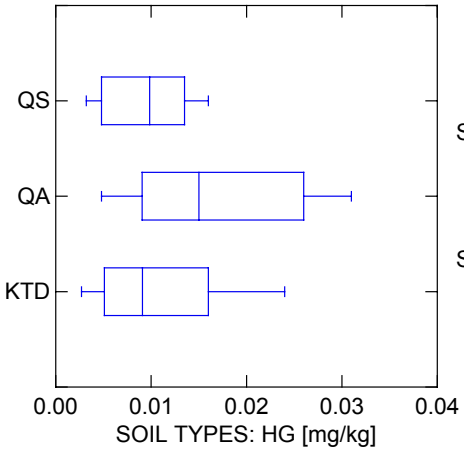

SS
SB
0.025
0.030
0.035
0.040
0.045
QS: CD[mg/kg]

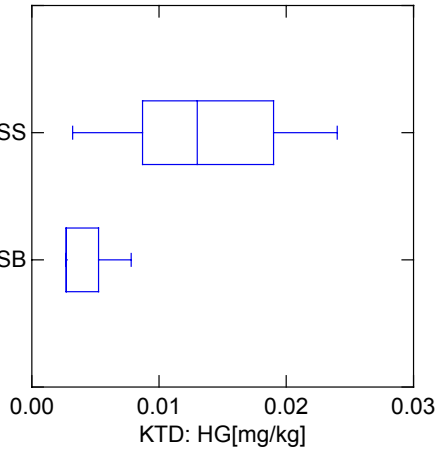

QS
QA
KTD
0
10
20
30
SOIL TYPES: CO [mg/kg]
SS
SB
6
7
8
9
10
11
12
13
14
KTD: CO[mg/kg]
SS
SB
0
10
20
30
QA: CO[mg/kg]
SS
SB
0
5
10
15
QS: CO[mg/kg]

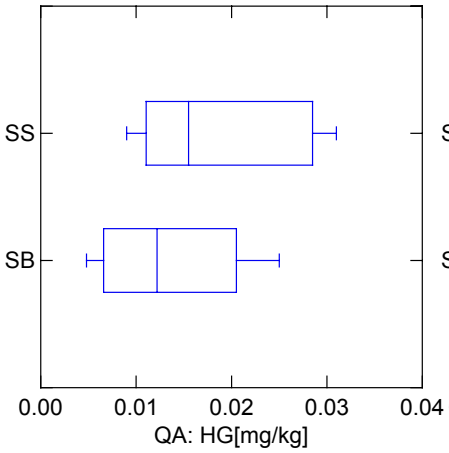

QS
QA
KTD
0 10 20 30 40 50 60 70 80
SOIL TYPES: CR [mg/kg]
SS
SB
0 10 20 30 40 50 60
KTD: CR[mg/kg]
SS
SB
0 10 20 30 40 50 60 70 80
QA: CR[mg/kg]
SS
SB
0 10 20 30 40 50
QS: CR[mg/kg]

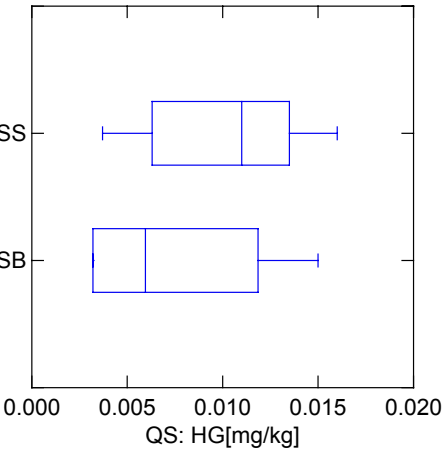

QS
QA
KTD
0 10 20 30 40 50 60 70
SOIL TYPES: CU [mg/kg]
SS
SB
10 20 30 40 50
KTD: CU[mg/kg]
SS
SB
0 10 20 30 40 50 60 70
QA: CU[mg/kg]
SS
SB
0 10 20 30 40
QS: CU[mg/kg]

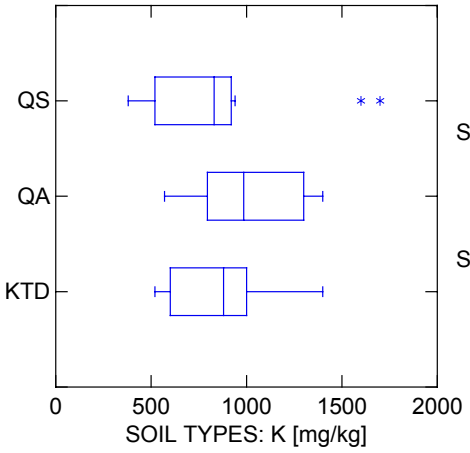

QS
QA
KTD
0
10000
20000
30000
40000
SOIL TYPES: FE [mg/kg]
SS
SB
10000
15000
20000
25000
30000
KTD: FE[mg/kg]
SS
SB
10000
20000
30000
40000
QA: FE[mg/kg]
SS
SB
0
5000
10000
15000
20000
QS: FE[mg/kg]

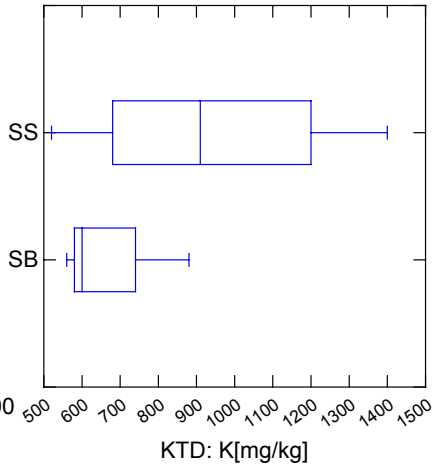

QS
QA
KTD
0.00
0.01
0.02
0.03
0.04
SOIL TYPES: HG [mg/kg]

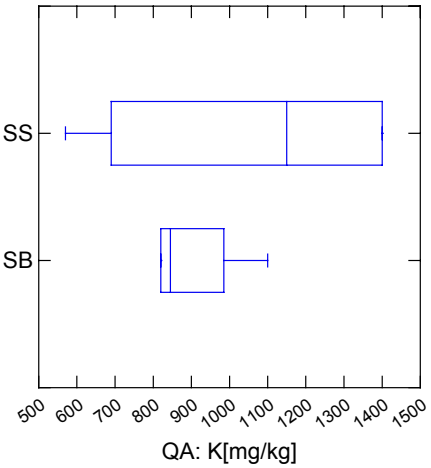

SS
SB
0.00
0.01
0.02
0.03
KTD: HG[mg/kg]

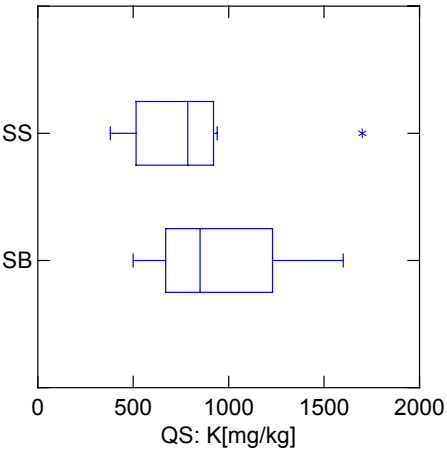

SS
SB
0.00
0.01
0.02
0.03
0.04
QA: HG[mg/kg]

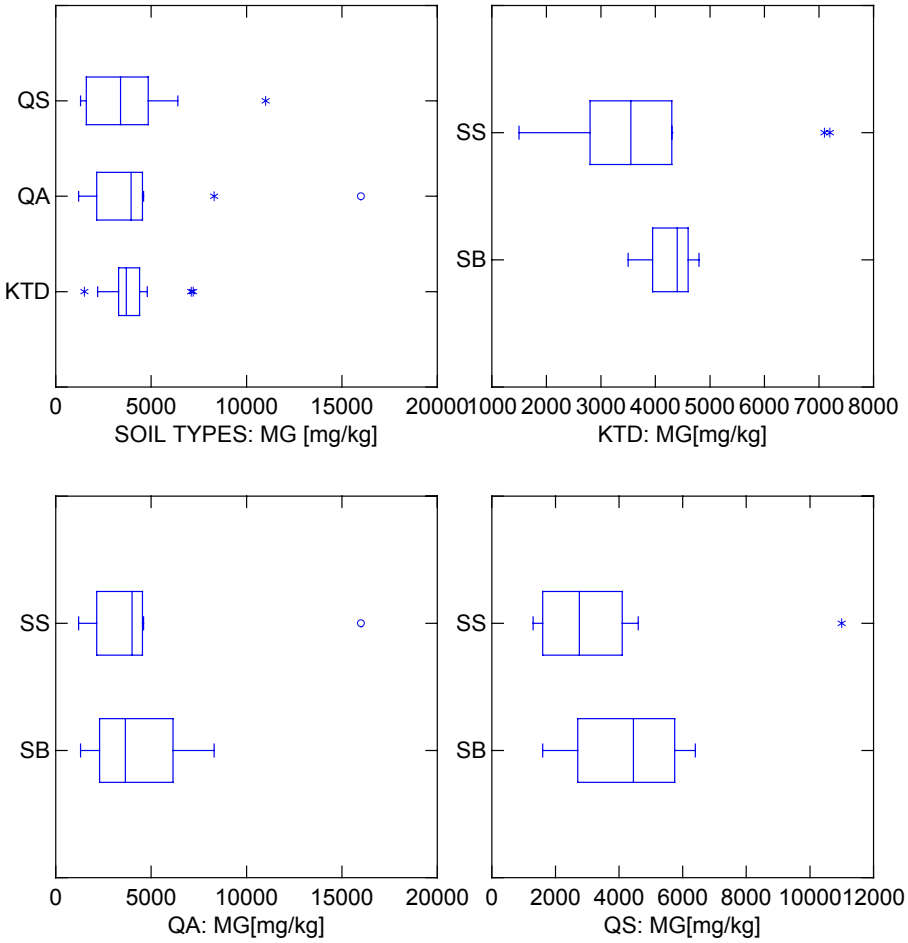

SS
SB
0.000
0.005
0.010
0.015
0.020
QS: HG[mg/kg]

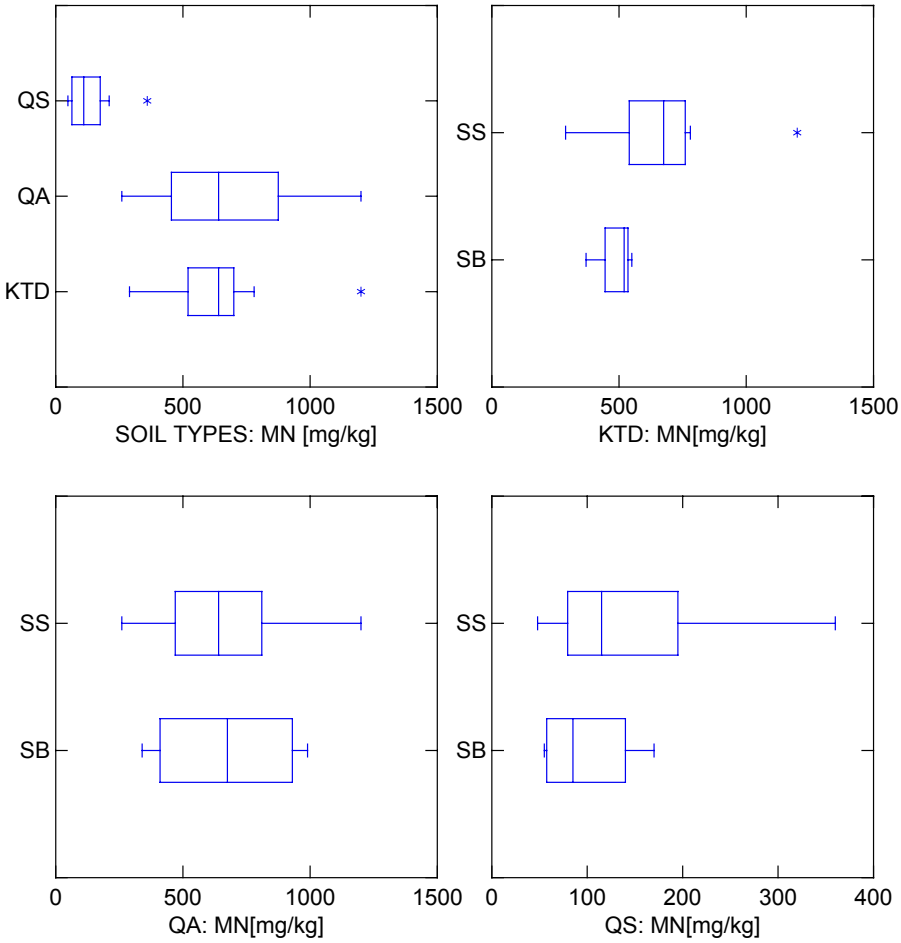

QS
QA
KTD
0
500
1000
1500
2000
SOIL TYPES: K [mg/kg]

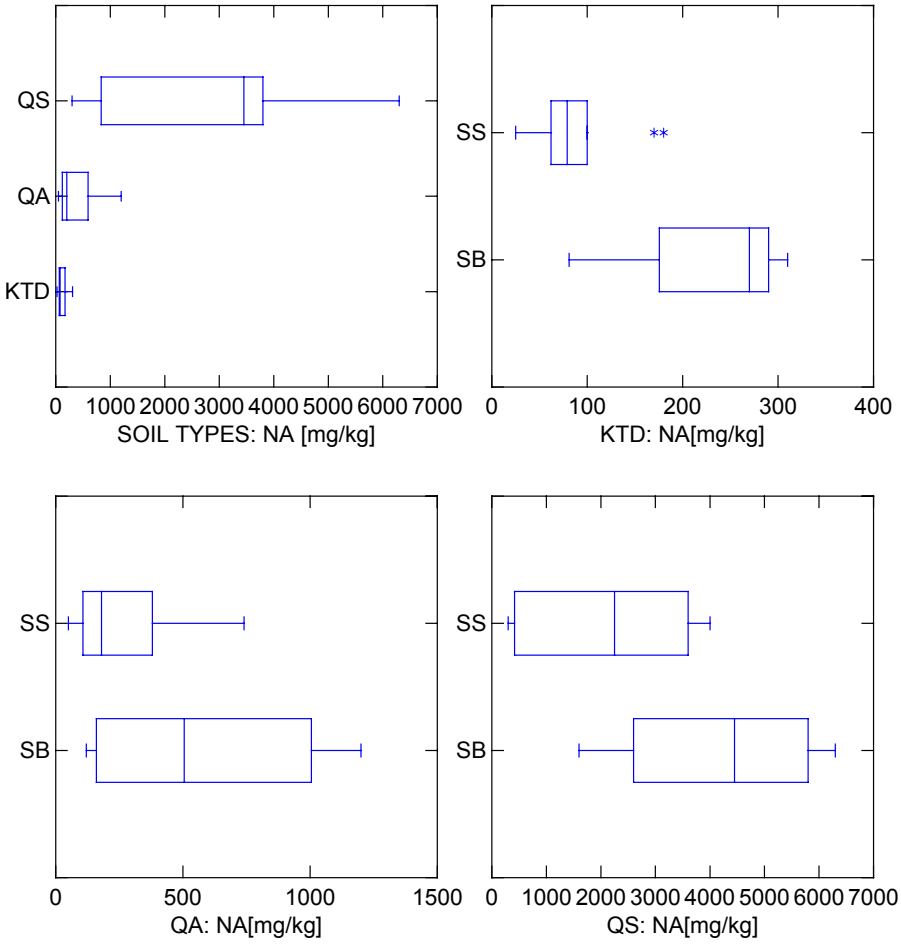

SS
SB
500
600
700
800
900
1000
1100
1200
1300
1400
1500
KTD: K[mg/kg]

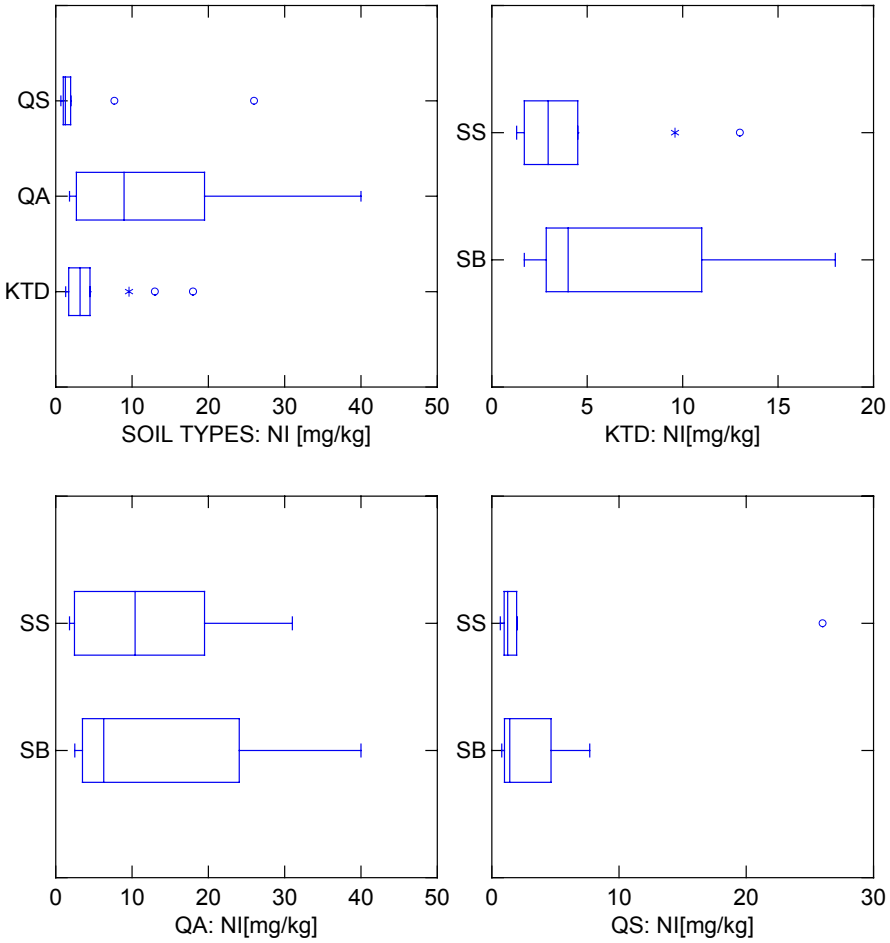

SS
SB
500
600
700
800
900
1000
1100
1200
1300
1400
1500
QA: K[mg/kg]

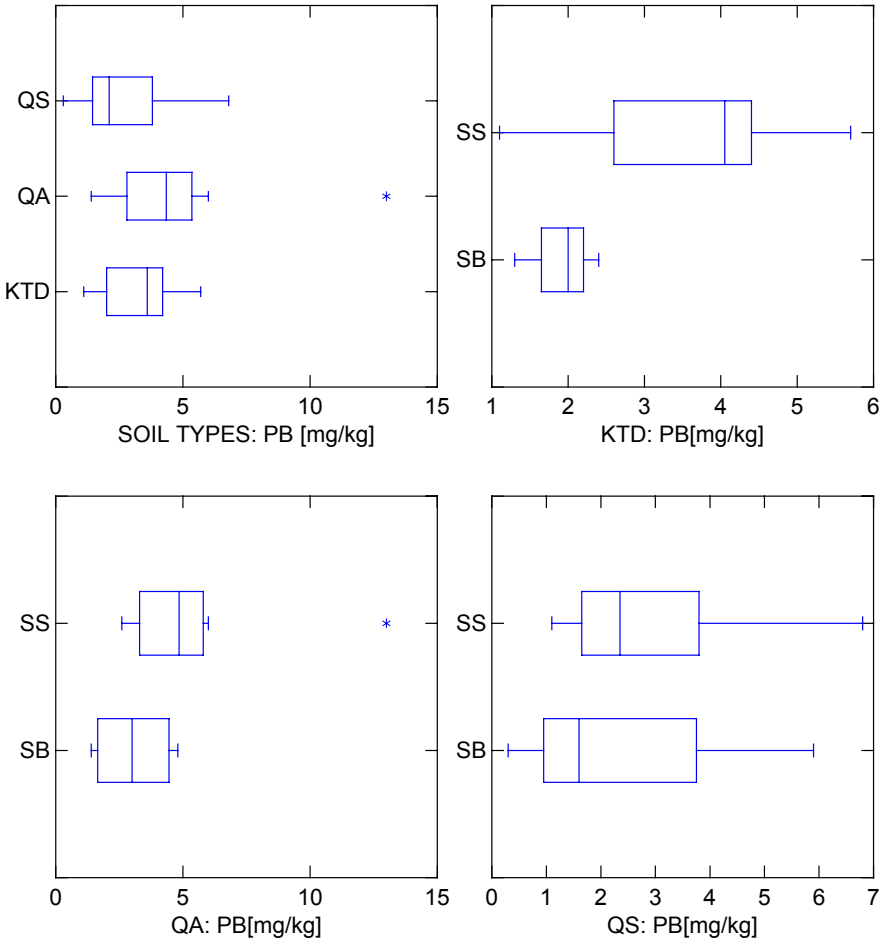

SS
SB
0
500
1000
1500
2000
QS: K[mg/kg]

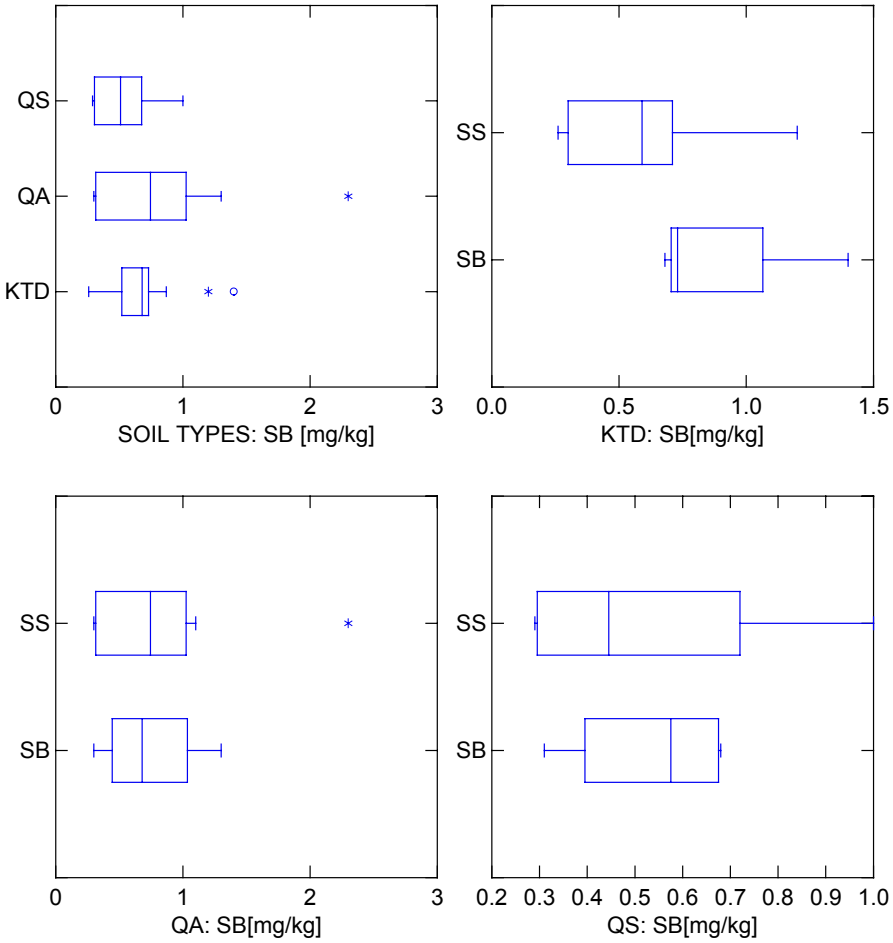

QS
QA
KTD
0
5000
10000
15000
20000
SOIL TYPES: MG [mg/kg]
SS
SB
1000 2000 3000 4000 5000 6000 7000 8000
KTD: MG[mg/kg]
SS
SB
0
5000
10000
15000
20000
QA: MG[mg/kg]
SS
SB
0
2000
4000
6000
8000
10000
12000
QS: MG[mg/kg]

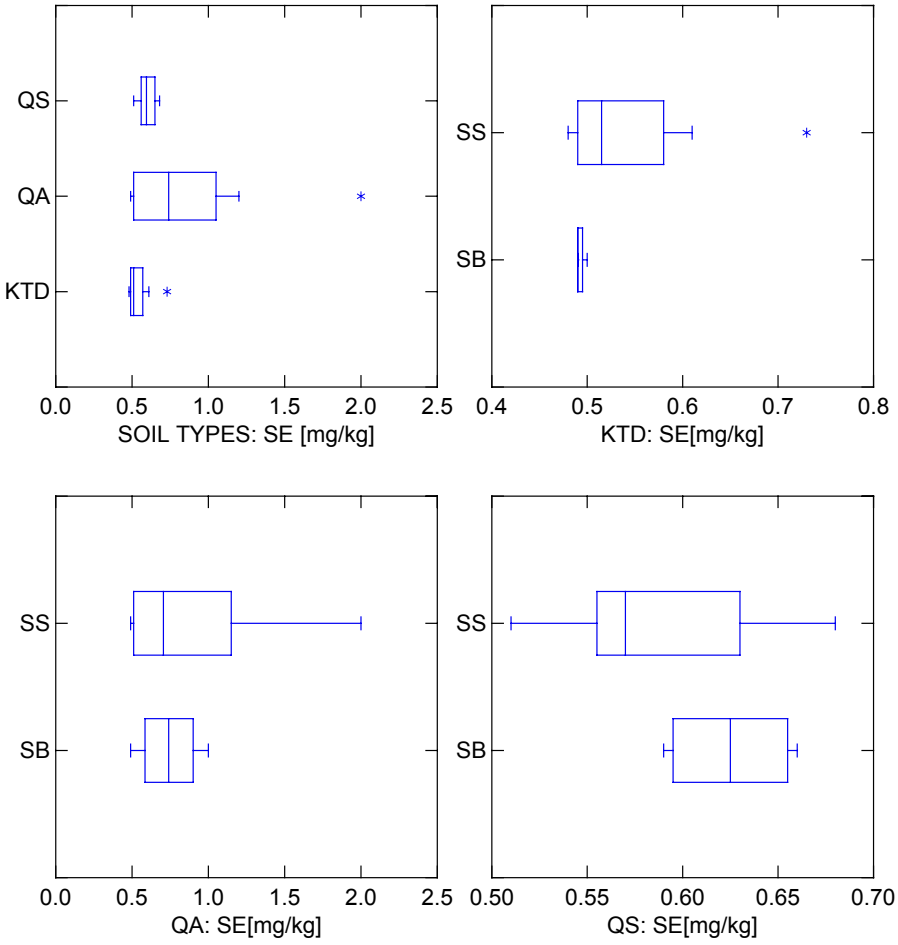

QS
QA
KTD
0
500
1000
1500
SOIL TYPES: MN [mg/kg]
SS
SB
0
500
1000
1500
KTD: MN[mg/kg]
SS
SB
0
500
1000
1500
QA: MN[mg/kg]
SS
SB
0
100
200
300
400
QS: MN[mg/kg]

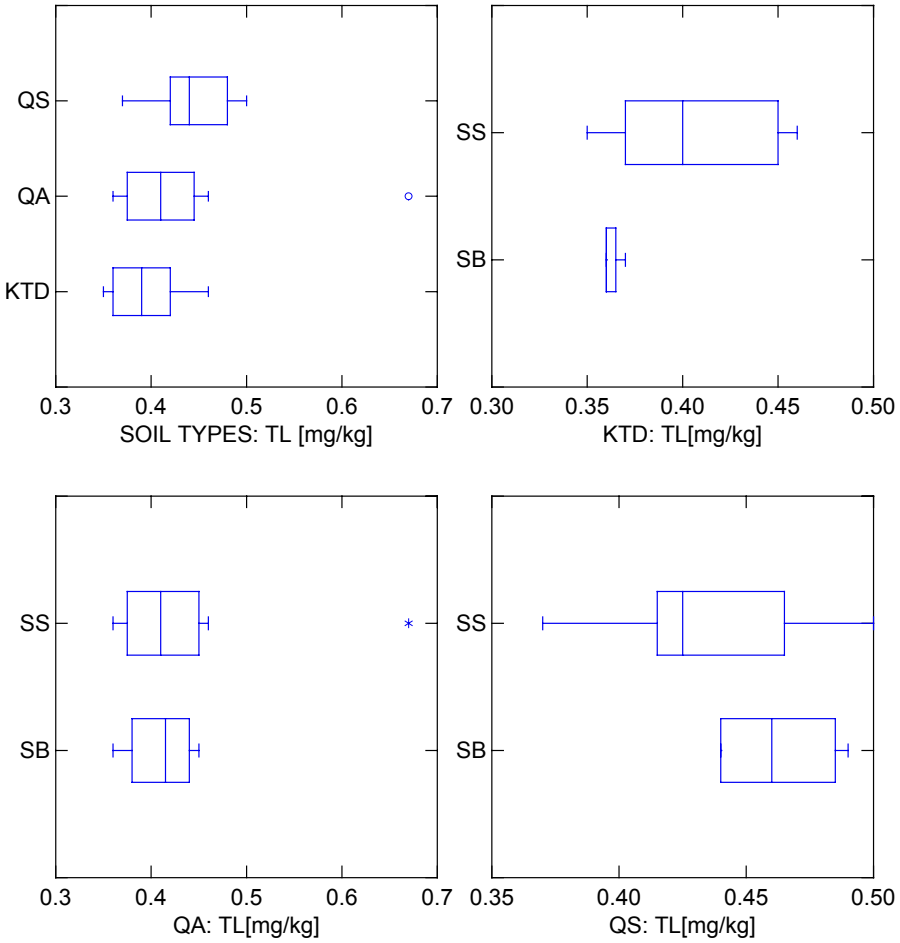

QS
QA
KTD
0 1000 2000 3000 4000 5000 6000 7000
SOIL TYPES: NA [mg/kg]
SS
SB
0 100 200 300 400
KTD: NA[mg/kg]
SS
SB
0 500 1000 1500
QA: NA[mg/kg]
SS
SB
0 1000 2000 3000 4000 5000 6000 7000
QS: NA[mg/kg]

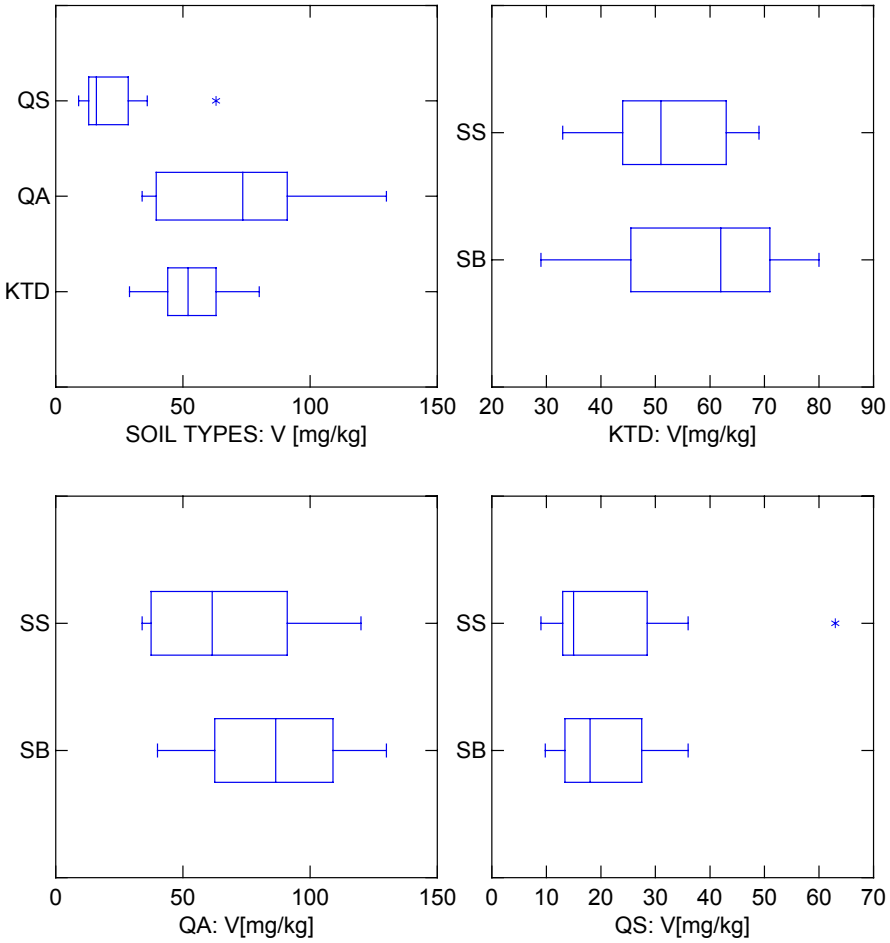

QS
QA
KTD
0
10
20
30
40
50
SOIL TYPES: NI [mg/kg]
SS
SB
0
5
10
15
20
KTD: NI[mg/kg]
SS
SB
0
10
20
30
40
50
QA: NI[mg/kg]
SS
SB
0
10
20
30
QS: NI[mg/kg]

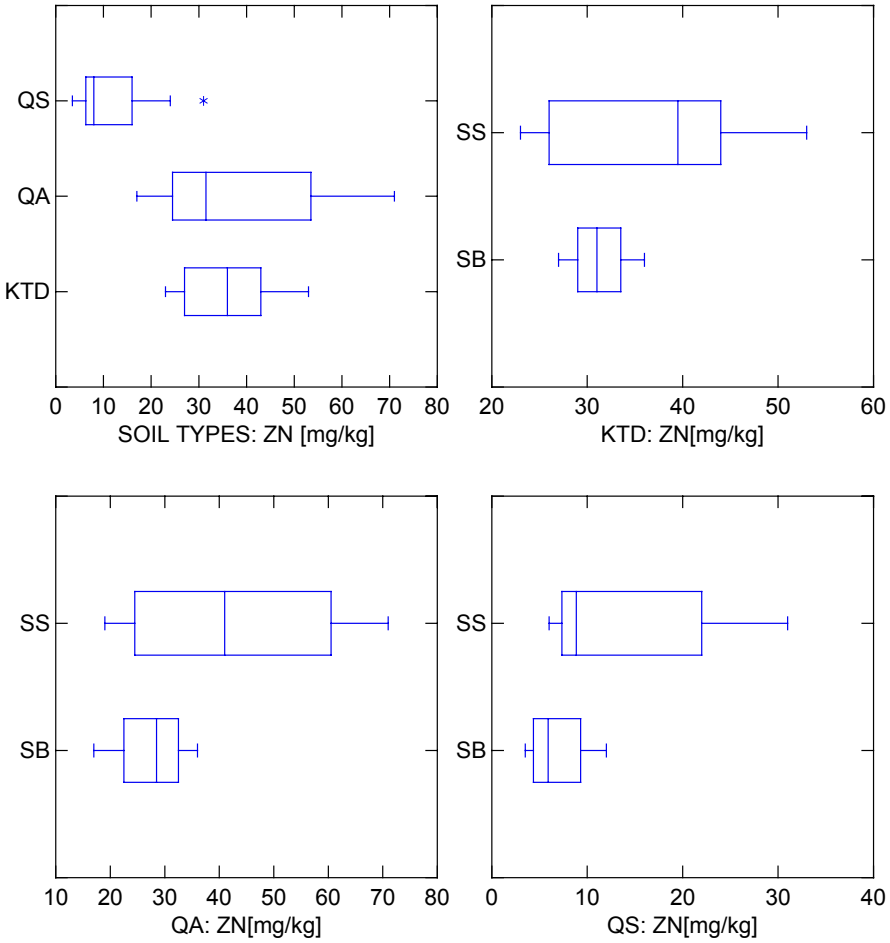

QS
QA
KTD
0
5
10
15
SOIL TYPES: PB [mg/kg]
SS
SB
1
2
3
4
5
6
KTD: PB[mg/kg]
SS
SB
0
5
10
15
QA: PB[mg/kg]
SS
SB
0
1
2
3
4
5
6
7
QS: PB[mg/kg]


QS
QA
KTD
0
1
2
3
SOIL TYPES: SB [mg/kg]
SS
SB
0.0
0.5
1.0
1.5
KTD: SB[mg/kg]
SS
SB
0
1
2
3
QA: SB[mg/kg]
SS
SB
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
QS: SB[mg/kg]


QS
QA
KTD
0.0
0.5
1.0
1.5
2.0
2.5
SOIL TYPES: SE [mg/kg]
SS
SB
0.4
0.5
0.6
0.7
0.8
KTD: SE[mg/kg]
SS
SB
0.0
0.5
1.0
1.5
2.0
2.5
QA: SE[mg/kg]
SS
SB
0.50
0.55
0.60
0.65
0.70
QS: SE[mg/kg]


QS
QA
KTD
0.3
0.4
0.5
0.6
0.7
SOIL TYPES: TL [mg/kg]
SS
SB
0.30
0.35
0.40
0.45
0.50
KTD: TL[mg/kg]
SS
SB
0.3
0.4
0.5
0.6
0.7
QA: TL[mg/kg]
SS
SB
0.35
0.40
0.45
0.50
QS: TL[mg/kg]

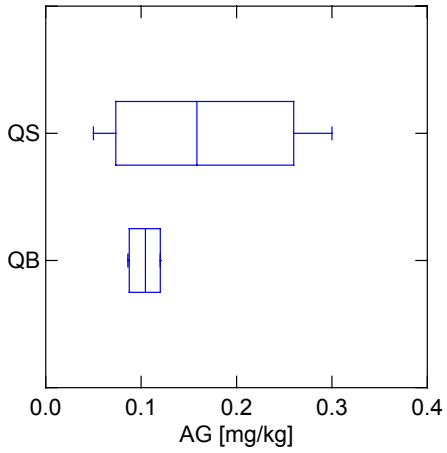

QS
QA
KTD
0
50
100
150
SOIL TYPES: V [mg/kg]
SS
SB
20
30
40
50
60
70
80
90
KTD: V[mg/kg]
SS
SB
0
50
100
150
QA: V[mg/kg]
SS
SB
0
10
20
30
40
50
60
70
QS: V[mg/kg]

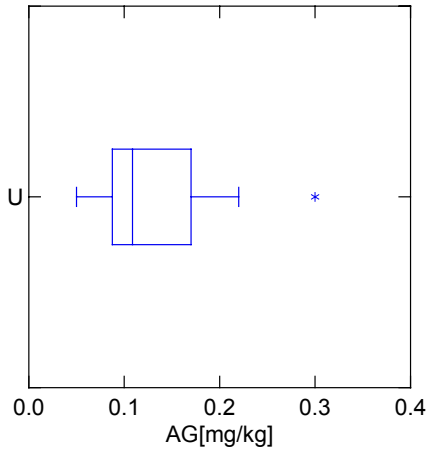

QS
QA
KTD
0 10 20 30 40 50 60 70 80
SOIL TYPES: ZN [mg/kg]
SS
SB
20 30 40 50 60
KTD: ZN[mg/kg]
SS
SB
10 20 30 40 50 60 70 80
QA: ZN[mg/kg]
SS
SB
0 10 20 30 40
QS: ZN[mg/kg]

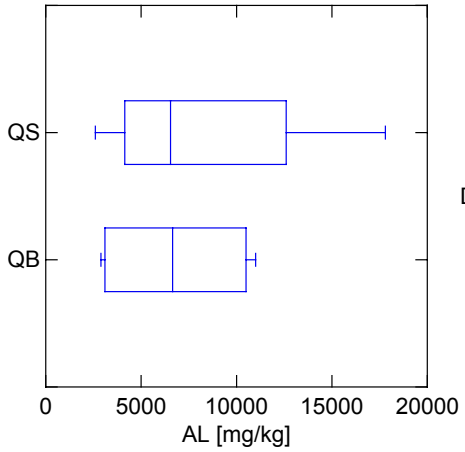
APPENDIX F

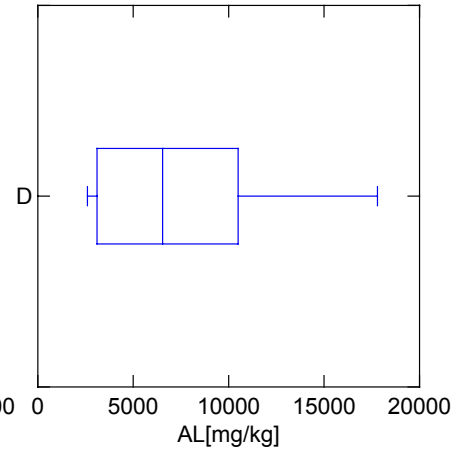
Box Plot Analyses: Surface Water

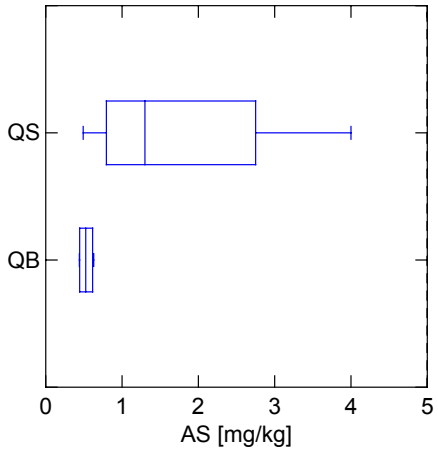
NASD Background Analysis

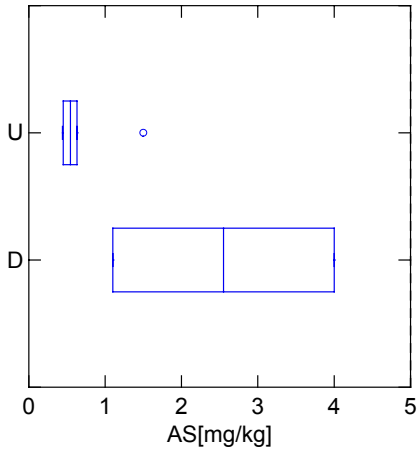


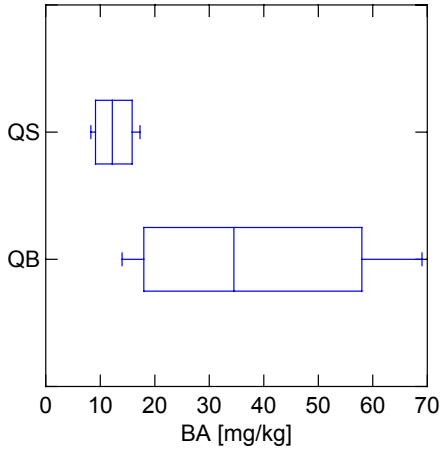


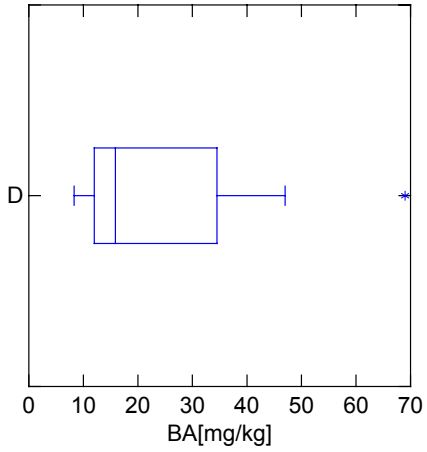


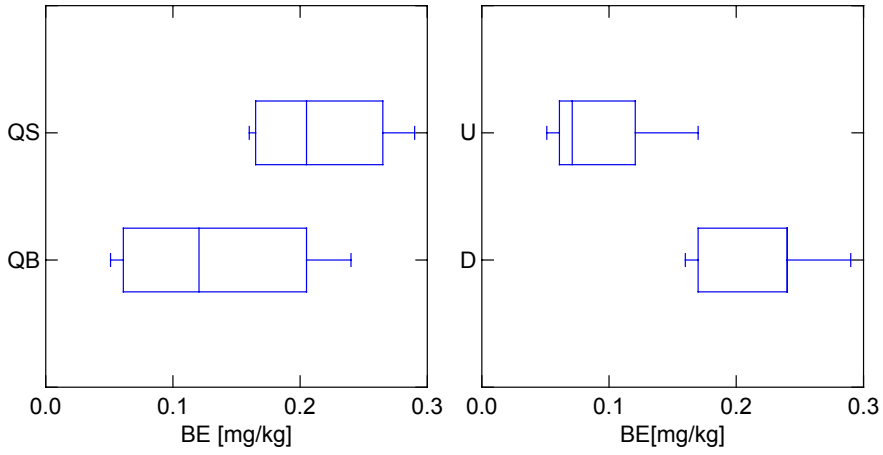


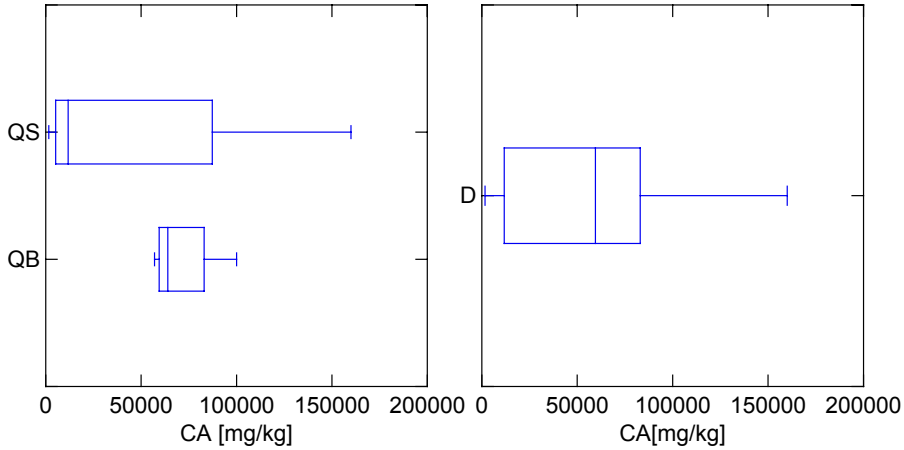

QS
QB
0
1
2
3
4
5
AS [mg/kg]

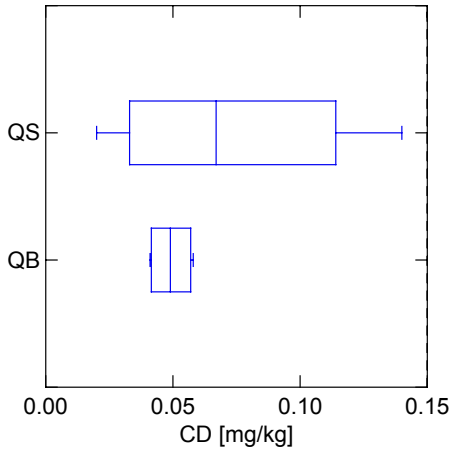

U
D
0
1
2
3
4
5
AS[mg/kg]

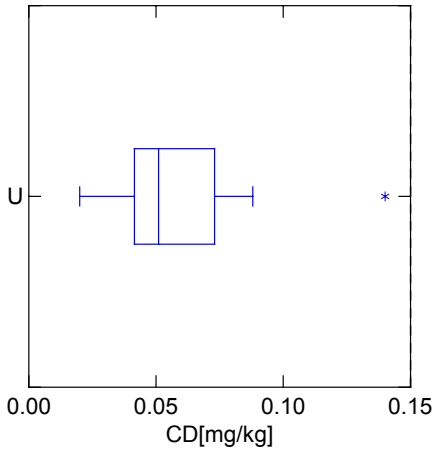

QS
QB
0
10
20
30
40
50
60
70
BA [mg/kg]

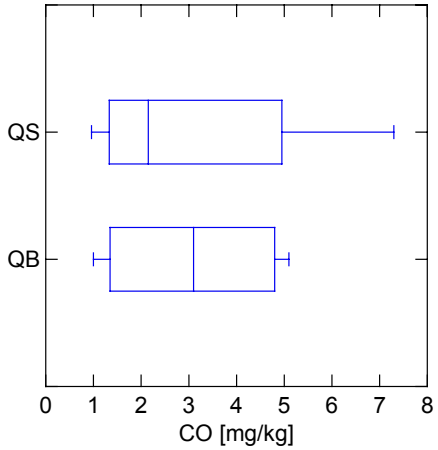

D
0
10
20
30
40
50
60
70
BA[mg/kg]

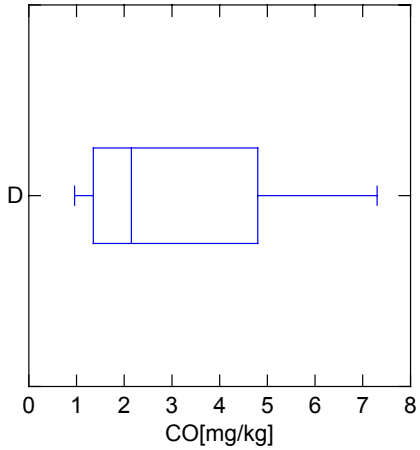

QS
QB
0.0
0.1
0.2
0.3
BE [mg/kg]
U
D
0.0
0.1
0.2
0.3
BE[mg/kg]

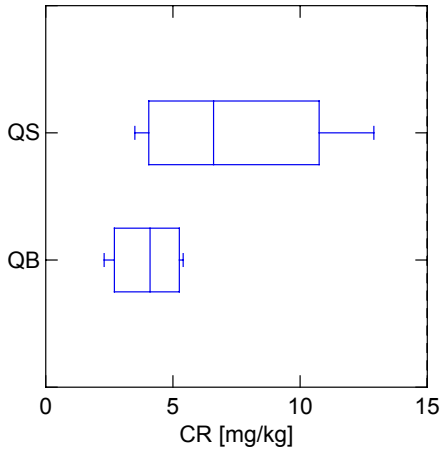

QS
QB
0
50000
100000
150000
200000
CA [mg/kg]
D
0
50000
100000
150000
200000
CA[mg/kg]

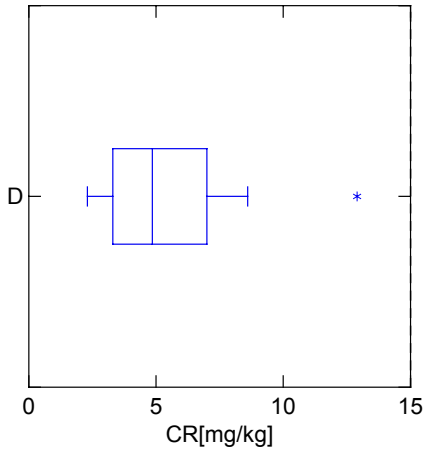

QS
QB
0.00
0.05
0.10
0.15
CD [mg/kg]

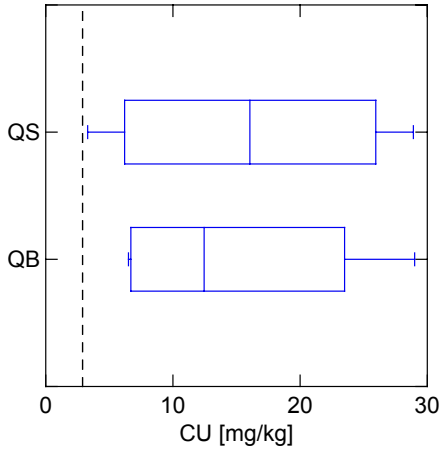

U
0.00
0.05
0.10
0.15
CD[mg/kg]

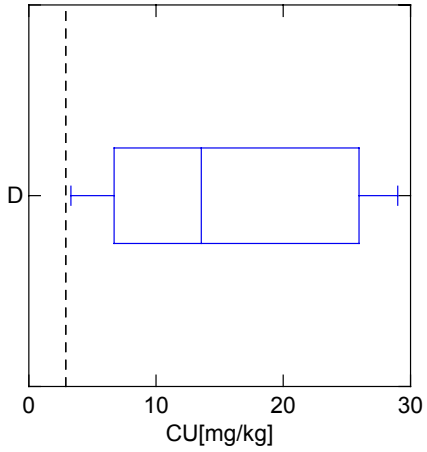

QS
QB
0
1
2
3
4
5
6
7
8
CO [mg/kg]

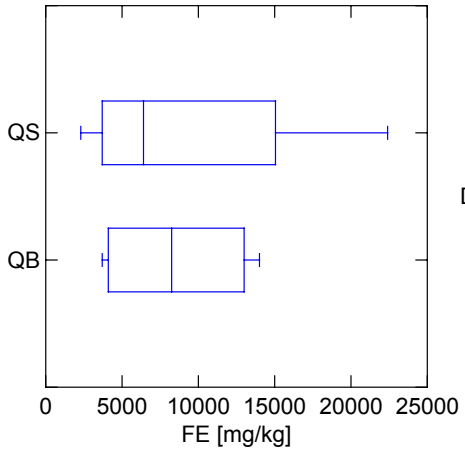

D
0
1
2
3
4
5
6
7
8
CO[mg/kg]

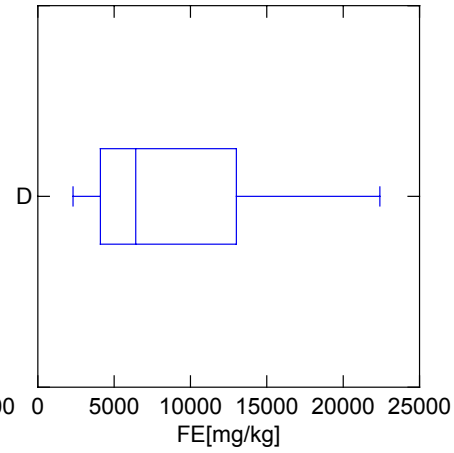

QS
QB
0
5
10
15
CR [mg/kg]

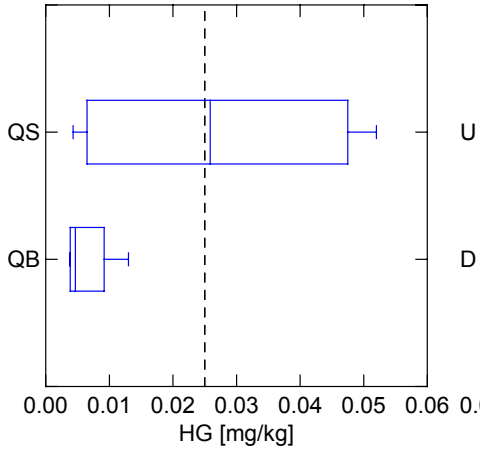

D
0
5
10
15
CR[mg/kg]

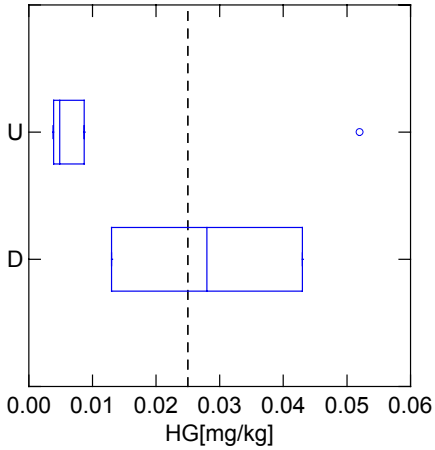

QS
QB
0
10
20
30
CU [mg/kg]

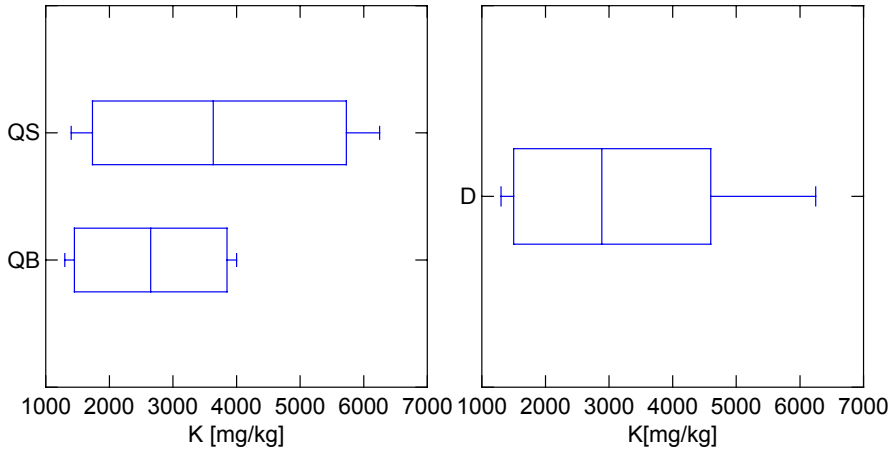

D
0
10
20
30
CU[mg/kg]

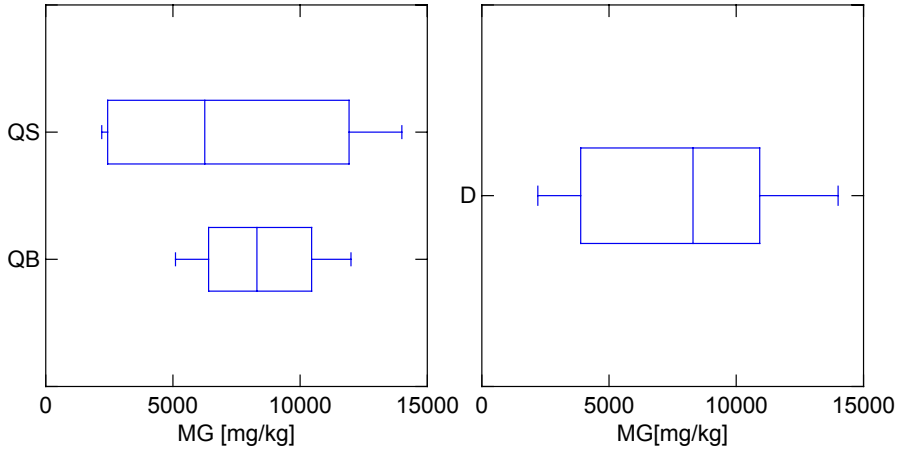

QS
QB
0
5000
10000
15000
20000
25000
FE [mg/kg]

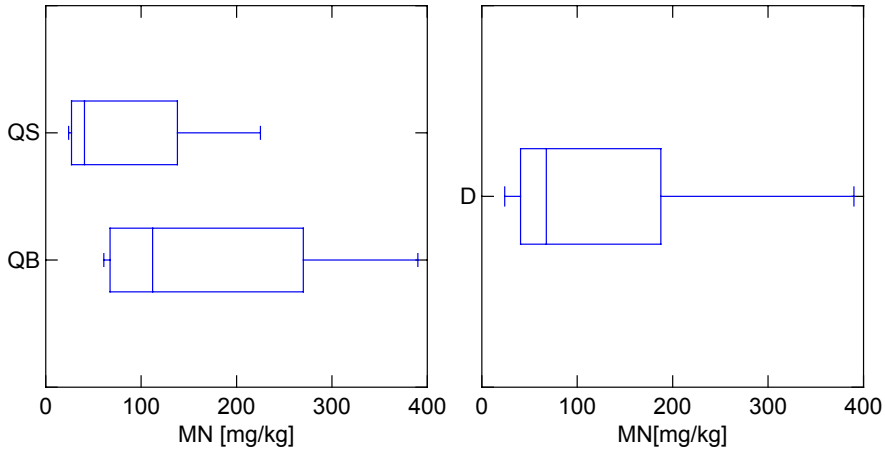

D
0
5000
10000
15000
20000
25000
FE[mg/kg]

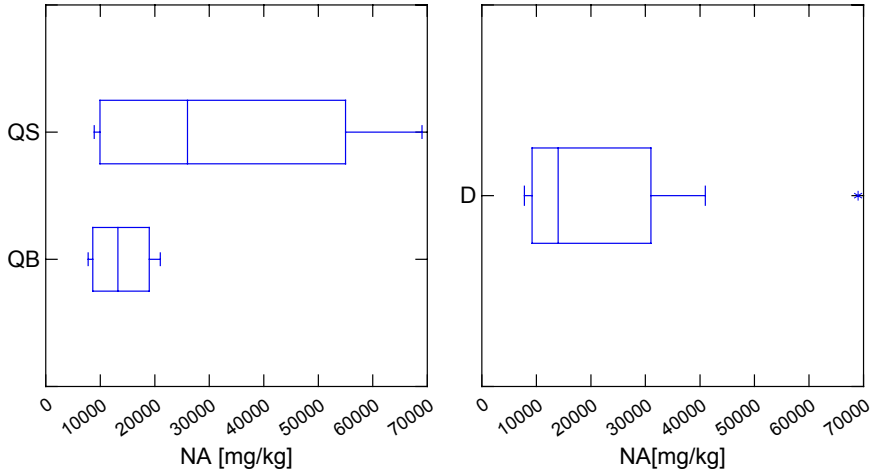

QS
QB
0.00
0.01
0.02
0.03
0.04
0.05
0.06
HG [mg/kg]

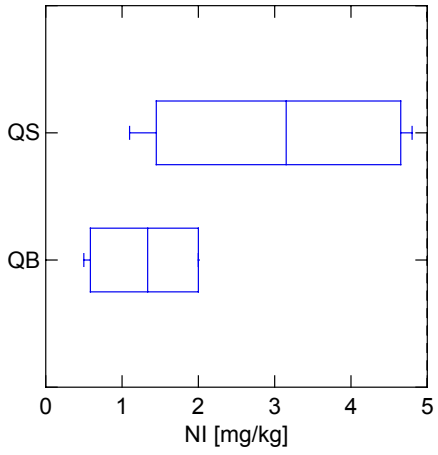

U
D
0.00
0.01
0.02
0.03
0.04
0.05
0.06
HG[mg/kg]

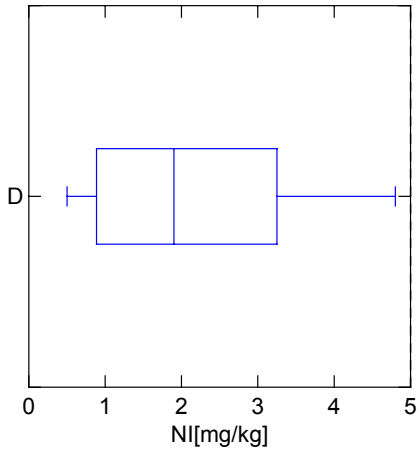

QS
QB
1000 2000 3000 4000 5000 6000 7000
K [mg/kg]
D
1000 2000 3000 4000 5000 6000 7000
K[mg/kg]

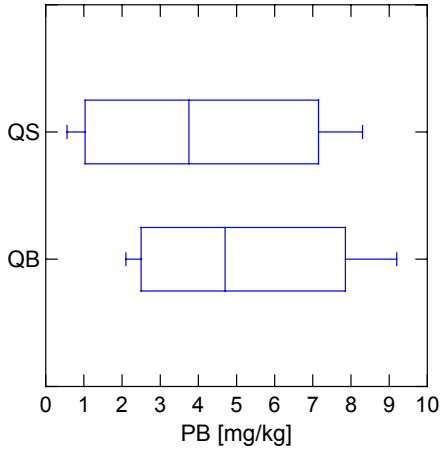

QS
QB
0 5000 10000 15000
MG [mg/kg]
D
0 5000 10000 15000
MG[mg/kg]

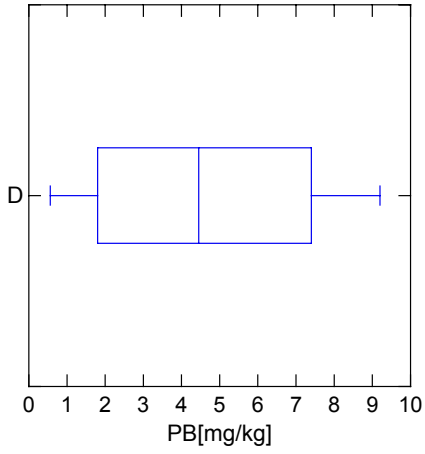

QS
QB
0
100
200
300
400
MN [mg/kg]
D
0
100
200
300
400
MN[mg/kg]

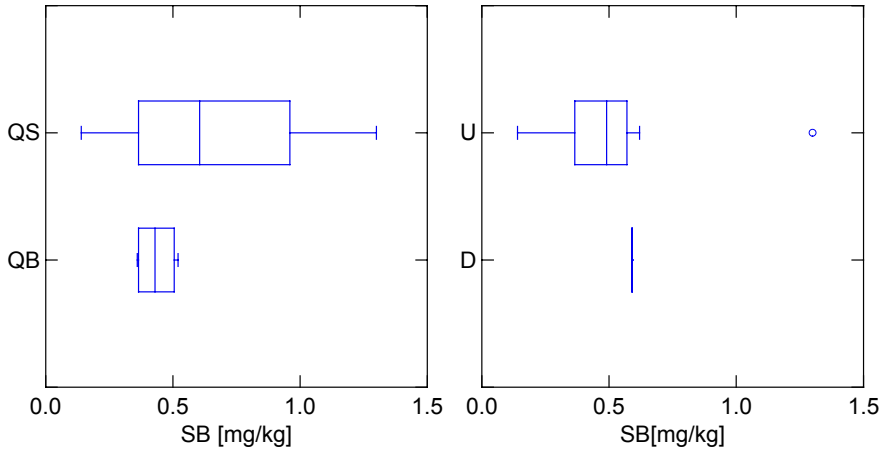

QS
QB
0
10000
20000
30000
40000
50000
60000
70000
NA [mg/kg]
D
0
10000
20000
30000
40000
50000
60000
70000
NA[mg/kg]

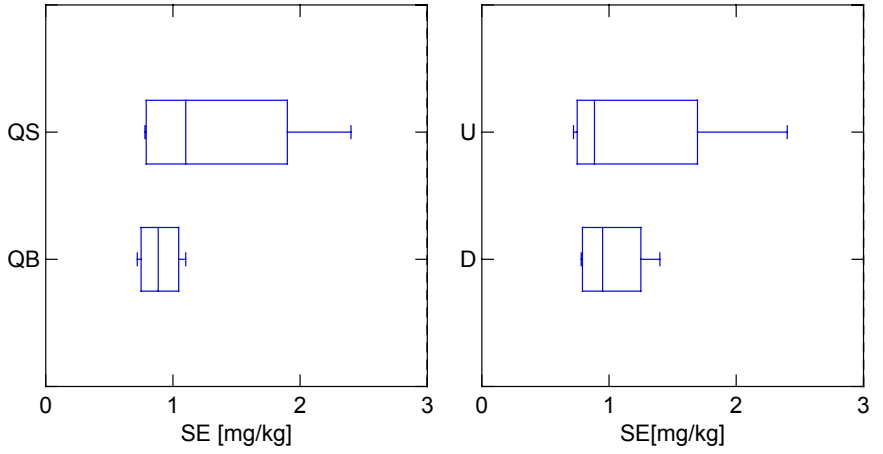

QS
QB
0
1
2
3
4
5
NI [mg/kg]

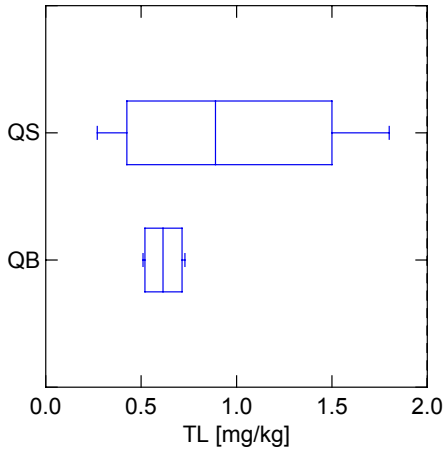

D
0
1
2
3
4
5
NI[mg/kg]

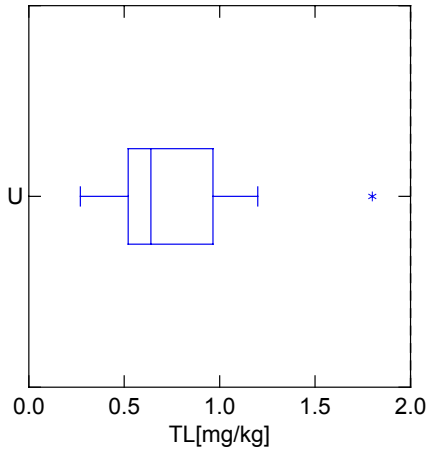

QS
QB
0
1
2
3
4
5
6
7
8
9
10
PB [mg/kg]

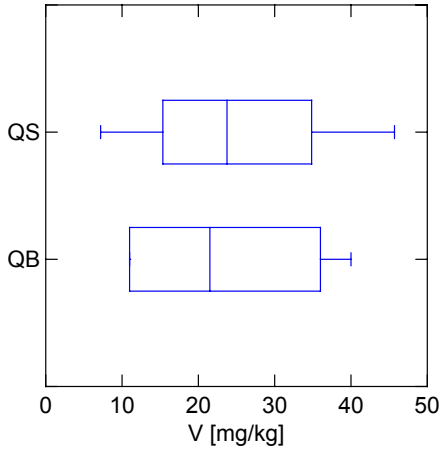

D
0
1
2
3
4
5
6
7
8
9
10
PB[mg/kg]

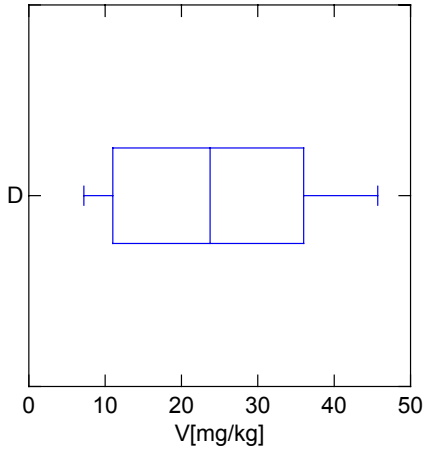

QS
QB
0.0
0.5
1.0
1.5
SB [mg/kg]
U
D
0.0
0.5
1.0
1.5
SB[mg/kg]

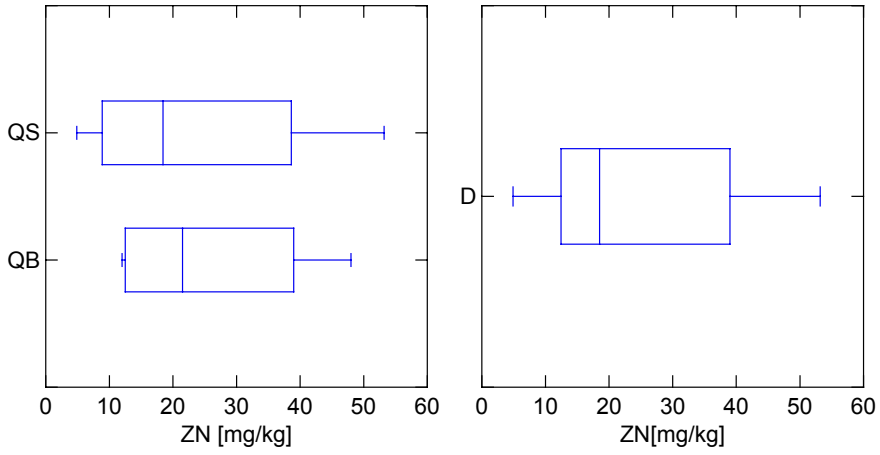

QS
QB
0
1
2
3
SE [mg/kg]
U
D
0
1
2
3
SE[mg/kg]


QS
QB
0.0
0.5
1.0
1.5
2.0
TL [mg/kg]


U
0.0
0.5
1.0
1.5
2.0
TL[mg/kg]


QS
QB
0
10
20
30
40
50
V [mg/kg]


D
0
10
20
30
40
50
V[mg/kg]


QS
QB
0
10
20
30
40
50
60
ZN [mg/kg]
D
0
10
20
30
40
50
60
ZN[mg/kg]

Appendix G

Shapiro-Wilk Test For Normality (For N < 50)

For untransformed data:

Hypothesis

H_o = The population has a normal distribution

H_a = The population does not have a normal distribution

Assumptions:

1. Assumes sample is random sample

Test Statistic:

$$W_{calculated} = \left[\frac{\left[\sum_{i=1}^{k} a_{n-i+1} \left(x_{(n-i+1)} - x_{(i)} \right) \right]}{SD\sqrt{n-1}} \right]^2$$

Where:

n = total number of observations

SD = standard deviation

$x_{(i)}$ = ordered sample from smallest to largest

$x_{(n-i+1)}$ = ordered sample from largest to smallest

k = greatest integer less than or equal to n/2

a_{n-i+1} = coefficient for observed n (Table A6 in Gilbert, 1987)

Decision Rule:

Reject H_o at the □ = 0.05 level if $W_{calculated} < W_{critical(□=0.05)}$

For log transformed data:

Hypothesis

H_o = The population has a lognormal distribution

H_a = The population does not have a lognormal distribution

Assumptions, Test Statistic, and Decision Rule are same as for untransformed data.

Source:

Gilbert, 1987

UPPER TOLERANCE LIMIT CALCULATIONS

For Normally Distributed data:

The upper 100(1-□)% confidence limit for the true 95th quantile ($x_{0.95}$) or UTL is calculated as:

$$UTL_{1-\alpha}(x_{0.95}) = \bar{x} + sK_{1-\alpha,0.95}$$

Where:

x = Mean of untransformed data

s = Standard deviation of untransformed data

$K_{1-a,\ 0.95}$ = Tolerance interval for the 95th quantile at the specified confidence level (Table A3 in Gilbert, 1987)

For LogNormally Distributed data:

Perform the same calculation using the mean and standard deviation of the logged data, take the antilog of the calculated result to obtain the UTL.

For NonNormally Distributed data:

For N<50, the nonparametric 95UTL can be taken to be the maximum detected value. The minimum coverage obtained with 95 % confidence for the given N is obtained from Table A-6 in USEPA, 1992

Source:

Gilbert, 1987

USEPA, 1992

Calculation of 95% Upper Confidence Limit (UCL_{95})

If the data set was distributed normally, the 95 percent UCL was calculated using the following formula (EPA, 1992a):

$$UCL = \bar{x} + t\left(\frac{s}{\sqrt{n}}\right) \qquad (1)$$

Where:

UCL = upper confidence limit

$\bar{x}$ = mean of the untransformed data

t = Student-t statistic (e.g., from Table A2 published in Gilbert, 1987)

s = standard deviation of the untransformed data

n = number of samples

If the data set was distributed lognormally, the 95 percent UCL was calculated using the following formula (EPA, 1992a):

$$UCL = e^{\left(\bar{x}+0.5s^2+sH/\sqrt{n-1}\right)} \quad (2)$$

Where:

UCL = upper confidence limit

e = constant (base of the natural log, equal to 2.718)

$\bar{x}$ = mean of the log-transformed data

s = standard deviation of the log-transformed data

H = H-statistic (Table A12 in Gilbert, 1987)

n = number of samples

When data are non-normal, then non-parametric methods were used to estimate UCL95% using EPA statistical calculation package available through regional EPA program for such estimations (ProUCL, Version 2.0, Prepared by Environmental Services, Lockheed Martin, under contract to EPA 2001).

Population Comparison Testing

Kruskal-Wallis Test

Hypothesis

H_o: The populations from which the k data sets have been drawn have the same mean.

H_a: At least one population has a mean larger or smaller than at least one other population

Assumptions

1. The *k* distributions are assumed to be identical in shape

Test Statistic

1. Rank the *m* data from smallest to largest. Assign midranks to ties.
2. Compute the sum of the ranks for each k data sets. Denote the sum of the jth data set by R_j
3. If there are no tied values compute:

$$K_w = \left[\frac{12}{m(m+1)}\sum_{j=1}^{k}\frac{R_j^2}{n_j}\right] - 3(m+1)$$

If there are tied values compute:

$$K'_w = \frac{K_w}{1-\frac{1}{m(m^2-1)}\sum_{j=1}^{g} t_j(t_j^2-1)}$$

Where:

n_j = number of samples in the jth dataset

$m = n_1 + n_2 + \ldots + n_k$

R_j = sum of the ranks of the jth dataset

g = number of tied groups

t_j = number of tied data in the jth group

Decision Rule:

Reject H_o and accept H_a at an α level of signficance if:

$$K'_w \geq \chi^2_{1-\propto,k-1}$$

Where,

$\chi^2_{1-\propto,k-1}$ is the $1-\propto$ quantile of the chi-square distribution with k-1 degrees of freedom and can be found in Table A19 of Gilbert (1987).

Source:

Gilbert, 1987

REFERENCES

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York.

USEPA, 1992. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Addendum to Interim Final Guidance. Draft.

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
KTD-ROCK														
KTD-ROCK4	D02	RK	CU	DD	-127.8	127.8	**13**	**D**	59	D				
KTD-ROCK4	D02	RK	MN	DD	-29.4	29.4	**580**	**D**	780	D				
KTD-ROCK4	D02	RK	CR	DD	-28.6	28.6	**1.5**	**D**	2	D				
KTD-ROCK4	D02	RK	NA	DD	-14.4	14.4	**580**	**D**	670	D				
KTD-ROCK4	D02	RK	CO	DD	-12.2	12.2	**4.6**	**D**	5.2	D				
KTD-ROCK4	D02	RK	MG	DD	-3.0	3.0	**3300**	**D**	3400	D				
KTD-ROCK4	D02	RK	ZN	DD	-2.4	2.4	**42**	**D**	43	D				
KTD-ROCK4	D02	RK	AL	DD	0.0	0.0	**4400**	**D**	4400	D				
KTD-ROCK4	D02	RK	FE	DD	0.0	0.0	**10000**	**D**	10000	D				
KTD-ROCK4	D02	RK	K	DD	5.3	5.3	**390**	**D**	370	D				
KTD-ROCK4	D02	RK	V	DD	9.1	9.1	**23**	**D**	21	D				
KTD-ROCK4	D02	RK	CA	DD	9.5	9.5	**2200**	**D**	2000	D				
KTD-ROCK4	D02	RK	NI	DD	32.6	32.6	**2.5**	**D**	1.8	D				
KTD-ROCK4	D02	RK	BA	DD	33.6	33.6	**87**	**D**	62	D				
KTD-ROCK4	D02	RK	HG	DU	18.2	18.2	**0.003**	**D**	0.0025	U				
KTD-ROCK4	D02	RK	PB	UD	-156.2	156.2	**0.16**	**U**	1.3	D				
KTD-ROCK4	D02	RK	AG	UU	0.0	0.0	**0.057**	**U**	0.057	U				
KTD-ROCK4	D02	RK	AS	UU	0.0	0.0	**0.29**	**U**	0.29	U				
KTD-ROCK4	D02	RK	BE	UU	0.0	0.0	**0.033**	**U**	0.033	U				
KTD-ROCK4	D02	RK	CD	UU	0.0	0.0	**0.027**	**U**	0.027	U				
KTD-ROCK4	D02	RK	SB	UU	0.0	0.0	**0.24**	**U**	0.24	U				
KTD-ROCK4	D02	RK	SE	UU	0.0	0.0	**0.46**	**U**	0.46	U				
KTD-ROCK4	D02	RK	TL	UU	0.0	0.0	**0.34**	**U**	0.34	U				
				MEAN	-11.6	21.0								

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
SUBSURFACE SOILS														
QA-SB01	D06	SB	SE	DD	-31.6	31.6	**0.8**	**D**	1.1	D				
QA-SB01	D06	SB	K	DD	-17.8	17.8	**820**	**D**	980	D				
QA-SB01	D06	SB	HG	DD	-17.4	17.4	**0.0084**	**D**	0.01	D				
QA-SB01	D06	SB	AL	DD	-17.1	17.1	**16000**	**D**	19000	D				
QA-SB01	D06	SB	NI	DD	-14.4	14.4	**4.5**	**D**	5.2	D				
QA-SB01	D06	SB	BE	DD	-11.5	11.5	**0.41**	**D**	0.46	D				
QS-SB07	D10	SB	ZN	DD	-10.9	10.9	**5.2**	**D**	5.8	D				
QS-SB07	D10	SB	FE	DD	-9.3	9.3	**4100**	**D**	4500	D				
QS-SB07	D10	SB	CU	DD	-6.6	6.6	**4.4**	**D**	4.7	D				
QS-SB07	D10	SB	MN	DD	-3.6	3.6	**55**	**D**	57	D				
QS-SB07	D10	SB	NA	DD	-2.7	2.7	**3600**	**D**	3700	D				
QS-SB07	D10	SB	BA	DD	-1.5	1.5	**6.6**	**D**	6.7	D				
QS-SB07	D10	SB	AL	DD	0.0	0.0	**3200**	**D**	3200	D				
QS-SB07	D10	SB	CO	DD	0.0	0.0	**1.9**	**D**	1.9	D				
QS-SB07	D10	SB	MG	DD	0.0	0.0	**1600**	**D**	1600	D				
QS-SB07	D10	SB	NI	DD	0.0	0.0	**1.2**	**D**	1.2	D				
QS-SB07	D10	SB	PB	DD	0.0	0.0	**1.6**	**D**	1.6	D				
QS-SB07	D10	SB	K	DD	1.2	1.2	**840**	**D**	830	D				
QA-SB01	D06	SB	MN	DD	2.0	2.0	**990**	**D**	970	D				
QS-SB07	D10	SB	CR	DD	2.7	2.7	**3.7**	**D**	3.6	D				
QA-SB01	D06	SB	CA	DD	3.2	3.2	**32000**	**D**	31000	D				
QA-SB01	D06	SB	NA	DD	6.4	6.4	**810**	**D**	760	D				
QS-SB07	D10	SB	CA	DD	8.0	8.0	**26000**	**D**	24000	D				
QS-SB07	D10	SB	V	DD	11.1	11.1	**19**	**D**	17	D				
QA-SB01	D06	SB	FE	DD	11.8	11.8	**27000**	**D**	24000	D				
QA-SB01	D06	SB	V	DD	12.0	12.0	**88**	**D**	78	D				
QA-SB01	D06	SB	CO	DD	13.3	13.3	**16**	**D**	14	D				
QA-SB01	D06	SB	CU	DD	13.3	13.3	**32**	**D**	28	D				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
SUBSURFACE SOILS (CONTINUED)														
QA-SB01	D06	SB	ZN	DD	14.8	14.8	**29**	**D**	25	D				
QA-SB01	D06	SB	MG	DD	19.2	19.2	**4000**	**D**	3300	D				
QA-SB01	D06	SB	PB	DD	23.3	23.3	**4.8**	**D**	3.8	D				
QA-SB01	D06	SB	CR	DD	28.9	28.9	**9.9**	**D**	7.4	D				
QA-SB01	D06	SB	BA	DD	32.7	32.7	**320**	**D**	230	D				
QA-SB01	D06	SB	AS	DU	70.5	70.5	**0.71**	**D**	0.34	U				
QA-SB01	D06	SB	SB	DU	71.3	71.3	**0.59**	**D**	0.28	U				
QS-SB07	D10	SB	AS	DU	99.3	99.3	**1.1**	**D**	0.37	U				
QA-SB01	D06	SB	CD	UU	-14.9	14.9	**0.031**	**U**	0.036	U				
QA-SB01	D06	SB	AG	UU	-14.1	14.1	**0.066**	**U**	0.076	U				
QS-SB07	D10	SB	CD	UU	0.0	0.0	**0.035**	**U**	0.035	U				
QS-SB07	D10	SB	HG	UU	0.0	0.0	**0.0032**	**U**	0.0032	U				
QS-SB07	D10	SB	SB	UU	0.0	0.0	**0.31**	**U**	0.31	U				
QS-SB07	D10	SB	TL	UU	0.0	0.0	**0.44**	**U**	0.44	U				
QS-SB07	D10	SB	AG	UU	1.4	1.4	**0.074**	**U**	0.073	U				
QS-SB07	D10	SB	SE	UU	1.7	1.7	**0.6**	**U**	0.59	U				
QS-SB07	D10	SB	BE	UU	2.4	2.4	**0.043**	**U**	0.042	U				
QA-SB01	D06	SB	TL	UU	11.8	11.8	**0.45**	**U**	0.4	U				
				MEAN	6.3	13.8								

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
SURFACE SOILS														
QA-SS08	D07	SS	HG	DD	-47.1	47.1	**0.013**	**D**	0.021	D				
KTD-SS01	D03	SS	AS	DD	-34.1	34.1	**0.85**	**D**	1.2	D				
QA-SS08	D07	SS	PB	DD	-29.5	29.5	**2.6**	**D**	3.5	D				
KTD-SS02	D04	SS	MN	DD	-21.5	21.5	**290**	**D**	360	D				
KTD-SS02	D04	SS	FE	DD	-21.1	21.1	**17000**	**D**	21000	D				
QA-SS08	D07	SS	NI	DD	-18.2	18.2	**2**	**D**	2.4	D				
KTD-SS02	D04	SS	NA	DD	-16.3	16.3	**79**	**D**	93	D				
QS-SS03	D12	SS	NA	DD	-15.7	15.7	**470**	**D**	550	D				
QS-SS03	D12	SS	CR	DD	-14.6	14.6	**3.8**	**D**	4.4	D				
KTD-SS01	D03	SS	CR	DD	-13.0	13.0	**36**	**D**	41	D				
KTD-SS02	D04	SS	CU	DD	-12.5	12.5	**30**	**D**	34	D				
KTD-SS02	D04	SS	K	DD	-12.4	12.4	**680**	**D**	770	D				
KTD-SS02	D04	SS	ZN	DD	-11.3	11.3	**25**	**D**	28	D				
KTD-SS02	D04	SS	PB	DD	-8.7	8.7	**1.1**	**D**	1.2	D				
QA-SS08	D07	SS	V	DD	-8.5	8.5	**34**	**D**	37	D				
QA-SS08	D07	SS	MG	DD	-8.0	8.0	**1200**	**D**	1300	D				
KTD-SS01	D03	SS	HG	DD	-8.0	8.0	**0.024**	**D**	0.026	D				
QA-SS08	D07	SS	K	DD	-7.9	7.9	**610**	**D**	660	D				
KTD-SS01	D03	SS	V	DD	-7.0	7.0	**69**	**D**	74	D				
QS-SS03	D12	SS	FE	DD	-6.9	6.9	**4200**	**D**	4500	D				
QA-SS08	D07	SS	NA	DD	-6.2	6.2	**94**	**D**	100	D				
QA-SS08	D07	SS	CA	DD	-5.4	5.4	**1800**	**D**	1900	D				
KTD-SS01	D03	SS	BA	DD	-4.8	4.8	**61**	**D**	64	D				
QA-SS08	D07	SS	AL	DD	-4.7	4.7	**6200**	**D**	6500	D				
QS-SS03	D12	SS	CA	DD	-4.3	4.3	**45000**	**D**	47000	D				
QA-SS08	D07	SS	ZN	DD	-4.3	4.3	**23**	**D**	24	D				
KTD-SS01	D03	SS	CA	DD	-4.0	4.0	**4900**	**D**	5100	D				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
SURFACE SOILS (CONTINUED)														
QA-SS08	D07	SS	BE	DD	-3.0	3.0	**0.33**	**D**	0.34	D				
QS-SS03	D12	SS	PB	DD	-1.5	1.5	**6.8**	**D**	6.9	D				
QA-SS08	D07	SS	BA	DD	-1.1	1.1	**91**	**D**	92	D				
KTD-SS01	D03	SS	BE	DD	0.0	0.0	**0.17**	**D**	0.17	D				
KTD-SS01	D03	SS	MN	DD	0.0	0.0	**640**	**D**	640	D				
KTD-SS01	D03	SS	SB	DD	0.0	0.0	**1.2**	**D**	1.2	D				
KTD-SS02	D04	SS	NI	DD	0.0	0.0	**1.8**	**D**	1.8	D				
QS-SS03	D12	SS	BA	DD	0.0	0.0	**12**	**D**	12	D				
QS-SS03	D12	SS	CO	DD	0.0	0.0	**1**	**D**	1	D				
QS-SS03	D12	SS	CU	DD	0.0	0.0	**7.1**	**D**	7.1	D				
QS-SS03	D12	SS	K	DD	0.0	0.0	**490**	**D**	490	D				
QS-SS03	D12	SS	V	DD	0.0	0.0	**12**	**D**	12	D				
QS-SS03	D12	SS	ZN	DD	0.0	0.0	**24**	**D**	24	D				
KTD-SS01	D03	SS	MG	DD	2.4	2.4	**4300**	**D**	4200	D				
KTD-SS01	D03	SS	ZN	DD	2.7	2.7	**37**	**D**	36	D				
KTD-SS01	D03	SS	FE	DD	3.9	3.9	**26000**	**D**	25000	D				
QS-SS03	D12	SS	AL	DD	4.4	4.4	**2300**	**D**	2200	D				
KTD-SS02	D04	SS	AL	DD	4.8	4.8	**8600**	**D**	8200	D				
KTD-SS01	D03	SS	PB	DD	4.9	4.9	**4.2**	**D**	4	D				
KTD-SS01	D03	SS	AL	DD	5.7	5.7	**18000**	**D**	17000	D				
QA-SS08	D07	SS	CR	DD	6.5	6.5	**4.8**	**D**	4.5	D				
QA-SS08	D07	SS	FE	DD	6.9	6.9	**15000**	**D**	14000	D				
KTD-SS02	D04	SS	SB	DD	7.3	7.3	**0.71**	**D**	0.66	D				
QA-SS08	D07	SS	CU	DD	7.4	7.4	**9.8**	**D**	9.1	D				
KTD-SS01	D03	SS	CO	DD	8.0	8.0	**13**	**D**	12	D				
KTD-SS01	D03	SS	NI	DD	8.0	8.0	**13**	**D**	12	D				
QS-SS03	D12	SS	AS	DD	8.0	8.0	**1.3**	**D**	1.2	D				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
SURFACE SOILS (CONTINUED)														
KTD-SS02	D04	SS	CA	DD	8.5	8.5	**3700**	**D**	3400	D				
QS-SS03	D12	SS	NI	DD	8.7	8.7	**1.2**	**D**	1.1	D				
QA-SS08	D07	SS	MN	DD	8.7	8.7	**1200**	**D**	1100	D				
QS-SS03	D12	SS	MN	DD	9.4	9.4	**67**	**D**	61	D				
QA-SS08	D07	SS	CO	DD	9.9	9.9	**7.4**	**D**	6.7	D				
KTD-SS01	D03	SS	CU	DD	10.5	10.5	**30**	**D**	27	D				
QA-SS08	D07	SS	AS	DD	11.4	11.4	**0.74**	**D**	0.66	D				
KTD-SS02	D04	SS	MG	DD	12.5	12.5	**3400**	**D**	3000	D				
QS-SS03	D12	SS	MG	DD	13.3	13.3	**1600**	**D**	1400	D				
KTD-SS02	D04	SS	BA	DD	14.6	14.6	**66**	**D**	57	D				
QS-SS03	D12	SS	BE	DD	15.4	15.4	**0.21**	**D**	0.18	D				
QS-SS03	D12	SS	HG	DD	16.7	16.7	**0.013**	**D**	0.011	D				
KTD-SS02	D04	SS	CO	DD	17.2	17.2	**8.2**	**D**	6.9	D				
KTD-SS01	D03	SS	K	DD	19.2	19.2	**1200**	**D**	990	D				
KTD-SS02	D04	SS	V	DD	23.0	23.0	**63**	**D**	50	D				
KTD-SS02	D04	SS	CR	DD	25.4	25.4	**4**	**D**	3.1	D				
KTD-SS01	D03	SS	NA	DD	26.7	26.7	**170**	**D**	130	D				
QA-SS08	D07	SS	SE	DD	29.2	29.2	**1.1**	**D**	0.82	D				
KTD-SS02	D04	SS	AS	UD	-47.4	47.4	**0.37**	**U**	0.6	D				
KTD-SS02	D04	SS	HG	UD	-14.5	14.5	**0.0032**	**U**	0.0037	D				
QS-SS03	D12	SS	SB	UU	-15.4	15.4	**0.3**	**U**	0.35	U				
QS-SS03	D12	SS	TL	UU	-15.1	15.1	**0.43**	**U**	0.5	U				
QS-SS03	D12	SS	SE	UU	-14.4	14.4	**0.58**	**U**	0.67	U				
KTD-SS02	D04	SS	BE	UU	-12.7	12.7	**0.037**	**U**	0.042	U				
KTD-SS02	D04	SS	SE	UU	-10.9	10.9	**0.52**	**U**	0.58	U				
KTD-SS02	D04	SS	AG	UU	-10.2	10.2	**0.065**	**U**	0.072	U				
KTD-SS02	D04	SS	TL	UU	-9.8	9.8	**0.39**	**U**	0.43	U				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
SURFACE SOILS (CONTINUED)														
KTD-SS01	D03	SS	SE	UU	-1.9	1.9	**0.51**	**U**	0.52	U				
QA-SS08	D07	SS	SB	UU	0.0	0.0	**0.3**	**U**	0.3	U				
QA-SS08	D07	SS	TL	UU	0.0	0.0	**0.42**	**U**	0.42	U				
QA-SS08	D07	SS	AG	UU	1.4	1.4	**0.071**	**U**	0.07	U				
KTD-SS01	D03	SS	AG	UU	1.6	1.6	**0.065**	**U**	0.064	U				
KTD-SS01	D03	SS	TL	UU	2.6	2.6	**0.39**	**U**	0.38	U				
QA-SS08	D07	SS	CD	UU	3.0	3.0	**0.034**	**U**	0.033	U				
KTD-SS01	D03	SS	CD	UU	3.3	3.3	**0.031**	**U**	0.03	U				
KTD-SS02	D04	SS	CD	UU	9.2	9.2	**0.034**	**U**	0.031	U				
QS-SS03	D12	SS	AG	UU	14.2	14.2	**0.083**	**U**	0.072	U				
QS-SS03	D12	SS	CD	UU	16.2	16.2	**0.04**	**U**	0.034	U				
				MEAN	-1.1	10.1								

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
SEDIMENTS														
QB-SED03	D08	SD	CA	DD	-33.6	33.6	**57000**	**D**	80000	D				
QS-SED01	D11	SD	HG	DD	-18.9	18.9	**0.043**	**D**	0.052	D				
QS-SED01	D11	SD	V	DD	-18.9	18.9	**24**	**D**	29	D				
QS-SED01	D11	SD	BA	DD	18.4	18.4	**8.3**	**D**	6.9	D				
QB-SED03	D08	SD	NI	DD	-18.2	18.2	**2**	**D**	2.4	D				
QS-SED01	D11	SD	AL	DD	14.5	14.5	**7400**	**D**	6400	D				
QB-SED03	D08	SD	PB	DD	14.0	14.0	**9.2**	**D**	8	D				
QB-SED03	D08	SD	ZN	DD	-13.6	13.6	**48**	**D**	55	D				
QB-SED03	D08	SD	V	DD	13.3	13.3	**32**	**D**	28	D				
QS-SED01	D11	SD	CO	DD	12.2	12.2	**2.6**	**D**	2.3	D				
QB-SED03	D08	SD	CU	DD	10.9	10.9	**29**	**D**	26	D				
QB-SED03	D08	SD	MN	DD	10.8	10.8	**390**	**D**	350	D				
QS-SED01	D11	SD	CR	DD	9.8	9.8	**8.6**	**D**	7.8	D				
QB-SED03	D08	SD	AL	DD	9.5	9.5	**11000**	**D**	10000	D				
QS-SED01	D11	SD	NI	DD	9.3	9.3	**4.5**	**D**	4.1	D				
QB-SED03	D08	SD	CO	DD	8.2	8.2	**5.1**	**D**	4.7	D				
QB-SED03	D08	SD	MG	DD	-8.0	8.0	**12000**	**D**	13000	D				
QS-SED01	D11	SD	K	DD	-7.4	7.4	**5200**	**D**	5600	D				
QB-SED03	D08	SD	K	DD	-7.2	7.2	**4000**	**D**	4300	D				
QB-SED03	D08	SD	FE	DD	-6.9	6.9	**14000**	**D**	15000	D				
QS-SED01	D11	SD	PB	DD	-6.5	6.5	**6**	**D**	6.4	D				
QB-SED03	D08	SD	CR	DD	-5.7	5.7	**5.1**	**D**	5.4	D				
QS-SED01	D11	SD	FE	DD	5.3	5.3	**7700**	**D**	7300	D				
QS-SED01	D11	SD	CU	DD	-4.3	4.3	**23**	**D**	24	D				
QB-SED03	D08	SD	BE	DD	4.3	4.3	**0.24**	**D**	0.23	D				
QB-SED03	D08	SD	BA	DD	-4.2	4.2	**47**	**D**	49	D				
QS-SED01	D11	SD	MN	DD	4.0	4.0	**51**	**D**	49	D				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
SEDIMENTS (CONTINUED)														
QS-SED01	D11	SD	CA	DD	-3.3	3.3	**8900**	**D**	9200	D				
QS-SED01	D11	SD	NA	DD	2.9	2.9	**69000**	**D**	67000	D				
QB-SED03	D08	SD	HG	DD	0.0	0.0	**0.013**	**D**	0.013	D				
QB-SED03	D08	SD	NA	DD	0.0	0.0	**17000**	**D**	17000	D				
QB-SED03	D08	SD	SE	DD	0.0	0.0	**1.1**	**D**	1.1	D				
QS-SED01	D11	SD	MG	DD	0.0	0.0	**14000**	**D**	14000	D				
QS-SED01	D11	SD	ZN	DD	0.0	0.0	**24**	**D**	24	D				
QB-SED03	D08	SD	SB	UU	-2.0	2.0	**0.49**	**U**	0.5	U				
QB-SED03	D08	SD	TL	UU	-1.4	1.4	**0.7**	**U**	0.71	U				
QB-SED03	D08	SD	AG	UU	0.0	0.0	**0.12**	**U**	0.12	U				
QB-SED03	D08	SD	AS	UU	0.0	0.0	**0.6**	**U**	0.6	U				
QB-SED03	D08	SD	CD	UU	0.0	0.0	**0.056**	**U**	0.056	U				
QS-SED01	D11	SD	AG	UU	0.0	0.0	**0.3**	**U**	0.3	U				
QS-SED01	D11	SD	AS	UU	0.0	0.0	**1.5**	**U**	1.5	U				
QS-SED01	D11	SD	BE	UU	0.0	0.0	**0.17**	**U**	0.17	U				
QS-SED01	D11	SD	CD	UU	0.0	0.0	**0.14**	**U**	0.14	U				
QS-SED01	D11	SD	SB	UU	0.0	0.0	**1.3**	**U**	1.3	U				
QS-SED01	D11	SD	SE	UU	0.0	0.0	**2.4**	**U**	2.4	U				
QS-SED01	D11	SD	TL	UU	0.0	0.0	**1.8**	**U**	1.8	U				
				MEAN	-0.3	6.7								

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
GROUNDWATER														
KTD-NAVY1	D01	WG	TLd	DD	-30.9	30.9	**6.3**	**D**	8.6	D				
QA-MW02	D05	WG	TLd	DD	-10.4	10.4	**6.4**	**D**	7.1	D				
QA-MW02	D05	WG	Vt	DD	-9.0	9.0	**3.2**	**D**	3.5	D				
QA-MW02	D05	WG	FEt	DD	-8.7	8.7	**440**	**D**	480	D				
KTD-NAVY1	D01	WG	TLt	DD	-8.0	8.0	**7.2**	**D**	7.8	D				
QA-MW02	D05	WG	MNt	DD	-7.4	7.4	**910**	**D**	980	D				
QA-MW02	D05	WG	NAt	DD	-6.9	6.9	**1400000**	**D**	1500000	D				
KTD-NAVY1	D01	WG	NIt	DD	-5.4	5.4	**1.8**	**D**	1.9	D				
KTD-NAVY1	D01	WG	CAd	DD	-5.2	5.2	**56000**	**D**	59000	D				
QA-MW02	D05	WG	Kt	DD	-5.2	5.2	**56000**	**D**	59000	D				
KTD-NAVY1	D01	WG	Kd	DD	-3.9	3.9	**2500**	**D**	2600	D				
KTD-NAVY1	D01	WG	CAt	DD	-3.5	3.5	**56000**	**D**	58000	D				
KTD-NAVY1	D01	WG	FEd	DD	-3.5	3.5	**2800**	**D**	2900	D				
KTD-NAVY1	D01	WG	FEt	DD	-2.9	2.9	**3400**	**D**	3500	D				
KTD-NAVY1	D01	WG	MNt	DD	-2.0	2.0	**98**	**D**	100	D				
KTD-NAVY1	D01	WG	BAt	DD	0.0	0.0	**73**	**D**	73	D				
KTD-NAVY1	D01	WG	NAd	DD	0.0	0.0	**150000**	**D**	150000	D				
QA-MW02	D05	WG	BAd	DD	0.0	0.0	**230**	**D**	230	D				
QA-MW02	D05	WG	CAd	DD	0.0	0.0	**330000**	**D**	330000	D				
QA-MW02	D05	WG	FEd	DD	0.0	0.0	**420**	**D**	420	D				
QA-MW02	D05	WG	Kd	DD	0.0	0.0	**60000**	**D**	60000	D				
QA-MW02	D05	WG	MGd	DD	0.0	0.0	**310000**	**D**	310000	D				
QA-MW02	D05	WG	NAd	DD	0.0	0.0	**1500000**	**D**	1500000	D				
KTD-NAVY1	D01	WG	MGt	DD	2.9	2.9	**35000**	**D**	34000	D				
QA-MW02	D05	WG	CAt	DD	3.1	3.1	**330000**	**D**	320000	D				
KTD-NAVY1	D01	WG	Kt	DD	3.9	3.9	**2600**	**D**	2500	D				
KTD-NAVY1	D01	WG	MNd	DD	4.2	4.2	**98**	**D**	94	D				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
GROUNDWATER (CONTINUED)														
QA-MW02	D05	WG	BAt	DD	4.7	4.7	**220**	**D**	210	D				
KTD-NAVY1	D01	WG	BAd	DD	5.5	5.5	**75**	**D**	71	D				
KTD-NAVY1	D01	WG	MGd	DD	5.7	5.7	**36000**	**D**	34000	D				
QA-MW02	D05	WG	MGt	DD	6.7	6.7	**310000**	**D**	290000	D				
KTD-NAVY1	D01	WG	NAt	DD	6.9	6.9	**150000**	**D**	140000	D				
QA-MW02	D05	WG	Vd	DD	7.4	7.4	**2.8**	**D**	2.6	D				
QA-MW02	D05	WG	MNd	DD	9.5	9.5	**1100**	**D**	1000	D				
KTD-NAVY1	D01	WG	NId	DD	10.0	10.0	**2.1**	**D**	1.9	D				
QA-MW02	D05	WG	NIt	DD	10.2	10.2	**3.1**	**D**	2.8	D				
KTD-NAVY1	D01	WG	ZNt	DD	16.4	16.4	**9.9**	**D**	8.4	D				
KTD-NAVY1	D01	WG	ZNd	DD	17.9	17.9	**6.7**	**D**	5.6	D				
QA-MW02	D05	WG	NId	DD	18.2	18.2	**2.4**	**D**	2	D				
KTD-NAVY1	D01	WG	Vd	DD	18.2	18.2	**3**	**D**	2.5	D				
QA-MW02	D05	WG	TLt	DD	22.2	22.2	**6**	**D**	4.8	D				
KTD-NAVY1	D01	WG	Vt	DD	51.0	51.0	**3.2**	**D**	1.9	D				
QA-MW02	D05	WG	COt	UD	-94.5	94.5	**0.43**	**U**	1.2	D				
KTD-NAVY1	D01	WG	ALd	UD	-79.4	79.4	**95**	**U**	220	D				
QA-MW02	D05	WG	ALt	UD	-31.1	31.1	**95**	**U**	130	D				
KTD-NAVY1	D01	WG	BEd	UD	0.0	0.0	**0.33**	**U**	0.33	D				
KTD-NAVY1	D01	WG	AGd	UU	0.0	0.0	**0.57**	**U**	0.57	U				
KTD-NAVY1	D01	WG	AGt	UU	0.0	0.0	**0.57**	**U**	0.57	U				
KTD-NAVY1	D01	WG	ALt	UU	0.0	0.0	**95**	**U**	95	U				
KTD-NAVY1	D01	WG	ASd	UU	0.0	0.0	**2.9**	**U**	2.9	U				
KTD-NAVY1	D01	WG	ASt	UU	0.0	0.0	**2.9**	**U**	2.9	U				
KTD-NAVY1	D01	WG	BEt	UU	0.0	0.0	**0.33**	**U**	0.33	U				
KTD-NAVY1	D01	WG	CDd	UU	0.0	0.0	**0.27**	**U**	0.27	U				
KTD-NAVY1	D01	WG	CDt	UU	0.0	0.0	**0.27**	**U**	0.27	U				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
GROUNDWATER (CONTINUED)														
KTD-NAVY1	D01	WG	COd	UU	0.0	0.0	**0.43**	**U**	0.43	U				
KTD-NAVY1	D01	WG	COt	UU	0.0	0.0	**0.43**	**U**	0.43	U				
KTD-NAVY1	D01	WG	CRd	UU	0.0	0.0	**0.87**	**U**	0.87	U				
KTD-NAVY1	D01	WG	CRt	UU	0.0	0.0	**0.87**	**U**	0.87	U				
KTD-NAVY1	D01	WG	CUd	UU	0.0	0.0	**0.8**	**U**	0.8	U				
KTD-NAVY1	D01	WG	CUt	UU	0.0	0.0	**0.8**	**U**	0.8	U				
KTD-NAVY1	D01	WG	HGd	UU	0.0	0.0	**0.025**	**U**	0.025	U				
KTD-NAVY1	D01	WG	HGt	UU	0.0	0.0	**0.025**	**U**	0.025	U				
KTD-NAVY1	D01	WG	PBd	UU	0.0	0.0	**1.6**	**U**	1.6	U				
KTD-NAVY1	D01	WG	PBt	UU	0.0	0.0	**1.6**	**U**	1.6	U				
KTD-NAVY1	D01	WG	SBd	UU	0.0	0.0	**2.4**	**U**	2.4	U				
KTD-NAVY1	D01	WG	SBt	UU	0.0	0.0	**2.4**	**U**	2.4	U				
KTD-NAVY1	D01	WG	SEd	UU	0.0	0.0	**4.6**	**U**	4.6	U				
KTD-NAVY1	D01	WG	SEt	UU	0.0	0.0	**4.6**	**U**	4.6	U				
QA-MW02	D05	WG	AGd	UU	0.0	0.0	**0.56**	**U**	0.56	U				
QA-MW02	D05	WG	AGt	UU	0.0	0.0	**0.57**	**U**	0.57	U				
QA-MW02	D05	WG	ALd	UU	0.0	0.0	**95**	**U**	95	U				
QA-MW02	D05	WG	ASd	UU	0.0	0.0	**2.9**	**U**	2.9	U				
QA-MW02	D05	WG	ASt	UU	0.0	0.0	**2.9**	**U**	2.9	U				
QA-MW02	D05	WG	BEd	UU	0.0	0.0	**0.33**	**U**	0.33	U				
QA-MW02	D05	WG	BEt	UU	0.0	0.0	**0.33**	**U**	0.33	U				
QA-MW02	D05	WG	CDd	UU	0.0	0.0	**0.27**	**U**	0.27	U				
QA-MW02	D05	WG	CDt	UU	0.0	0.0	**0.27**	**U**	0.27	U				
QA-MW02	D05	WG	COd	UU	0.0	0.0	**0.43**	**U**	0.43	U				
QA-MW02	D05	WG	CRd	UU	0.0	0.0	**0.87**	**U**	0.87	U				
QA-MW02	D05	WG	CRt	UU	0.0	0.0	**0.87**	**U**	0.87	U				
QA-MW02	D05	WG	CUd	UU	0.0	0.0	**0.8**	**U**	0.8	U				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
GROUNDWATER (CONTINUED)														
QA-MW02	D05	WG	CUt	UU	0.0	0.0	**0.8**	**U**	0.8	U				
QA-MW02	D05	WG	HGd	UU	0.0	0.0	**0.025**	**U**	0.025	U				
QA-MW02	D05	WG	HGt	UU	0.0	0.0	**0.025**	**U**	0.025	U				
QA-MW02	D05	WG	PBd	UU	0.0	0.0	**1.6**	**U**	1.6	U				
QA-MW02	D05	WG	PBt	UU	0.0	0.0	**1.6**	**U**	1.6	U				
QA-MW02	D05	WG	SBd	UU	0.0	0.0	**2.4**	**U**	2.4	U				
QA-MW02	D05	WG	SBt	UU	0.0	0.0	**2.4**	**U**	2.4	U				
QA-MW02	D05	WG	SEd	UU	0.0	0.0	**4.6**	**U**	4.6	U				
QA-MW02	D05	WG	SEt	UU	0.0	0.0	**4.6**	**U**	4.6	U				
QA-MW02	D05	WG	ZNd	UU	0.0	0.0	**5**	**U**	5	U				
QA-MW02	D05	WG	ZNt	UU	0.0	0.0	**5**	**U**	5	U				
				MEAN	-1.0	5.9								
SURFACE WATERS														
QS-SW01	D13	WS	ASt	DD	-97.0	97.0	**5.2**	**D**	15	D				
QS-SW01	D13	WS	BAt	DD	-59.6	59.6	**20**	**D**	37	D				
QB-SW03	D09	WS	ZNt	DD	-46.2	46.2	**1000**	**D**	1600	D				
QB-SW03	D09	WS	CUt	DD	-45.6	45.6	**610**	**D**	970	D				
QB-SW03	D09	WS	BAt	DD	-44.9	44.9	**760**	**D**	1200	D				
QB-SW03	D09	WS	CRt	DD	-42.4	42.4	**78**	**D**	120	D				
QB-SW03	D09	WS	FEt	DD	-38.6	38.6	**230000**	**D**	340000	D				
QB-SW03	D09	WS	CAt	DD	-33.0	33.0	**8600000**	**D**	12000000	D				
QB-SW03	D09	WS	BEt	DD	-26.8	26.8	**8.4**	**D**	11	D				
QS-SW01	D13	WS	TLt	DD	-25.6	25.6	**7.5**	**D**	9.7	D				
QS-SW01	D13	WS	MGt	DD	-18.2	18.2	**1000000**	**D**	1000000	D	1100000	D	1200000	D
QB-SW03	D09	WS	MGt	DD	-7.4	7.4	**13000000**	**D**	14000000	D				
QS-SW01	D13	WS	CAt	DD	-2.6	2.6	**380000**	**D**	390000	D				
QB-SW03	D09	WS	NAt	DD	-1.6	1.6	**64000000**	**D**	65000000	D				
QB-SW03	D09	WS	ASt	DD	5.4	5.4	**19**	**D**	18	D				

344 PAIRED RESULTS BY MATRIX

Station ID	DUP	Matrix	P	QQ	RPD	RPDabs	1	Q1	2	Q2	3	Q3	4	Q4
QS-SW01	D13	WS	Kt	DD	6.7	6.7	**620000**	**D**	580000	D				
QB-SW03	D09	WS	Kt	DD	8.3	8.3	**6300000**	**D**	5800000	D				
QS-SW01	D13	WS	BEt	DD	8.7	8.7	**1.2**	**D**	1.1	D				
QB-SW03	D09	WS	SBt	DD	26.1	26.1	**13**	**D**	10	D				
QB-SW03	D09	WS	NIt	DD	34.6	34.6	**61**	**D**	43	D				
QB-SW03	D09	WS	Vt	DD	42.1	42.1	**690**	**D**	450	D				
QS-SW01	D13	WS	NIt	DD	44.7	44.7	**5.2**	**D**	3.3	D				
QB-SW03	D09	WS	COt	DD	44.9	44.9	**120**	**D**	76	D				
QB-SW03	D09	WS	PBt	DD	46.9	46.9	**150**	**D**	93	D				
QB-SW03	D09	WS	CDt	DD	51.6	51.6	**39**	**D**	23	D				
QB-SW03	D09	WS	MNt	DD	51.9	51.9	**17000**	**D**	10000	D				
QS-SW01	D13	WS	NAt	DD	52.9	52.9	**8600000**	**D**	8200000	D	5000000	D		
QS-SW01	D13	WS	COt	DD	58.1	58.1	**2**	**D**	1.1	D				
QB-SW03	D09	WS	AGt	DD	59.5	59.5	**2.4**	**D**	1.3	D				
QS-SW01	D13	WS	MNt	DD	59.5	59.5	**85**	**D**	46	D				
QS-SW01	D13	WS	Vt	DD	93.8	93.8	**8.3**	**D**	3	D				
QS-SW01	D13	WS	FEt	DD	101.5	101.5	**4900**	**D**	1600	D				
QS-SW01	D13	WS	CUt	DD	102.7	102.7	**14**	**D**	4.5	D				
QS-SW01	D13	WS	ALt	DD	107.7	107.7	**5000**	**D**	1500	D				
QS-SW01	D13	WS	CRt	DD	112.7	112.7	**4.3**	**D**	1.2	D				
QS-SW01	D13	WS	CDt	DU	121.2	121.2	**1.1**	**D**	0.27	U				
QB-SW03	D09	WS	TLt	UU	-120.0	120.0	**3.4**	**U**	13.6	U				
QB-SW03	D09	WS	HGt	UU	0.0	0.0	**0.025**	**U**	0.025	U				
QB-SW03	D09	WS	SEt	UU	0.0	0.0	**18.4**	**U**	18.4	U				
QS-SW01	D13	WS	AGt	UU	0.0	0.0	**0.57**	**U**	0.57	U				
QS-SW01	D13	WS	HGt	UU	0.0	0.0	**0.025**	**U**	0.025	U				
QS-SW01	D13	WS	PBt	UU	0.0	0.0	**1.6**	**U**	1.6	U				
QS-SW01	D13	WS	SBt	UU	0.0	0.0	**2.4**	**U**	2.4	U				
QS-SW01	D13	WS	SEt	UU	0.0	0.0	**4.6**	**U**	4.6	U				
QS-SW01	D13	WS	ZNt	UU	0.0	0.0	**5**	**U**	5	U				
				MEAN	14.0	41.1								

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
RK	BKG072	E200.7	SW3050	SELENIUM	0.47	U	0.47	UJ	0.47	1	mg/Kg	CC
RK	BKG073	E200.7	SW3050	SELENIUM	0.46	U	0.46	UJ	0.46	1	mg/Kg	CC
RK	BKG074	E200.7	SW3050	SELENIUM	0.46	U	0.46	UJ	0.46	1	mg/Kg	CC
RK	BKG075	E200.7	SW3050	SELENIUM	0.46	U	0.46	UJ	0.46	1	mg/Kg	CC
RK	BKG076FD1	E200.7	SW3050	SELENIUM	0.46	U	0.46	UJ	0.46	1	mg/Kg	CC
RK	BKG077	E200.7	SW3050	SELENIUM	0.46	U	0.46	UJ	0.46	1	mg/Kg	CC
SB	BKG004	E200.7	SW3050	CALCIUM	150000	E	150000	R	3.6	1290	mg/Kg	DL
SS	BKG003	E200.7	SW3050	CALCIUM	150000	E	150000	R	4.1	1480	mg/Kg	DL
SW	BKG085FD1	E200.7	SW3050	CALCIUM	1400000	E	1400000	R	28	5000	ug/L	DL
SW	BKG086	E200.7	SW3050	CALCIUM	1200000	E	1200000	R	28	5000	ug/L	DL
SW	BKG087	E200.7	SW3050	CALCIUM	1100000	E	1100000	R	28	5000	ug/L	DL
SW	BKG023	E200.7	SW3050	MAGNESIUM	1300000	E	1300000	R	13	5000	ug/L	DL
SW	BKG083	E200.7	SW3050	MAGNESIUM	1500000	E	1500000	R	13	5000	ug/L	DL
SW	BKG084	E200.7	SW3050	MAGNESIUM	1400000	E	1400000	R	13	5000	ug/L	DL
SW	BKG085FD1	E200.7	SW3050	MAGNESIUM	1800000	E	1800000	R	13	5000	ug/L	DL
SW	BKG086	E200.7	SW3050	MAGNESIUM	1800000	E	1800000	R	13	5000	ug/L	DL
SW	BKG087	E200.7	SW3050	MAGNESIUM	1500000	E	1500000	R	13	5000	ug/L	DL
WG	BKG025	E200.7	SW3050	MAGNESIUM	1200000	E	1200000	R	13	5000	ug/L	DL
WG	BKG026	E200.7	SW3050	MAGNESIUM	1400000	E	1400000	R	13	5000	ug/L	DL
WG	BKG025	E200.7	FLDFLT	MAGNESIUM, DISSOLVED	1100000	E	1100000	R	13	5000	ug/L	DL
WG	BKG026	E200.7	FLDFLT	MAGNESIUM, DISSOLVED	1400000	E	1400000	R	13	5000	ug/L	DL
SW	BKG022	E200.7	SW3050	POTASSIUM	610000	E	610000	R	30	5000	ug/L	DL
SW	BKG023	E200.7	SW3050	POTASSIUM	30	E	30	R	30	5000	ug/L	DL
SW	BKG024FD1	E200.7	SW3050	POTASSIUM	570000	=	570000	R	30	5000	ug/L	DL
SW	BKG083	E200.7	SW3050	POTASSIUM	30	U	30	R	30	5000	ug/L	DL
SW	BKG084	E200.7	SW3050	POTASSIUM	30	U	30	R	30	5000	ug/L	DL
SW	BKG085FD1	E200.7	SW3050	POTASSIUM	30	U	30	R	30	5000	ug/L	DL
SW	BKG086	E200.7	SW3050	POTASSIUM	30	U	30	R	30	5000	ug/L	DL
SW	BKG087	E200.7	SW3050	POTASSIUM	30	U	30	R	30	5000	ug/L	DL
WG	BKG026	E200.7	SW3050	POTASSIUM	30	U	30	R	30	5000	ug/L	DL
WG	BKG026	E200.7	FLDFLT	POTASSIUM, DISSOLVED	30	U	30	R	30	5000	ug/L	DL
SW	BKG084	E200.7	SW3050	SELENIUM	4.6	U	4.6	R	4.6	5	ug/L	DL
SW	BKG085FD1	E200.7	SW3050	SELENIUM	4.6	U	4.6	R	4.6	5	ug/L	DL
SW	BKG086	E200.7	SW3050	SELENIUM	4.6	U	4.6	R	4.6	5	ug/L	DL
SW	BKG022	E200.7	SW3050	SODIUM	8900000	E	8900000	R	200	5000	ug/L	DL
SW	BKG023	E200.7	SW3050	SODIUM	6000000	E	6000000	R	200	5000	ug/L	DL
SW	BKG083	E200.7	SW3050	SODIUM	7300000	E	7300000	R	200	5000	ug/L	DL
SW	BKG084	E200.7	SW3050	SODIUM	6500000	E	6500000	R	200	5000	ug/L	DL
SW	BKG085FD1	E200.7	SW3050	SODIUM	7700000	E	7700000	R	200	5000	ug/L	DL
SW	BKG086	E200.7	SW3050	SODIUM	8200000	E	8200000	R	200	5000	ug/L	DL
SW	BKG087	E200.7	SW3050	SODIUM	6700000	E	6700000	R	200	5000	ug/L	DL
WG	BKG025	E200.7	SW3050	SODIUM	11000000	E	11000000	R	200	5000	ug/L	DL
WG	BKG026	E200.7	SW3050	SODIUM	6800000	E	6800000	R	200	5000	ug/L	DL
WG	BKG046FD1	E200.7	SW3050	SODIUM	1300000	E	1300000	R	200	5000	ug/L	DL
WG	BKG047	E200.7	SW3050	SODIUM	1300000	E	1300000	R	200	5000	ug/L	DL
WG	BKG025	E200.7	FLDFLT	SODIUM, DISSOLVED	5600000	E	5600000	R	200	5000	ug/L	DL
WG	BKG026	E200.7	FLDFLT	SODIUM, DISSOLVED	7000000	E	7000000	R	200	5000	ug/L	DL
WG	BKG046FD1	E200.7	FLDFLT	SODIUM, DISSOLVED	1300000	E	1300000	R	200	5000	ug/L	DL
WG	BKG047	E200.7	FLDFLT	SODIUM, DISSOLVED	1300000	E	1300000	R	200	5000	ug/L	DL
SW	BKG085FD1	E200.7	SW3050	THALLIUM	3.4	U	3.4	R	3.4	10	ug/L	DL
SW	BKG083	E200.7	SW3050	ZINC	5	U	5	R	5	20	ug/L	DL
WG	BKG025	E200.7	SW3050	ZINC	5	U	5	R	5	20	ug/L	DL
WG	BKG026	E200.7	SW3050	ZINC	5	U	5	R	5	20	ug/L	DL
WG	BKG025	E200.7	FLDFLT	ZINC, DISSOLVED	5	U	5	R	5	20	ug/L	DL
WG	BKG026	E200.7	FLDFLT	ZINC, DISSOLVED	5	U	5	R	5	20	ug/L	DL
SB	BKG004	E200.7	SW3050	ANTIMONY	0.48	B	0.48	J	0.31	15	mg/Kg	IB
SB	BKG008	E200.7	SW3050	ANTIMONY	0.68	B	0.68	J	0.35	17	mg/Kg	IB
SD	BKG018	E200.7	SW3050	ANTIMONY	0.59	B	0.59	J	0.41	20	mg/Kg	IB
SS	BKG003	E200.7	SW3050	ANTIMONY	0.62	B	0.62	J	0.36	18	mg/Kg	IB
SS	BKG016	E200.7	SW3050	ANTIMONY	0.54	B	0.54	J	0.34	17	mg/Kg	IB
SW	BKG023	E200.7	SW3050	ANTIMONY	3.3	B	3.3	J	2.4	60	ug/L	IB
SW	BKG083	E200.7	SW3050	ANTIMONY	3.7	B	3.7	J	2.4	60	ug/L	IB
SW	BKG084	E200.7	SW3050	ANTIMONY	7.6	B	7.6	J	2.4	60	ug/L	IB
SW	BKG085FD1	E200.7	SW3050	ANTIMONY	13	B	13	J	2.4	60	ug/L	IB
SW	BKG086	E200.7	SW3050	ANTIMONY	10	B	10	J	2.4	60	ug/L	IB
SW	BKG087	E200.7	SW3050	ANTIMONY	9.4	B	9.4	J	2.4	60	ug/L	IB
WG	BKG025	E200.7	SW3050	ANTIMONY	5.1	B	5.1	J	2.4	60	ug/L	IB
WG	BKG026	E200.7	SW3050	ANTIMONY	5.2	B	5.2	J	2.4	60	ug/L	IB
WG	BKG025	E200.7	FLDFLT	ANTIMONY, DISSOLVED	9.1	B	9.1	J	2.4	60	ug/L	IB
WG	BKG026	E200.7	FLDFLT	ANTIMONY, DISSOLVED	3.8	B	3.8	J	2.4	60	ug/L	IB
SB	BKG004	E200.7	SW3050	ARSENIC	2.5	B	2.5	J	0.37	2.6	mg/Kg	IB

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SB	BKG051	E200.7	SW3050	ARSENIC	1	B	1	J	0.31	2.1	mg/Kg	IB
SB	BKG054	E200.7	SW3050	ARSENIC	0.87	B	0.87	J	0.31	2.2	mg/Kg	IB
SB	BKG058	E200.7	SW3050	ARSENIC	1	B	1	J	0.31	2.1	mg/Kg	IB
SB	BKG008	E200.7	SW3050	ARSENIC	1.9	B	1.9	J	0.42	2.9	mg/Kg	IB
SB	BKG014	E200.7	SW3050	ARSENIC	1.1	B	1.1	J	0.38	2.6	mg/Kg	IB
SB	BKG032	E200.7	SW3050	ARSENIC	0.71	B	0.71	J	0.39	2.7	mg/Kg	IB
SB	BKG038	E200.7	SW3050	ARSENIC	1.3	B	1.3	J	0.41	2.8	mg/Kg	IB
SS	BKG009	E200.7	SW3050	ARSENIC	0.79	B	0.79	J	0.31	2.1	mg/Kg	IB
SS	BKG010	E200.7	SW3050	ARSENIC	1.2	B	1.2	J	0.31	2.1	mg/Kg	IB
SS	BKG012	E200.7	SW3050	ARSENIC	2.2	B	2.2	J	0.34	2.3	mg/Kg	IB
SS	BKG033	E200.7	SW3050	ARSENIC	1.3	B	1.3	J	0.33	2.3	mg/Kg	IB
SS	BKG062	E200.7	SW3050	ARSENIC	0.59	B	0.59	J	0.3	2.1	mg/Kg	IB
SS	BKG003	E200.7	SW3050	ARSENIC	2.1	B	2.1	J	0.43	3	mg/Kg	IB
SS	BKG005	E200.7	SW3050	ARSENIC	1.3	B	1.3	J	0.35	2.4	mg/Kg	IB
SS	BKG006	E200.7	SW3050	ARSENIC	1.2	B	1.2	J	0.42	2.9	mg/Kg	IB
SS	BKG007FD1	E200.7	SW3050	ARSENIC	1.3	B	1.3	J	0.37	2.5	mg/Kg	IB
SS	BKG016	E200.7	SW3050	ARSENIC	0.84	B	0.84	J	0.41	2.8	mg/Kg	IB
SS	BKG042FD1	E200.7	SW3050	ARSENIC	0.74	B	0.74	J	0.36	2.5	mg/Kg	IB
SS	BKG043	E200.7	SW3050	ARSENIC	0.66	B	0.66	J	0.36	2.5	mg/Kg	IB
SS	BKG049	E200.7	SW3050	ARSENIC	1.2	B	1.2	J	0.33	2.3	mg/Kg	IB
SS	BKG050FD1	E200.7	SW3050	ARSENIC	0.85	B	0.85	J	0.32	2.2	mg/Kg	IB
SS	BKG052	E200.7	SW3050	ARSENIC	0.6	B	0.6	J	0.33	2.3	mg/Kg	IB
SS	BKG053	E200.7	SW3050	ARSENIC	0.87	B	0.87	J	0.36	2.5	mg/Kg	IB
SS	BKG056	E200.7	SW3050	ARSENIC	0.57	B	0.57	J	0.3	2.1	mg/Kg	IB
SS	BKG057	E200.7	SW3050	ARSENIC	0.72	B	0.72	J	0.37	2.5	mg/Kg	IB
SS	BKG059	E200.7	SW3050	ARSENIC	0.99	B	0.99	J	0.39	2.7	mg/Kg	IB
SS	BKG013	E200.7	SW3050	ARSENIC	0.79	B	0.79	J	0.36	2.5	mg/Kg	IB
SS	BKG030	E200.7	SW3050	ARSENIC	0.66	B	0.66	J	0.37	2.6	mg/Kg	IB
SS	BKG036	E200.7	SW3050	ARSENIC	0.94	B	0.94	J	0.35	2.4	mg/Kg	IB
SS	BKG039	E200.7	SW3050	ARSENIC	0.7	B	0.7	J	0.32	2.2	mg/Kg	IB
SW	BKG024FD1	E200.7	SW3050	ARSENIC	5.2	B	5.2	J	2.9	10	ug/L	IB
SW	BKG083	E200.7	SW3050	ARSENIC	7.8	B	7.8	J	2.9	10	ug/L	IB
WG	BKG025	E200.7	FLDFLT	ARSENIC, DISSOLVED	5.5	B	5.5	J	2.9	10	ug/L	IB
RK	BKG073	E200.7	SW3050	BARIUM	23	B	23	J	0.01	40	mg/Kg	IB
RK	BKG077	E200.7	SW3050	BARIUM	18	B	18	J	0.01	40	mg/Kg	IB
SB	BKG004	E200.7	SW3050	BARIUM	6.4	B	6.4	J	0.01	51	mg/Kg	IB
SB	BKG041	E200.7	SW3050	BARIUM	30	B	30	J	0.01	50	mg/Kg	IB
SB	BKG054	E200.7	SW3050	BARIUM	20	B	20	J	0.01	43	mg/Kg	IB
SB	BKG008	E200.7	SW3050	BARIUM	15	B	15	J	0.01	58	mg/Kg	IB
SB	BKG014	E200.7	SW3050	BARIUM	6.6	B	6.6	J	0.01	52	mg/Kg	IB
SB	BKG015FD1	E200.7	SW3050	BARIUM	6.7	B	6.7	J	0.01	51	mg/Kg	IB
SD	BKG017	E200.7	SW3050	BARIUM	6.9	B	6.9	J	0.06	212	mg/Kg	IB
SD	BKG018	E200.7	SW3050	BARIUM	10	B	10	J	0.02	68	mg/Kg	IB
SD	BKG019FD1	E200.7	SW3050	BARIUM	8.3	B	8.3	J	0.06	212	mg/Kg	IB
SD	BKG078	E200.7	SW3050	BARIUM	69	B	69	J	0.02	86	mg/Kg	IB
SD	BKG079	E200.7	SW3050	BARIUM	14	B	14	J	0.02	62	mg/Kg	IB
SD	BKG080FD1	E200.7	SW3050	BARIUM	47	B	47	J	0.02	83	mg/Kg	IB
SD	BKG081	E200.7	SW3050	BARIUM	49	B	49	J	0.02	82	mg/Kg	IB
SD	BKG082	E200.7	SW3050	BARIUM	22	B	22	J	0.02	60	mg/Kg	IB
SS	BKG003	E200.7	SW3050	BARIUM	6.9	B	6.9	J	0.01	59	mg/Kg	IB
SS	BKG005	E200.7	SW3050	BARIUM	22	B	22	J	0.01	49	mg/Kg	IB
SS	BKG006	E200.7	SW3050	BARIUM	12	B	12	J	0.01	59	mg/Kg	IB
SS	BKG007FD1	E200.7	SW3050	BARIUM	12	B	12	J	0.01	51	mg/Kg	IB
SS	BKG016	E200.7	SW3050	BARIUM	24	B	24	J	0.01	56	mg/Kg	IB
SS	BKG053	E200.7	SW3050	BARIUM	39	B	39	J	0.01	50	mg/Kg	IB
SS	BKG013	E200.7	SW3050	BARIUM	6.7	B	6.7	J	0.01	49	mg/Kg	IB
SW	BKG022	E200.7	SW3050	BARIUM	37	B	37	J	0.13	200	ug/L	IB
SW	BKG023	E200.7	SW3050	BARIUM	17	B	17	J	0.13	200	ug/L	IB
SW	BKG024FD1	E200.7	SW3050	BARIUM	20	B	20	J	0.13	200	ug/L	IB
WG	BKG067	E200.7	SW3050	BARIUM	73	B	73	J	0.13	200	ug/L	IB
WG	BKG068FD1	E200.7	SW3050	BARIUM	73	B	73	J	0.13	200	ug/L	IB
WG	BKG069	E200.7	SW3050	BARIUM	15	B	15	J	0.13	200	ug/L	IB
WG	BKG070	E200.7	SW3050	BARIUM	71	B	71	J	0.13	200	ug/L	IB
WG	BKG045	E200.7	SW3050	BARIUM	180	B	180	J	0.13	200	ug/L	IB
WG	BKG068FD1	E200.7	FLDFLT	BARIUM, DISSOLVED	75	B	75	J	0.13	200	ug/L	IB
WG	BKG069	E200.7	FLDFLT	BARIUM, DISSOLVED	15	B	15	J	0.13	200	ug/L	IB
WG	BKG070	E200.7	FLDFLT	BARIUM, DISSOLVED	62	B	62	J	0.13	200	ug/L	IB
WG	BKG045	E200.7	FLDFLT	BARIUM, DISSOLVED	120	B	120	J	0.13	200	ug/L	IB
RK	BKG072	E200.7	SW3050	BERYLLIUM	0.16	B	0.16	J	0.03	1	mg/Kg	IB
RK	BKG074	E200.7	SW3050	BERYLLIUM	0.2	B	0.2	J	0.03	1	mg/Kg	IB
SB	BKG011	E200.7	SW3050	BERYLLIUM	0.13	B	0.13	J	0.03	1.1	mg/Kg	IB

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SB	BKG004	E200.7	SW3050	BERYLLIUM	0.41	B	0.41	J	0.04	1.3	mg/Kg	IB
SB	BKG041	E200.7	SW3050	BERYLLIUM	0.29	B	0.29	J	0.04	1.3	mg/Kg	IB
SB	BKG051	E200.7	SW3050	BERYLLIUM	0.19	B	0.19	J	0.03	1.1	mg/Kg	IB
SB	BKG054	E200.7	SW3050	BERYLLIUM	0.18	B	0.18	J	0.03	1.1	mg/Kg	IB
SB	BKG058	E200.7	SW3050	BERYLLIUM	0.25	B	0.25	J	0.03	1.1	mg/Kg	IB
SB	BKG008	E200.7	SW3050	BERYLLIUM	0.28	B	0.28	J	0.04	1.4	mg/Kg	IB
SB	BKG031FD1	E200.7	SW3050	BERYLLIUM	0.41	B	0.41	J	0.03	1.2	mg/Kg	IB
SB	BKG032	E200.7	SW3050	BERYLLIUM	0.46	B	0.46	J	0.04	1.3	mg/Kg	IB
SB	BKG035	E200.7	SW3050	BERYLLIUM	0.31	B	0.31	J	0.03	1.2	mg/Kg	IB
SB	BKG038	E200.7	SW3050	BERYLLIUM	0.27	B	0.27	J	0.04	1.4	mg/Kg	IB
SD	BKG018	E200.7	SW3050	BERYLLIUM	0.24	B	0.24	J	0.05	1.7	mg/Kg	IB
SD	BKG080FD1	E200.7	SW3050	BERYLLIUM	0.23	B	0.23	J	0.06	2.1	mg/Kg	IB
SD	BKG081	E200.7	SW3050	BERYLLIUM	0.24	B	0.24	J	0.06	2.1	mg/Kg	IB
SD	BKG082	E200.7	SW3050	BERYLLIUM	0.17	B	0.17	J	0.05	1.5	mg/Kg	IB
SS	BKG009	E200.7	SW3050	BERYLLIUM	0.16	B	0.16	J	0.03	1.1	mg/Kg	IB
SS	BKG010	E200.7	SW3050	BERYLLIUM	0.13	B	0.13	J	0.03	1.1	mg/Kg	IB
SS	BKG012	E200.7	SW3050	BERYLLIUM	0.22	B	0.22	J	0.03	1.2	mg/Kg	IB
SS	BKG033	E200.7	SW3050	BERYLLIUM	0.21	B	0.21	J	0.03	1.2	mg/Kg	IB
SS	BKG062	E200.7	SW3050	BERYLLIUM	0.13	B	0.13	J	0.03	1	mg/Kg	IB
SS	BKG003	E200.7	SW3050	BERYLLIUM	0.41	B	0.41	J	0.04	1.5	mg/Kg	IB
SS	BKG005	E200.7	SW3050	BERYLLIUM	0.22	B	0.22	J	0.04	1.2	mg/Kg	IB
SS	BKG006	E200.7	SW3050	BERYLLIUM	0.21	B	0.21	J	0.04	1.5	mg/Kg	IB
SS	BKG007FD1	E200.7	SW3050	BERYLLIUM	0.18	B	0.18	J	0.04	1.3	mg/Kg	IB
SS	BKG016	E200.7	SW3050	BERYLLIUM	0.36	B	0.36	J	0.04	1.4	mg/Kg	IB
SS	BKG040	E200.7	SW3050	BERYLLIUM	0.25	B	0.25	J	0.04	1.3	mg/Kg	IB
SS	BKG042FD1	E200.7	SW3050	BERYLLIUM	0.34	B	0.34	J	0.04	1.2	mg/Kg	IB
SS	BKG043	E200.7	SW3050	BERYLLIUM	0.33	B	0.33	J	0.04	1.2	mg/Kg	IB
SS	BKG049	E200.7	SW3050	BERYLLIUM	0.17	B	0.17	J	0.03	1.1	mg/Kg	IB
SS	BKG050FD1	E200.7	SW3050	BERYLLIUM	0.17	B	0.17	J	0.03	1.1	mg/Kg	IB
SS	BKG057	E200.7	SW3050	BERYLLIUM	0.17	B	0.17	J	0.04	1.3	mg/Kg	IB
SS	BKG059	E200.7	SW3050	BERYLLIUM	0.24	B	0.24	J	0.04	1.3	mg/Kg	IB
SS	BKG030	E200.7	SW3050	BERYLLIUM	0.19	B	0.19	J	0.04	1.3	mg/Kg	IB
SS	BKG034	E200.7	SW3050	BERYLLIUM	0.25	B	0.25	J	0.04	1.3	mg/Kg	IB
SS	BKG036	E200.7	SW3050	BERYLLIUM	0.13	B	0.13	J	0.04	1.2	mg/Kg	IB
SS	BKG037	E200.7	SW3050	BERYLLIUM	0.31	B	0.31	J	0.04	1.3	mg/Kg	IB
SS	BKG060	E200.7	SW3050	BERYLLIUM	0.27	B	0.27	J	0.03	1.1	mg/Kg	IB
SS	BKG063	E200.7	SW3050	BERYLLIUM	0.26	B	0.26	J	0.03	1.1	mg/Kg	IB
SS	BKG064	E200.7	SW3050	BERYLLIUM	0.22	B	0.22	J	0.03	1.2	mg/Kg	IB
SW	BKG022	E200.7	SW3050	BERYLLIUM	1.1	B	1.1	J	0.33	5	ug/L	IB
SW	BKG023	E200.7	SW3050	BERYLLIUM	2.5	B	2.5	J	0.33	5	ug/L	IB
SW	BKG024FD1	E200.7	SW3050	BERYLLIUM	1.2	B	1.2	J	0.33	5	ug/L	IB
SW	BKG083	E200.7	SW3050	BERYLLIUM	2.8	B	2.8	J	0.33	5	ug/L	IB
WG	BKG025	E200.7	SW3050	BERYLLIUM	1.8	B	1.8	J	0.33	5	ug/L	IB
WG	BKG026	E200.7	SW3050	BERYLLIUM	1.4	B	1.4	J	0.33	5	ug/L	IB
WG	BKG067	E200.7	FLDFLT	BERYLLIUM, DISSOLVED	0.33	U	0.33	J	0.33	5	ug/L	IB
WG	BKG025	E200.7	FLDFLT	BERYLLIUM, DISSOLVED	2.2	B	2.2	J	0.33	5	ug/L	IB
WG	BKG026	E200.7	FLDFLT	BERYLLIUM, DISSOLVED	1	B	1	J	0.33	5	ug/L	IB
SW	BKG022	E200.7	SW3050	CADMIUM	1.1	B	1.1	J	0.27	5	ug/L	IB
SW	BKG083	E200.7	SW3050	CADMIUM	1.7	B	1.7	J	0.27	5	ug/L	IB
WG	BKG025	E200.7	SW3050	CADMIUM	1	B	1	J	0.27	5	ug/L	IB
WG	BKG025	E200.7	FLDFLT	CADMIUM, DISSOLVED	1.1	B	1.1	J	0.27	5	ug/L	IB
WG	BKG025	E200.7	FLDFLT	CHROMIUM, DISSOLVED	4.6	B	4.6	J	0.87	10	ug/L	IB
WG	BKG026	E200.7	FLDFLT	CHROMIUM, DISSOLVED	2.9	B	2.9	J	0.87	10	ug/L	IB
RK	BKG072	E200.7	SW3050	CHROMIUM, TOTAL	0.86	B	0.86	J	0.08	2	mg/Kg	IB
RK	BKG074	E200.7	SW3050	CHROMIUM, TOTAL	1.6	B	1.6	J	0.08	2	mg/Kg	IB
RK	BKG075	E200.7	SW3050	CHROMIUM, TOTAL	2	B	2	J	0.08	2	mg/Kg	IB
RK	BKG076FD1	E200.7	SW3050	CHROMIUM, TOTAL	1.5	B	1.5	J	0.08	2	mg/Kg	IB
RK	BKG077	E200.7	SW3050	CHROMIUM, TOTAL	1	B	1	J	0.08	2	mg/Kg	IB
SD	BKG017	E200.7	SW3050	CHROMIUM, TOTAL	7.8	B	7.8	J	0.46	11	mg/Kg	IB
SD	BKG019FD1	E200.7	SW3050	CHROMIUM, TOTAL	8.6	B	8.6	J	0.46	11	mg/Kg	IB
SD	BKG079	E200.7	SW3050	CHROMIUM, TOTAL	2.3	B	2.3	J	0.14	3.1	mg/Kg	IB
SS	BKG064	E200.7	SW3050	CHROMIUM, TOTAL	2.2	B	2.2	J	0.1	2.4	mg/Kg	IB
SW	BKG022	E200.7	SW3050	CHROMIUM, TOTAL	4.3	B	4.3	J	0.87	10	ug/L	IB
SW	BKG024FD1	E200.7	SW3050	CHROMIUM, TOTAL	1.2	B	1.2	J	0.87	10	ug/L	IB
SW	BKG083	E200.7	SW3050	CHROMIUM, TOTAL	4.4	B	4.4	J	0.87	10	ug/L	IB
WG	BKG069	E200.7	SW3050	CHROMIUM, TOTAL	2	B	2	J	0.87	10	ug/L	IB
WG	BKG070	E200.7	SW3050	CHROMIUM, TOTAL	1.6	B	1.6	J	0.87	10	ug/L	IB
WG	BKG025	E200.7	SW3050	CHROMIUM, TOTAL	5.9	B	5.9	J	0.87	10	ug/L	IB
WG	BKG026	E200.7	SW3050	CHROMIUM, TOTAL	3.7	B	3.7	J	0.87	10	ug/L	IB
WG	BKG045	E200.7	SW3050	CHROMIUM, TOTAL	6.8	B	6.8	J	0.87	10	ug/L	IB
RK	BKG072	E200.7	SW3050	COBALT	5.9	B	5.9	J	0.04	10	mg/Kg	IB

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
RK	BKG073	E200.7	SW3050	COBALT	3.5	B	3.5	J	0.04	10	mg/Kg	IB
RK	BKG074	E200.7	SW3050	COBALT	6.9	B	6.9	J	0.04	10	mg/Kg	IB
RK	BKG075	E200.7	SW3050	COBALT	4.6	B	4.6	J	0.04	10	mg/Kg	IB
RK	BKG076FD1	E200.7	SW3050	COBALT	5.2	B	5.2	J	0.04	10	mg/Kg	IB
RK	BKG077	E200.7	SW3050	COBALT	2.2	B	2.2	J	0.04	10	mg/Kg	IB
SB	BKG011	E200.7	SW3050	COBALT	9.8	B	9.8	J	0.04	11	mg/Kg	IB
SB	BKG004	E200.7	SW3050	COBALT	1.2	B	1.2	J	0.05	13	mg/Kg	IB
SB	BKG041	E200.7	SW3050	COBALT	4.6	B	4.6	J	0.05	13	mg/Kg	IB
SB	BKG054	E200.7	SW3050	COBALT	8.7	B	8.7	J	0.04	11	mg/Kg	IB
SB	BKG058	E200.7	SW3050	COBALT	6.8	B	6.8	J	0.04	11	mg/Kg	IB
SB	BKG008	E200.7	SW3050	COBALT	4.8	B	4.8	J	0.06	14	mg/Kg	IB
SB	BKG014	E200.7	SW3050	COBALT	1.9	B	1.9	J	0.05	13	mg/Kg	IB
SB	BKG015FD1	E200.7	SW3050	COBALT	1.9	B	1.9	J	0.05	13	mg/Kg	IB
SB	BKG038	E200.7	SW3050	COBALT	1.4	B	1.4	J	0.06	14	mg/Kg	IB
SD	BKG017	E200.7	SW3050	COBALT	2.3	B	2.3	J	0.23	53	mg/Kg	IB
SD	BKG018	E200.7	SW3050	COBALT	0.96	B	0.96	J	0.07	17	mg/Kg	IB
SD	BKG019FD1	E200.7	SW3050	COBALT	2.6	B	2.6	J	0.23	53	mg/Kg	IB
SD	BKG078	E200.7	SW3050	COBALT	4.5	B	4.5	J	0.09	22	mg/Kg	IB
SD	BKG079	E200.7	SW3050	COBALT	1.7	B	1.7	J	0.06	16	mg/Kg	IB
SD	BKG080FD1	E200.7	SW3050	COBALT	5.1	B	5.1	J	0.08	21	mg/Kg	IB
SD	BKG081	E200.7	SW3050	COBALT	4.7	B	4.7	J	0.08	21	mg/Kg	IB
SD	BKG082	E200.7	SW3050	COBALT	1	B	1	J	0.06	15	mg/Kg	IB
SS	BKG009	E200.7	SW3050	COBALT	9.4	B	9.4	J	0.04	11	mg/Kg	IB
SS	BKG062	E200.7	SW3050	COBALT	7.9	B	7.9	J	0.04	10	mg/Kg	IB
SS	BKG003	E200.7	SW3050	COBALT	1.1	B	1.1	J	0.06	15	mg/Kg	IB
SS	BKG005	E200.7	SW3050	COBALT	1.6	B	1.6	J	0.05	12	mg/Kg	IB
SS	BKG006	E200.7	SW3050	COBALT	1	B	1	J	0.06	15	mg/Kg	IB
SS	BKG007FD1	E200.7	SW3050	COBALT	1	B	1	J	0.05	13	mg/Kg	IB
SS	BKG016	E200.7	SW3050	COBALT	2	B	2	J	0.06	14	mg/Kg	IB
SS	BKG040	E200.7	SW3050	COBALT	4.3	B	4.3	J	0.05	13	mg/Kg	IB
SS	BKG042FD1	E200.7	SW3050	COBALT	6.7	B	6.7	J	0.05	12	mg/Kg	IB
SS	BKG043	E200.7	SW3050	COBALT	7.4	B	7.4	J	0.05	12	mg/Kg	IB
SS	BKG052	E200.7	SW3050	COBALT	6.9	B	6.9	J	0.04	11	mg/Kg	IB
SS	BKG053	E200.7	SW3050	COBALT	11	B	11	J	0.05	12	mg/Kg	IB
SS	BKG055FD1	E200.7	SW3050	COBALT	8.2	B	8.2	J	0.05	13	mg/Kg	IB
SS	BKG056	E200.7	SW3050	COBALT	7.3	B	7.3	J	0.04	10	mg/Kg	IB
SS	BKG057	E200.7	SW3050	COBALT	8.6	B	8.6	J	0.05	13	mg/Kg	IB
SS	BKG059	E200.7	SW3050	COBALT	10	B	10	J	0.05	13	mg/Kg	IB
SS	BKG013	E200.7	SW3050	COBALT	1.6	B	1.6	J	0.05	12	mg/Kg	IB
SS	BKG030	E200.7	SW3050	COBALT	4.6	B	4.6	J	0.05	13	mg/Kg	IB
SS	BKG037	E200.7	SW3050	COBALT	1.4	B	1.4	J	0.05	13	mg/Kg	IB
SS	BKG039	E200.7	SW3050	COBALT	3.8	B	3.8	J	0.04	11	mg/Kg	IB
SS	BKG060	E200.7	SW3050	COBALT	6.9	B	6.9	J	0.04	11	mg/Kg	IB
SS	BKG064	E200.7	SW3050	COBALT	6.7	B	6.7	J	0.05	12	mg/Kg	IB
SW	BKG022	E200.7	SW3050	COBALT	2	B	2	J	0.43	50	ug/L	IB
SW	BKG024FD1	E200.7	SW3050	COBALT	1.1	B	1.1	J	0.43	50	ug/L	IB
SW	BKG083	E200.7	SW3050	COBALT	5.4	B	5.4	J	0.43	50	ug/L	IB
WG	BKG070	E200.7	SW3050	COBALT	1.5	B	1.5	J	0.43	50	ug/L	IB
WG	BKG025	E200.7	SW3050	COBALT	12	B	12	J	0.43	50	ug/L	IB
WG	BKG026	E200.7	SW3050	COBALT	8.6	B	8.6	J	0.43	50	ug/L	IB
WG	BKG045	E200.7	SW3050	COBALT	20	B	20	J	0.43	50	ug/L	IB
WG	BKG046FD1	E200.7	SW3050	COBALT	1.2	B	1.2	J	0.43	50	ug/L	IB
WG	BKG025	E200.7	FLDFLT	COBALT, DISSOLVED	11	B	11	J	0.43	50	ug/L	IB
WG	BKG026	E200.7	FLDFLT	COBALT, DISSOLVED	5.5	B	5.5	J	0.43	50	ug/L	IB
WG	BKG045	E200.7	FLDFLT	COBALT, DISSOLVED	5.7	B	5.7	J	0.43	50	ug/L	IB
RK	BKG073	E200.7	SW3050	COPPER	2.5	B	2.5	J	0.08	5	mg/Kg	IB
RK	BKG077	E200.7	SW3050	COPPER	4.4	B	4.4	J	0.08	5	mg/Kg	IB
SB	BKG004	E200.7	SW3050	COPPER	1.8	B	1.8	J	0.1	6.4	mg/Kg	IB
SB	BKG014	E200.7	SW3050	COPPER	4.7	B	4.7	J	0.1	6.5	mg/Kg	IB
SB	BKG015FD1	E200.7	SW3050	COPPER	4.4	B	4.4	J	0.1	6.4	mg/Kg	IB
SD	BKG017	E200.7	SW3050	COPPER	23	B	23	J	0.42	26	mg/Kg	IB
SD	BKG018	E200.7	SW3050	COPPER	3.3	B	3.3	J	0.14	8.5	mg/Kg	IB
SD	BKG019FD1	E200.7	SW3050	COPPER	24	B	24	J	0.42	26	mg/Kg	IB
SD	BKG079	E200.7	SW3050	COPPER	6.9	B	6.9	J	0.12	7.8	mg/Kg	IB
SD	BKG082	E200.7	SW3050	COPPER	6.5	B	6.5	J	0.12	7.5	mg/Kg	IB
SS	BKG003	E200.7	SW3050	COPPER	2.6	B	2.6	J	0.12	7.4	mg/Kg	IB
SS	BKG005	E200.7	SW3050	COPPER	3.6	B	3.6	J	0.09	6.1	mg/Kg	IB
SS	BKG006	E200.7	SW3050	COPPER	7.1	B	7.1	J	0.12	7.3	mg/Kg	IB
SS	BKG016	E200.7	SW3050	COPPER	5.5	B	5.5	J	0.11	7.1	mg/Kg	IB
SS	BKG013	E200.7	SW3050	COPPER	5.7	B	5.7	J	0.09	6.1	mg/Kg	IB
SW	BKG022	E200.7	SW3050	COPPER	14	B	14	J	0.8	25	ug/L	IB

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SW	BKG024FD1	E200.7	SW3050	COPPER	4.5	B	4.5	J	0.8	25	ug/L	IB
SW	BKG083	E200.7	SW3050	COPPER	16	B	16	J	0.8	25	ug/L	IB
WG	BKG025	E200.7	SW3050	COPPER	4.4	B	4.4	J	0.8	25	ug/L	IB
[illegible]	BKG026	E200.7	SW3050	COPPER	2.8	B	2.8	J	0.8	25	ug/L	IB
WG	BKG045	E200.7	SW3050	COPPER	15	B	15	J	0.8	25	ug/L	IB
SB	BKG004	E200.7	SW3050	LEAD	0.3	B	0.3	J	0.21	0.77	mg/Kg	IB
SD	BKG018	E200.7	SW3050	LEAD	0.56	B	0.56	J	0.27	1	mg/Kg	IB
RK	BKG073	E200.7	SW3050	MAGNESIUM	910	B	910	J	0.13	1000	mg/Kg	IB
SS	BKG040	E200.7	SW3050	MAGNESIUM	1300	B	1300	J	0.17	1340	mg/Kg	IB
SS	BKG043	E200.7	SW3050	MAGNESIUM	1200	B	1200	J	0.16	1230	mg/Kg	IB
RK	BKG074	E245.5	METHOD	MERCURY	0.0039	B	0.0039	J	0.0025	0.04	mg/Kg	IB
RK	BKG075	E245.5	METHOD	MERCURY	0.003	B	0.003	J	0.0025	0.04	mg/Kg	IB
RK	BKG077	E245.5	METHOD	MERCURY	0.0063	B	0.0063	J	0.0025	0.04	mg/Kg	IB
SB	BKG011	E245.5	METHOD	MERCURY	0.016	B	0.016	J	0.0027	0.04	mg/Kg	IB
SB	BKG041	E245.5	METHOD	MERCURY	0.0048	B	0.0048	J	0.0031	0.05	mg/Kg	IB
SB	BKG051	E245.5	METHOD	MERCURY	0.0078	B	0.0078	J	0.0027	0.04	mg/Kg	IB
SB	BKG008	E245.5	METHOD	MERCURY	0.0087	B	0.0087	J	0.0036	0.05	mg/Kg	IB
SB	BKG031FD1	E245.5	METHOD	MERCURY	0.01	B	0.01	J	0.0029	0.04	mg/Kg	IB
SB	BKG032	E245.5	METHOD	MERCURY	0.0084	B	0.0084	J	0.0033	0.05	mg/Kg	IB
SB	BKG035	E245.5	METHOD	MERCURY	0.025	B	0.025	J	0.003	0.04	mg/Kg	IB
SB	BKG038	E245.5	METHOD	MERCURY	0.015	B	0.015	J	0.0035	0.05	mg/Kg	IB
SD	BKG017	E245.5	METHOD	MERCURY	0.052	B	0.052	J	0.01	0.21	mg/Kg	IB
SD	BKG019FD1	E245.5	METHOD	MERCURY	0.043	B	0.043	J	0.01	0.21	mg/Kg	IB
SD	BKG080FD1	E245.5	METHOD	MERCURY	0.013	B	0.013	J	0.0052	0.08	mg/Kg	IB
SD	BKG081	E245.5	METHOD	MERCURY	0.013	B	0.013	J	0.0051	0.08	mg/Kg	IB
SS	BKG009	E245.5	METHOD	MERCURY	0.014	B	0.014	J	0.0027	0.04	mg/Kg	IB
SS	BKG010	E245.5	METHOD	MERCURY	0.03	B	0.03	J	0.0027	0.04	mg/Kg	IB
SS	BKG012	E245.5	METHOD	MERCURY	0.009	B	0.009	J	0.0029	0.04	mg/Kg	IB
SS	BKG033	E245.5	METHOD	MERCURY	0.031	B	0.031	J	0.0029	0.04	mg/Kg	IB
SS	BKG062	E245.5	METHOD	MERCURY	0.013	B	0.013	J	0.0026	0.04	mg/Kg	IB
SS	BKG003	E245.5	METHOD	MERCURY	0.014	B	0.014	J	0.0037	0.05	mg/Kg	IB
SS	BKG005	E245.5	METHOD	MERCURY	0.0037	B	0.0037	J	0.0031	0.04	mg/Kg	IB
SS	BKG006	E245.5	METHOD	MERCURY	0.011	B	0.011	J	0.0037	0.05	mg/Kg	IB
SS	BKG007FD1	E245.5	METHOD	MERCURY	0.013	B	0.013	J	0.0032	0.05	mg/Kg	IB
[illegible]	BKG016	E245.5	METHOD	MERCURY	0.011	B	0.011	J	0.0035	0.05	mg/Kg	IB
SS	BKG040	E245.5	METHOD	MERCURY	0.0091	B	0.0091	J	0.0034	0.05	mg/Kg	IB
SS	BKG042FD1	E245.5	METHOD	MERCURY	0.013	B	0.013	J	0.0031	0.05	mg/Kg	IB
SS	BKG043	E245.5	METHOD	MERCURY	0.021	B	0.021	J	0.0031	0.04	mg/Kg	IB
SS	BKG049	E245.5	METHOD	MERCURY	0.024	B	0.024	J	0.0028	0.04	mg/Kg	IB
SS	BKG050FD1	E245.5	METHOD	MERCURY	0.026	B	0.026	J	0.0028	0.04	mg/Kg	IB
SS	BKG052	E245.5	METHOD	MERCURY	0.0037	B	0.0037	J	0.0028	0.04	mg/Kg	IB
SS	BKG053	E245.5	METHOD	MERCURY	0.0051	B	0.0051	J	0.0031	0.05	mg/Kg	IB
SS	BKG056	E245.5	METHOD	MERCURY	0.0087	B	0.0087	J	0.0026	0.04	mg/Kg	IB
SS	BKG057	E245.5	METHOD	MERCURY	0.019	B	0.019	J	0.0032	0.05	mg/Kg	IB
SS	BKG059	E245.5	METHOD	MERCURY	0.013	B	0.013	J	0.0033	0.05	mg/Kg	IB
SS	BKG013	E245.5	METHOD	MERCURY	0.0059	B	0.0059	J	0.0031	0.04	mg/Kg	IB
SS	BKG030	E245.5	METHOD	MERCURY	0.017	B	0.017	J	0.0032	0.05	mg/Kg	IB
SS	BKG034	E245.5	METHOD	MERCURY	0.027	B	0.027	J	0.0032	0.05	mg/Kg	IB
SS	BKG036	E245.5	METHOD	MERCURY	0.0067	B	0.0067	J	0.003	0.04	mg/Kg	IB
SS	BKG037	E245.5	METHOD	MERCURY	0.016	B	0.016	J	0.0033	0.05	mg/Kg	IB
SS	BKG039	E245.5	METHOD	MERCURY	0.011	B	0.011	J	0.0028	0.04	mg/Kg	IB
SS	BKG060	E245.5	METHOD	MERCURY	0.019	B	0.019	J	0.0027	0.04	mg/Kg	IB
SS	BKG063	E245.5	METHOD	MERCURY	0.016	B	0.016	J	0.0028	0.04	mg/Kg	IB
SS	BKG064	E245.5	METHOD	MERCURY	0.0091	B	0.0091	J	0.003	0.04	mg/Kg	IB
RK	BKG072	E200.7	SW3050	NICKEL	1.2	B	1.2	J	0.09	8.2	mg/Kg	IB
RK	BKG073	E200.7	SW3050	NICKEL	0.84	B	0.84	J	0.09	8	mg/Kg	IB
RK	BKG074	E200.7	SW3050	NICKEL	1	B	1	J	0.09	8.1	mg/Kg	IB
RK	BKG075	E200.7	SW3050	NICKEL	1.8	B	1.8	J	0.09	8.1	mg/Kg	IB
RK	BKG076FD1	E200.7	SW3050	NICKEL	2.5	B	2.5	J	0.09	8.1	mg/Kg	IB
RK	BKG077	E200.7	SW3050	NICKEL	0.69	B	0.69	J	0.09	8	mg/Kg	IB
SB	BKG011	E200.7	SW3050	NICKEL	8.1	B	8.1	J	0.1	8.6	mg/Kg	IB
SB	BKG004	E200.7	SW3050	NICKEL	0.77	B	0.77	J	0.12	10	mg/Kg	IB
SB	BKG041	E200.7	SW3050	NICKEL	2.5	B	2.5	J	0.12	10	mg/Kg	IB
SB	BKG054	E200.7	SW3050	NICKEL	4	B	4	J	0.1	8.6	mg/Kg	IB
SB	BKG058	E200.7	SW3050	NICKEL	1.7	B	1.7	J	0.1	8.6	mg/Kg	IB
[illegible]	BKG008	E200.7	SW3050	NICKEL	7.7	B	7.7	J	0.13	12	mg/Kg	IB
SB	BKG014	E200.7	SW3050	NICKEL	1.2	B	1.2	J	0.12	10	mg/Kg	IB
SB	BKG015FD1	E200.7	SW3050	NICKEL	1.2	B	1.2	J	0.12	10	mg/Kg	IB
SD	BKG017	E200.7	SW3050	NICKEL	4.1	B	4.1	J	0.49	42	mg/Kg	IB
SD	BKG018	E200.7	SW3050	NICKEL	1.1	B	1.1	J	0.16	14	mg/Kg	IB
SD	BKG019FD1	E200.7	SW3050	NICKEL	4.5	B	4.5	J	0.49	42	mg/Kg	IB

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SD	BKG078	E200.7	SW3050	NICKEL	2	B	2	J	0.2	17	mg/Kg	IB
SD	BKG079	E200.7	SW3050	NICKEL	0.67	B	0.67	J	0.15	12	mg/Kg	IB
SD	BKG080FD1	E200.7	SW3050	NICKEL	2.4	B	2.4	J	0.19	17	mg/Kg	IB
SD	BKG081	E200.7	SW3050	NICKEL	2	B	2	J	0.19	16	mg/Kg	IB
SD	BKG082	E200.7	SW3050	NICKEL	0.5	B	0.5	J	0.14	12	mg/Kg	IB
SS	BKG062	E200.7	SW3050	NICKEL	4.5	B	4.5	J	0.09	8.3	mg/Kg	IB
SS	BKG003	E200.7	SW3050	NICKEL	0.67	B	0.67	J	0.14	12	mg/Kg	IB
SS	BKG005	E200.7	SW3050	NICKEL	0.73	B	0.73	J	0.11	9.8	mg/Kg	IB
SS	BKG006	E200.7	SW3050	NICKEL	1.2	B	1.2	J	0.14	12	mg/Kg	IB
SS	BKG007FD1	E200.7	SW3050	NICKEL	1.1	B	1.1	J	0.12	10	mg/Kg	IB
SS	BKG016	E200.7	SW3050	NICKEL	2	B	2	J	0.13	11	mg/Kg	IB
SS	BKG040	E200.7	SW3050	NICKEL	1.8	B	1.8	J	0.12	11	mg/Kg	IB
SS	BKG042FD1	E200.7	SW3050	NICKEL	2.4	B	2.4	J	0.12	10	mg/Kg	IB
SS	BKG043	E200.7	SW3050	NICKEL	2	B	2	J	0.11	9.8	mg/Kg	IB
SS	BKG052	E200.7	SW3050	NICKEL	1.8	B	1.8	J	0.11	9.1	mg/Kg	IB
SS	BKG053	E200.7	SW3050	NICKEL	3.2	B	3.2	J	0.12	9.9	mg/Kg	IB
SS	BKG055FD1	E200.7	SW3050	NICKEL	1.8	B	1.8	J	0.12	10	mg/Kg	IB
SS	BKG056	E200.7	SW3050	NICKEL	3.3	B	3.3	J	0.09	8.3	mg/Kg	IB
SS	BKG057	E200.7	SW3050	NICKEL	1.4	B	1.4	J	0.12	10	mg/Kg	IB
SS	BKG059	E200.7	SW3050	NICKEL	2.7	B	2.7	J	0.12	11	mg/Kg	IB
SS	BKG013	E200.7	SW3050	NICKEL	1.2	B	1.2	J	0.11	9.8	mg/Kg	IB
SW	BKG022	E200.7	SW3050	NICKEL	5.2	B	5.2	J	0.93	40	ug/L	IB
SW	BKG023	E200.7	SW3050	NICKEL	3.1	B	3.1	J	0.93	40	ug/L	IB
SW	BKG024FD1	E200.7	SW3050	NICKEL	3.3	B	3.3	J	0.93	40	ug/L	IB
SW	BKG083	E200.7	SW3050	NICKEL	4.2	B	4.2	J	0.93	40	ug/L	IB
SW	BKG084	E200.7	SW3050	NICKEL	39	B	39	J	0.93	40	ug/L	IB
SW	BKG087	E200.7	SW3050	NICKEL	32	B	32	J	0.93	40	ug/L	IB
WG	BKG067	E200.7	SW3050	NICKEL	1.8	B	1.8	J	0.93	40	ug/L	IB
WG	BKG068FD1	E200.7	SW3050	NICKEL	1.9	B	1.9	J	0.93	40	ug/L	IB
WG	BKG069	E200.7	SW3050	NICKEL	2.9	B	2.9	J	0.93	40	ug/L	IB
WG	BKG070	E200.7	SW3050	NICKEL	5.7	B	5.7	J	0.93	40	ug/L	IB
WG	BKG025	E200.7	SW3050	NICKEL	2.4	B	2.4	J	0.93	40	ug/L	IB
WG	BKG026	E200.7	SW3050	NICKEL	3.9	B	3.9	J	0.93	40	ug/L	IB
WG	BKG045	E200.7	SW3050	NICKEL	19	B	19	J	0.93	40	ug/L	IB
WG	BKG046FD1	E200.7	SW3050	NICKEL	2.8	B	2.8	J	0.93	40	ug/L	IB
WG	BKG047	E200.7	SW3050	NICKEL	3.1	B	3.1	J	0.93	40	ug/L	IB
WG	BKG067	E200.7	FLDFLT	NICKEL, DISSOLVED	1.9	B	1.9	J	0.93	40	ug/L	IB
WG	BKG068FD1	E200.7	FLDFLT	NICKEL, DISSOLVED	2.1	B	2.1	J	0.93	40	ug/L	IB
WG	BKG069	E200.7	FLDFLT	NICKEL, DISSOLVED	1.9	B	1.9	J	0.93	40	ug/L	IB
WG	BKG070	E200.7	FLDFLT	NICKEL, DISSOLVED	1.8	B	1.8	J	0.93	40	ug/L	IB
WG	BKG025	E200.7	FLDFLT	NICKEL, DISSOLVED	3.2	B	3.2	J	0.93	40	ug/L	IB
WG	BKG026	E200.7	FLDFLT	NICKEL, DISSOLVED	2.1	B	2.1	J	0.93	40	ug/L	IB
WG	BKG045	E200.7	FLDFLT	NICKEL, DISSOLVED	12	B	12	J	0.93	40	ug/L	IB
WG	BKG046FD1	E200.7	FLDFLT	NICKEL, DISSOLVED	2	B	2	J	0.93	40	ug/L	IB
WG	BKG047	E200.7	FLDFLT	NICKEL, DISSOLVED	2.4	B	2.4	J	0.93	40	ug/L	IB
RK	BKG072	E200.7	SW3050	POTASSIUM	200	B	200	J	3.1	1020	mg/Kg	IB
RK	BKG073	E200.7	SW3050	POTASSIUM	410	B	410	J	3	1000	mg/Kg	IB
RK	BKG074	E200.7	SW3050	POTASSIUM	170	B	170	J	3	1010	mg/Kg	IB
RK	BKG075	E200.7	SW3050	POTASSIUM	370	B	370	J	3	1010	mg/Kg	IB
RK	BKG076FD1	E200.7	SW3050	POTASSIUM	390	B	390	J	3	1010	mg/Kg	IB
RK	BKG077	E200.7	SW3050	POTASSIUM	530	B	530	J	3	1000	mg/Kg	IB
SB	BKG004	E200.7	SW3050	POTASSIUM	500	B	500	J	3.9	1290	mg/Kg	IB
SB	BKG041	E200.7	SW3050	POTASSIUM	820	B	820	J	3.8	1260	mg/Kg	IB
SB	BKG051	E200.7	SW3050	POTASSIUM	880	B	880	J	3.2	1070	mg/Kg	IB
SB	BKG054	E200.7	SW3050	POTASSIUM	560	B	560	J	3.2	1080	mg/Kg	IB
SB	BKG058	E200.7	SW3050	POTASSIUM	600	B	600	J	3.2	1070	mg/Kg	IB
SB	BKG031FD1	E200.7	SW3050	POTASSIUM	820	B	820	J	3.5	1170	mg/Kg	IB
SB	BKG032	E200.7	SW3050	POTASSIUM	980	B	980	J	4	1340	mg/Kg	IB
SB	BKG035	E200.7	SW3050	POTASSIUM	870	B	870	J	3.5	1180	mg/Kg	IB
SB	BKG038	E200.7	SW3050	POTASSIUM	860	B	860	J	4.2	1410	mg/Kg	IB
SS	BKG033	E200.7	SW3050	POTASSIUM	570	B	570	J	3.5	1150	mg/Kg	IB
SS	BKG062	E200.7	SW3050	POTASSIUM	560	B	560	J	3.1	1040	mg/Kg	IB
SS	BKG003	E200.7	SW3050	POTASSIUM	540	B	540	J	4.4	1480	mg/Kg	IB
SS	BKG005	E200.7	SW3050	POTASSIUM	380	B	380	J	3.7	1220	mg/Kg	IB
SS	BKG006	E200.7	SW3050	POTASSIUM	490	B	490	J	4.4	1460	mg/Kg	IB
SS	BKG007FD1	E200.7	SW3050	POTASSIUM	490	B	490	J	3.8	1270	mg/Kg	IB
SS	BKG016	E200.7	SW3050	POTASSIUM	940	B	940	J	4.2	1410	mg/Kg	IB
SS	BKG040	E200.7	SW3050	POTASSIUM	1200	B	1200	J	4	1340	mg/Kg	IB
SS	BKG042FD1	E200.7	SW3050	POTASSIUM	610	B	610	J	3.7	1250	mg/Kg	IB
SS	BKG043	E200.7	SW3050	POTASSIUM	660	B	660	J	3.7	1230	mg/Kg	IB
SS	BKG050FD1	E200.7	SW3050	POTASSIUM	990	B	990	J	3.3	1120	mg/Kg	IB

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SS	BKG052	E200.7	SW3050	POTASSIUM	680	B	680	J	3.4	1130	mg/Kg	IB
SS	BKG053	E200.7	SW3050	POTASSIUM	860	B	860	J	3.7	1240	mg/Kg	IB
SS	BKG055FD1	E200.7	SW3050	POTASSIUM	770	B	770	J	3.8	1270	mg/Kg	IB
SS	BKG056	E200.7	SW3050	POTASSIUM	1000	B	1000	J	3.1	1040	mg/Kg	IB
SS	BKG059	E200.7	SW3050	POTASSIUM	910	B	910	J	4	1330	mg/Kg	IB
SS	BKG030	E200.7	SW3050	POTASSIUM	1100	B	1100	J	3.8	1280	mg/Kg	IB
SS	BKG034	E200.7	SW3050	POTASSIUM	770	B	770	J	3.8	1280	mg/Kg	IB
SS	BKG037	E200.7	SW3050	POTASSIUM	750	B	750	J	4	1340	mg/Kg	IB
SS	BKG039	E200.7	SW3050	POTASSIUM	900	B	900	J	3.3	1100	mg/Kg	IB
SS	BKG060	E200.7	SW3050	POTASSIUM	910	B	910	J	3.2	1070	mg/Kg	IB
SS	BKG064	E200.7	SW3050	POTASSIUM	520	B	520	J	3.6	1190	mg/Kg	IB
WG	BKG067	E200.7	SW3050	POTASSIUM	2600	B	2600	J	30	5000	ug/L	IB
WG	BKG068FD1	E200.7	SW3050	POTASSIUM	2500	B	2500	J	30	5000	ug/L	IB
WG	BKG069	E200.7	SW3050	POTASSIUM	2000	B	2000	J	30	5000	ug/L	IB
SB	BKG041	E200.7	SW3050	SELENIUM	1	B	1	J	0.58	1.3	mg/Kg	IB
SB	BKG031FD1	E200.7	SW3050	SELENIUM	0.8	B	0.8	J	0.54	1.2	mg/Kg	IB
SB	BKG032	E200.7	SW3050	SELENIUM	1.1	B	1.1	J	0.61	1.3	mg/Kg	IB
SB	BKG035	E200.7	SW3050	SELENIUM	0.68	B	0.68	J	0.54	1.2	mg/Kg	IB
SD	BKG080FD1	E200.7	SW3050	SELENIUM	1.1	B	1.1	J	0.96	2.1	mg/Kg	IB
SD	BKG081	E200.7	SW3050	SELENIUM	1.1	B	1.1	J	0.95	2.1	mg/Kg	IB
SD	BKG082	E200.7	SW3050	SELENIUM	0.78	B	0.78	J	0.69	1.5	mg/Kg	IB
SS	BKG040	E200.7	SW3050	SELENIUM	0.87	B	0.87	J	0.62	1.3	mg/Kg	IB
SS	BKG042FD1	E200.7	SW3050	SELENIUM	1.1	B	1.1	J	0.57	1.2	mg/Kg	IB
SS	BKG043	E200.7	SW3050	SELENIUM	0.82	B	0.82	J	0.57	1.2	mg/Kg	IB
SS	BKG030	E200.7	SW3050	SELENIUM	1.2	B	1.2	J	0.59	1.3	mg/Kg	IB
SS	BKG064	E200.7	SW3050	SELENIUM	0.73	B	0.73	J	0.55	1.2	mg/Kg	IB
RK	BKG072	E200.7	SW3050	SODIUM	66	B	66	J	20	1020	mg/Kg	IB
RK	BKG073	E200.7	SW3050	SODIUM	64	B	64	J	20	1000	mg/Kg	IB
RK	BKG074	E200.7	SW3050	SODIUM	54	B	54	J	20	1010	mg/Kg	IB
RK	BKG075	E200.7	SW3050	SODIUM	580	B	580	J	20	1010	mg/Kg	IB
RK	BKG076FD1	E200.7	SW3050	SODIUM	670	B	670	J	20	1010	mg/Kg	IB
RK	BKG077	E200.7	SW3050	SODIUM	330	B	330	J	20	1000	mg/Kg	IB
SB	BKG011	E200.7	SW3050	SODIUM	200	B	200	J	21	1070	mg/Kg	IB
SB	BKG041	E200.7	SW3050	SODIUM	120	B	120	J	25	1260	mg/Kg	IB
SB	BKG051	E200.7	SW3050	SODIUM	310	B	310	J	21	1070	mg/Kg	IB
SB	BKG054	E200.7	SW3050	SODIUM	81	B	81	J	22	1080	mg/Kg	IB
SB	BKG058	E200.7	SW3050	SODIUM	270	B	270	J	21	1070	mg/Kg	IB
SB	BKG031FD1	E200.7	SW3050	SODIUM	810	B	810	J	23	1170	mg/Kg	IB
SB	BKG032	E200.7	SW3050	SODIUM	760	B	760	J	27	1340	mg/Kg	IB
SS	BKG009	E200.7	SW3050	SODIUM	210	B	210	J	21	1070	mg/Kg	IB
SS	BKG010	E200.7	SW3050	SODIUM	150	B	150	J	21	1060	mg/Kg	IB
SS	BKG012	E200.7	SW3050	SODIUM	450	B	450	J	23	1170	mg/Kg	IB
SS	BKG033	E200.7	SW3050	SODIUM	310	B	310	J	23	1150	mg/Kg	IB
SS	BKG062	E200.7	SW3050	SODIUM	66	B	66	J	21	1040	mg/Kg	IB
SS	BKG003	E200.7	SW3050	SODIUM	1200	B	1200	J	30	1480	mg/Kg	IB
SS	BKG005	E200.7	SW3050	SODIUM	300	B	300	J	24	1220	mg/Kg	IB
SS	BKG006	E200.7	SW3050	SODIUM	470	B	470	J	29	1460	mg/Kg	IB
SS	BKG007FD1	E200.7	SW3050	SODIUM	550	B	550	J	25	1270	mg/Kg	IB
SS	BKG040	E200.7	SW3050	SODIUM	50	B	50	J	27	1340	mg/Kg	IB
SS	BKG042FD1	E200.7	SW3050	SODIUM	100	B	100	J	25	1250	mg/Kg	IB
SS	BKG043	E200.7	SW3050	SODIUM	94	B	94	J	25	1230	mg/Kg	IB
SS	BKG049	E200.7	SW3050	SODIUM	130	B	130	J	23	1140	mg/Kg	IB
SS	BKG050FD1	E200.7	SW3050	SODIUM	170	B	170	J	22	1120	mg/Kg	IB
SS	BKG052	E200.7	SW3050	SODIUM	93	B	93	J	23	1130	mg/Kg	IB
SS	BKG053	E200.7	SW3050	SODIUM	26	B	26	J	25	1240	mg/Kg	IB
SS	BKG055FD1	E200.7	SW3050	SODIUM	79	B	79	J	25	1270	mg/Kg	IB
SS	BKG056	E200.7	SW3050	SODIUM	100	B	100	J	21	1040	mg/Kg	IB
SS	BKG057	E200.7	SW3050	SODIUM	84	B	84	J	25	1270	mg/Kg	IB
SS	BKG059	E200.7	SW3050	SODIUM	180	B	180	J	27	1330	mg/Kg	IB
SS	BKG030	E200.7	SW3050	SODIUM	740	B	740	J	26	1280	mg/Kg	IB
SS	BKG034	E200.7	SW3050	SODIUM	120	B	120	J	26	1280	mg/Kg	IB
SS	BKG039	E200.7	SW3050	SODIUM	360	B	360	J	22	1100	mg/Kg	IB
SS	BKG060	E200.7	SW3050	SODIUM	79	B	79	J	21	1070	mg/Kg	IB
SS	BKG063	E200.7	SW3050	SODIUM	62	B	62	J	22	1100	mg/Kg	IB
SS	BKG064	E200.7	SW3050	SODIUM	25	B	25	J	24	1190	mg/Kg	IB
SS	BKG057	E200.7	SW3050	THALLIUM	0.46	B	0.46	J	0.43	2.5	mg/Kg	IB
SS	BKG034	E200.7	SW3050	THALLIUM	0.67	B	0.67	J	0.43	2.6	mg/Kg	IB
SS	BKG060	E200.7	SW3050	THALLIUM	0.45	B	0.45	J	0.36	2.1	mg/Kg	IB
SW	BKG022	E200.7	SW3050	THALLIUM	9.7	B	9.7	J	3.4	10	ug/L	IB
SW	BKG023	E200.7	SW3050	THALLIUM	5.1	B	5.1	J	3.4	10	ug/L	IB
SW	BKG024FD1	E200.7	SW3050	THALLIUM	7.5	B	7.5	J	3.4	10	ug/L	IB

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SW	BKG083	E200.7	SW3050	THALLIUM	3.4	B	3.4	J	3.4	10	ug/L	IB
WG	BKG067	E200.7	SW3050	THALLIUM	7.2	B	7.2	J	3.4	10	ug/L	IB
WG	BKG068FD1	E200.7	SW3050	THALLIUM	7.8	B	7.8	J	3.4	10	ug/L	IB
WG	BKG069	E200.7	SW3050	THALLIUM	6	B	6	J	3.4	10	ug/L	IB
WG	BKG070	E200.7	SW3050	THALLIUM	8.8	B	8.8	J	3.4	10	ug/L	IB
WG	BKG026	E200.7	SW3050	THALLIUM	6.9	B	6.9	J	3.4	10	ug/L	IB
WG	BKG046FD1	E200.7	SW3050	THALLIUM	6	B	6	J	3.4	10	ug/L	IB
WG	BKG047	E200.7	SW3050	THALLIUM	4.8	B	4.8	J	3.4	10	ug/L	IB
WG	BKG067	E200.7	FLDFLT	THALLIUM, DISSOLVED	6.3	B	6.3	J	3.4	10	ug/L	IB
WG	BKG068FD1	E200.7	FLDFLT	THALLIUM, DISSOLVED	8.6	B	8.6	J	3.4	10	ug/L	IB
WG	BKG069	E200.7	FLDFLT	THALLIUM, DISSOLVED	5.1	B	5.1	J	3.4	10	ug/L	IB
WG	BKG070	E200.7	FLDFLT	THALLIUM, DISSOLVED	5.4	B	5.4	J	3.4	10	ug/L	IB
WG	BKG045	E200.7	FLDFLT	THALLIUM, DISSOLVED	5.5	B	5.5	J	3.4	10	ug/L	IB
WG	BKG046FD1	E200.7	FLDFLT	THALLIUM, DISSOLVED	6.4	B	6.4	J	3.4	10	ug/L	IB
WG	BKG047	E200.7	FLDFLT	THALLIUM, DISSOLVED	7.1	B	7.1	J	3.4	10	ug/L	IB
RK	BKG077	E200.7	SW3050	VANADIUM	7	B	7	J	0.07	10	mg/Kg	IB
SB	BKG004	E200.7	SW3050	VANADIUM	9.8	B	9.8	J	0.09	13	mg/Kg	IB
SD	BKG017	E200.7	SW3050	VANADIUM	29	B	29	J	0.37	53	mg/Kg	IB
SD	BKG018	E200.7	SW3050	VANADIUM	7.2	B	7.2	J	0.12	17	mg/Kg	IB
SD	BKG019FD1	E200.7	SW3050	VANADIUM	24	B	24	J	0.37	53	mg/Kg	IB
SD	BKG079	E200.7	SW3050	VANADIUM	11	B	11	J	0.11	16	mg/Kg	IB
SD	BKG082	E200.7	SW3050	VANADIUM	11	B	11	J	0.11	15	mg/Kg	IB
SS	BKG003	E200.7	SW3050	VANADIUM	9	B	9	J	0.1	15	mg/Kg	IB
SS	BKG006	E200.7	SW3050	VANADIUM	12	B	12	J	0.1	15	mg/Kg	IB
SS	BKG007FD1	E200.7	SW3050	VANADIUM	12	B	12	J	0.08	13	mg/Kg	IB
SW	BKG022	E200.7	SW3050	VANADIUM	8.3	B	8.3	J	0.7	50	ug/L	IB
SW	BKG023	E200.7	SW3050	VANADIUM	2.7	B	2.7	J	0.7	50	ug/L	IB
SW	BKG024FD1	E200.7	SW3050	VANADIUM	3	B	3	J	0.7	50	ug/L	IB
SW	BKG083	E200.7	SW3050	VANADIUM	44	B	44	J	0.7	50	ug/L	IB
WG	BKG067	E200.7	SW3050	VANADIUM	1.9	B	1.9	J	0.7	50	ug/L	IB
WG	BKG068FD1	E200.7	SW3050	VANADIUM	3.2	B	3.2	J	0.7	50	ug/L	IB
WG	BKG069	E200.7	SW3050	VANADIUM	2.2	B	2.2	J	0.7	50	ug/L	IB
WG	BKG070	E200.7	SW3050	VANADIUM	1.8	B	1.8	J	0.7	50	ug/L	IB
WG	BKG025	E200.7	SW3050	VANADIUM	7.6	B	7.6	J	0.7	50	ug/L	IB
WG	BKG026	E200.7	SW3050	VANADIUM	8.5	B	8.5	J	0.7	50	ug/L	IB
WG	BKG046FD1	E200.7	SW3050	VANADIUM	3.2	B	3.2	J	0.7	50	ug/L	IB
WG	BKG047	E200.7	SW3050	VANADIUM	3.5	B	3.5	J	0.7	50	ug/L	IB
WG	BKG067	E200.7	FLDFLT	VANADIUM, DISSOLVED	2.5	B	2.5	J	0.7	50	ug/L	IB
WG	BKG068FD1	E200.7	FLDFLT	VANADIUM, DISSOLVED	3	B	3	J	0.7	50	ug/L	IB
WG	BKG069	E200.7	FLDFLT	VANADIUM, DISSOLVED	1.9	B	1.9	J	0.7	50	ug/L	IB
WG	BKG025	E200.7	FLDFLT	VANADIUM, DISSOLVED	3	B	3	J	0.7	50	ug/L	IB
WG	BKG026	E200.7	FLDFLT	VANADIUM, DISSOLVED	5.9	B	5.9	J	0.7	50	ug/L	IB
WG	BKG045	E200.7	FLDFLT	VANADIUM, DISSOLVED	32	B	32	J	0.7	50	ug/L	IB
WG	BKG046FD1	E200.7	FLDFLT	VANADIUM, DISSOLVED	2.6	B	2.6	J	0.7	50	ug/L	IB
WG	BKG047	E200.7	FLDFLT	VANADIUM, DISSOLVED	2.8	B	2.8	J	0.7	50	ug/L	IB
SB	BKG004	E200.7	SW3050	ZINC	3.5	B	3.5	J	0.64	5.1	mg/Kg	IB
SD	BKG018	E200.7	SW3050	ZINC	4.9	B	4.9	J	0.85	6.8	mg/Kg	IB
WG	BKG067	E200.7	SW3050	ZINC	8.4	B	8.4	J	5	20	ug/L	IB
WG	BKG068FD1	E200.7	SW3050	ZINC	9.9	B	9.9	J	5	20	ug/L	IB
WG	BKG069	E200.7	SW3050	ZINC	14	B	14	J	5	20	ug/L	IB
WG	BKG067	E200.7	FLDFLT	ZINC, DISSOLVED	6.7	B	6.7	J	5	20	ug/L	IB
WG	BKG068FD1	E200.7	FLDFLT	ZINC, DISSOLVED	5.6	B	5.6	J	5	20	ug/L	IB
WG	BKG069	E200.7	FLDFLT	ZINC, DISSOLVED	10	B	10	J	5	20	ug/L	IB
WG	BKG045	E200.7	FLDFLT	ZINC, DISSOLVED	15	B	15	J	5	20	ug/L	IB
SS	BKG037	E200.7	SW3050	ARSENIC	1.2	B	1.2	J	0.39	2.7	mg/Kg	IS
SW	BKG083	E200.7	SW3050	ALUMINUM	16000	=	16000	J	95	200	ug/L	MS
SW	BKG084	E200.7	SW3050	ALUMINUM	230000	=	230000	J	95	200	ug/L	MS
SW	BKG085FD1	E200.7	SW3050	ALUMINUM	500000	=	500000	J	95	200	ug/L	MS
SW	BKG086	E200.7	SW3050	ALUMINUM	350000	=	350000	J	95	200	ug/L	MS
SW	BKG087	E200.7	SW3050	ALUMINUM	220000	=	220000	J	95	200	ug/L	MS
WG	BKG025	E200.7	SW3050	ALUMINUM	3000	=	3000	J	95	200	ug/L	MS
WG	BKG026	E200.7	SW3050	ALUMINUM	950	=	950	J	95	200	ug/L	MS, LD
WG	BKG045	E200.7	SW3050	ALUMINUM	3500	=	3500	J	95	200	ug/L	MS, LD
WG	BKG047	E200.7	SW3050	ALUMINUM	130	B	130	J	95	200	ug/L	MS, LD
SW	BKG022	E200.7	SW3050	ALUMINUM	5000	=	5000	J	95	200	ug/L	MS, SD
SW	BKG023	E200.7	SW3050	ALUMINUM	530	=	530	J	95	200	ug/L	MS, SD
SW	BKG024FD1	E200.7	SW3050	ALUMINUM	1500	=	1500	J	95	200	ug/L	MS, SD
RK	BKG072	E200.7	SW3050	ANTIMONY	0.25	U	0.25	UJ	0.25	12	mg/Kg	MS
RK	BKG073	E200.7	SW3050	ANTIMONY	0.24	U	0.24	UJ	0.24	12	mg/Kg	MS
RK	BKG074	E200.7	SW3050	ANTIMONY	0.24	U	0.24	UJ	0.24	12	mg/Kg	MS
RK	BKG075	E200.7	SW3050	ANTIMONY	0.24	U	0.24	UJ	0.24	12	mg/Kg	MS

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
RK	BKG076FD1	E200.7	SW3050	ANTIMONY	0.24	U	0.24	UJ	0.24	12	mg/Kg	MS
RK	BKG077	E200.7	SW3050	ANTIMONY	0.24	U	0.24	UJ	0.24	12	mg/Kg	MS
SB	BKG011	E200.7	SW3050	ANTIMONY	0.77	B	0.77	J	0.26	13	mg/Kg	MS
[illegible]	BKG051	E200.7	SW3050	ANTIMONY	1.4	B	1.4	J	0.26	13	mg/Kg	MS
[illegible]	BKG054	E200.7	SW3050	ANTIMONY	0.73	B	0.73	J	0.26	13	mg/Kg	MS
SB	BKG058	E200.7	SW3050	ANTIMONY	0.68	B	0.68	J	0.26	13	mg/Kg	MS
SB	BKG031FD1	E200.7	SW3050	ANTIMONY	0.28	U	0.28	UJ	0.28	14	mg/Kg	MS
SB	BKG032	E200.7	SW3050	ANTIMONY	0.59	B	0.59	J	0.32	16	mg/Kg	MS
SB	BKG035	E200.7	SW3050	ANTIMONY	1.3	B	1.3	J	0.28	14	mg/Kg	MS
SB	BKG038	E200.7	SW3050	ANTIMONY	0.67	B	0.67	J	0.34	17	mg/Kg	MS
SD	BKG078	E200.7	SW3050	ANTIMONY	0.52	U	0.52	UJ	0.52	26	mg/Kg	MS
SD	BKG079	E200.7	SW3050	ANTIMONY	0.37	U	0.37	UJ	0.37	19	mg/Kg	MS
SD	BKG080FD1	E200.7	SW3050	ANTIMONY	0.5	U	0.5	UJ	0.5	25	mg/Kg	MS
SD	BKG081	E200.7	SW3050	ANTIMONY	0.49	U	0.49	UJ	0.49	25	mg/Kg	MS
SD	BKG082	E200.7	SW3050	ANTIMONY	0.36	U	0.36	UJ	0.36	18	mg/Kg	MS
SS	BKG009	E200.7	SW3050	ANTIMONY	0.73	B	0.73	J	0.26	13	mg/Kg	MS
SS	BKG010	E200.7	SW3050	ANTIMONY	0.76	B	0.76	J	0.25	13	mg/Kg	MS
SS	BKG012	E200.7	SW3050	ANTIMONY	2.3	B	2.3	J	0.28	14	mg/Kg	MS
SS	BKG033	E200.7	SW3050	ANTIMONY	0.95	B	0.95	J	0.28	14	mg/Kg	MS
SS	BKG062	E200.7	SW3050	ANTIMONY	0.59	B	0.59	J	0.25	12	mg/Kg	MS
SS	BKG049	E200.7	SW3050	ANTIMONY	1.2	B	1.2	J	0.27	14	mg/Kg	MS
SS	BKG050FD1	E200.7	SW3050	ANTIMONY	1.2	B	1.2	J	0.27	13	mg/Kg	MS
SS	BKG052	E200.7	SW3050	ANTIMONY	0.66	B	0.66	J	0.27	14	mg/Kg	MS
SS	BKG053	E200.7	SW3050	ANTIMONY	0.71	B	0.71	J	0.3	15	mg/Kg	MS
SS	BKG055FD1	E200.7	SW3050	ANTIMONY	0.71	B	0.71	J	0.3	15	mg/Kg	MS
SS	BKG056	E200.7	SW3050	ANTIMONY	0.59	B	0.59	J	0.25	12	mg/Kg	MS
SS	BKG057	E200.7	SW3050	ANTIMONY	0.3	U	0.3	UJ	0.3	15	mg/Kg	MS
SS	BKG059	E200.7	SW3050	ANTIMONY	0.87	B	0.87	J	0.32	16	mg/Kg	MS
SS	BKG030	E200.7	SW3050	ANTIMONY	0.31	U	0.31	UJ	0.31	15	mg/Kg	MS
SS	BKG034	E200.7	SW3050	ANTIMONY	1.1	B	1.1	J	0.31	15	mg/Kg	MS
SS	BKG036	E200.7	SW3050	ANTIMONY	1	B	1	J	0.29	14	mg/Kg	MS
SS	BKG037	E200.7	SW3050	ANTIMONY	0.82	B	0.82	J	0.32	16	mg/Kg	MS
SS	BKG039	E200.7	SW3050	ANTIMONY	0.35	B	0.35	J	0.26	13	mg/Kg	MS
SS	BKG060	E200.7	SW3050	ANTIMONY	0.26	U	0.26	UJ	0.26	13	mg/Kg	MS
[illegible]	BKG063	E200.7	SW3050	ANTIMONY	0.52	B	0.52	J	0.26	13	mg/Kg	MS
[illegible]	BKG064	E200.7	SW3050	ANTIMONY	0.29	U	0.29	UJ	0.29	14	mg/Kg	MS
SB	BKG031FD1	E200.7	SW3050	BARIUM	230	=	230	J	0.01	47	mg/Kg	MS
SB	BKG032	E200.7	SW3050	BARIUM	320	=	320	J	0.01	53	mg/Kg	MS
SB	BKG035	E200.7	SW3050	BARIUM	150	=	150	J	0.01	47	mg/Kg	MS
SB	BKG038	E200.7	SW3050	BARIUM	16	B	16	J	0.01	56	mg/Kg	MS
SS	BKG030	E200.7	SW3050	BARIUM	32	B	32	J	0.01	51	mg/Kg	MS
SS	BKG034	E200.7	SW3050	BARIUM	70	=	70	J	0.01	51	mg/Kg	MS
SS	BKG036	E200.7	SW3050	BARIUM	21	B	21	J	0.01	48	mg/Kg	MS
SS	BKG037	E200.7	SW3050	BARIUM	17	B	17	J	0.01	53	mg/Kg	MS
SS	BKG039	E200.7	SW3050	BARIUM	22	B	22	J	0.01	44	mg/Kg	MS
SS	BKG060	E200.7	SW3050	BARIUM	170	=	170	J	0.01	43	mg/Kg	MS
SS	BKG063	E200.7	SW3050	BARIUM	190	=	190	J	0.01	44	mg/Kg	MS
SS	BKG064	E200.7	SW3050	BARIUM	150	=	150	J	0.01	48	mg/Kg	MS
SW	BKG083	E200.7	SW3050	BARIUM	100	B	100	J	0.13	200	ug/L	MS
SW	BKG084	E200.7	SW3050	BARIUM	480	=	480	J	0.13	200	ug/L	MS
SW	BKG085FD1	E200.7	SW3050	BARIUM	1200	=	1200	J	0.13	200	ug/L	MS
SW	BKG086	E200.7	SW3050	BARIUM	760	=	760	J	0.13	200	ug/L	MS
SW	BKG087	E200.7	SW3050	BARIUM	630	=	630	J	0.13	200	ug/L	MS
WG	BKG025	E200.7	SW3050	BARIUM	960	=	960	J	0.13	200	ug/L	MS
WG	BKG025	E200.7	FLDFLT	BARIUM, DISSOLVED	870	=	870	J	0.13	200	ug/L	MS, MD, SD
SW	BKG083	E200.7	SW3050	IRON	14000	=	14000	J	25	100	ug/L	MS
SW	BKG084	E200.7	SW3050	IRON	190000	=	190000	J	25	100	ug/L	MS
SW	BKG085FD1	E200.7	SW3050	IRON	340000	=	340000	J	25	100	ug/L	MS
SW	BKG086	E200.7	SW3050	IRON	230000	=	230000	J	25	100	ug/L	MS
SW	BKG087	E200.7	SW3050	IRON	160000	=	160000	J	25	100	ug/L	MS
WG	BKG068FD1	E200.7	SW3050	IRON	3500	=	3500	J	25	100	ug/L	MS
WG	BKG069	E200.7	SW3050	IRON	23000	=	23000	J	25	100	ug/L	MS
WG	BKG070	E200.7	SW3050	IRON	29000	=	29000	J	25	100	ug/L	MS
WG	BKG025	E200.7	SW3050	IRON	2700	=	2700	J	25	100	ug/L	MS
WG	BKG067	E200.7	FLDFLT	IRON, DISSOLVED	2800	=	2800	J	25	100	ug/L	MS
[illegible]	BKG068FD1	E200.7	FLDFLT	IRON, DISSOLVED	2900	=	2900	J	25	100	ug/L	MS
WG	BKG069	E200.7	FLDFLT	IRON, DISSOLVED	4300	=	4300	J	25	100	ug/L	MS
WG	BKG070	E200.7	FLDFLT	IRON, DISSOLVED	14000	=	14000	J	25	100	ug/L	MS
WG	BKG067	E200.7	SW3050	MAGNESIUM	34000	=	34000	J	13	5000	ug/L	MS
SW	BKG022	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
SW	BKG023	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SW	BKG024FD1	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
SW	BKG083	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
SW	BKG084	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
SW	BKG085FD1	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
SW	BKG086	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
SW	BKG087	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG025	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG026	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG045	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG046FD1	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG047	E245.2	METHOD	MERCURY	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG026	E245.2	FLDFLT	MERCURY, DISSOLVED	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG045	E245.2	FLDFLT	MERCURY, DISSOLVED	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG046FD1	E245.2	FLDFLT	MERCURY, DISSOLVED	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
WG	BKG047	E245.2	FLDFLT	MERCURY, DISSOLVED	0.025	U	0.025	UJ	0.02	0.2	ug/L	MS
SW	BKG084	E200.7	SW3050	SILVER	1	B	1	J	0.57	10	ug/L	MS
SW	BKG085FD1	E200.7	SW3050	SILVER	2.4	B	2.4	J	0.57	10	ug/L	MS
SW	BKG086	E200.7	SW3050	SILVER	1.3	B	1.3	J	0.57	10	ug/L	MS
SB	BKG011	E200.7	SW3050	THALLIUM	0.36	U	0.36	UJ	0.36	2.1	mg/Kg	MS
SS	BKG009	E200.7	SW3050	THALLIUM	0.36	U	0.36	UJ	0.36	2.1	mg/Kg	MS
SS	BKG010	E200.7	SW3050	THALLIUM	0.36	U	0.36	UJ	0.36	2.1	mg/Kg	MS
SS	BKG012	E200.7	SW3050	THALLIUM	0.4	U	0.4	UJ	0.4	2.3	mg/Kg	MS
SS	BKG033	E200.7	SW3050	THALLIUM	0.39	U	0.39	UJ	0.39	2.3	mg/Kg	MS
SS	BKG062	E200.7	SW3050	THALLIUM	0.35	U	0.35	UJ	0.35	2.1	mg/Kg	MS
SB	BKG031FD1	E200.7	SW3050	ALUMINUM	16000	=	16000	J	11	47	mg/Kg	SD
SB	BKG032	E200.7	SW3050	ALUMINUM	19000	=	19000	J	13	53	mg/Kg	SD
SB	BKG035	E200.7	SW3050	ALUMINUM	29000	=	29000	J	11	47	mg/Kg	SD
SB	BKG038	E200.7	SW3050	ALUMINUM	3300	=	3300	J	13	56	mg/Kg	SD
SS	BKG030	E200.7	SW3050	ALUMINUM	6300	=	6300	J	12	51	mg/Kg	SD
SS	BKG034	E200.7	SW3050	ALUMINUM	16000	=	16000	J	12	51	mg/Kg	SD
SS	BKG036	E200.7	SW3050	ALUMINUM	11000	=	11000	J	11	48	mg/Kg	SD
SS	BKG037	E200.7	SW3050	ALUMINUM	3400	=	3400	J	13	53	mg/Kg	SD
SS	BKG039	E200.7	SW3050	ALUMINUM	5400	=	5400	J	10	44	mg/Kg	SD
SS	BKG060	E200.7	SW3050	ALUMINUM	11000	=	11000	J	10	43	mg/Kg	SD
SS	BKG063	E200.7	SW3050	ALUMINUM	13000	=	13000	J	10	44	mg/Kg	SD
SS	BKG064	E200.7	SW3050	ALUMINUM	8900	=	8900	J	11	48	mg/Kg	SD
SB	BKG051	E200.7	SW3050	CALCIUM	4200	=	4200	J	3	1070	mg/Kg	SD
SB	BKG054	E200.7	SW3050	CALCIUM	6100	=	6100	J	3	1080	mg/Kg	SD
SB	BKG058	E200.7	SW3050	CALCIUM	3500	=	3500	J	3	1070	mg/Kg	SD
SB	BKG031FD1	E200.7	SW3050	CALCIUM	31000	=	31000	J	3.3	1170	mg/Kg	SD
SB	BKG032	E200.7	SW3050	CALCIUM	32000	=	32000	J	3.7	1340	mg/Kg	SD
SB	BKG035	E200.7	SW3050	CALCIUM	4800	=	4800	J	3.3	1180	mg/Kg	SD
SB	BKG038	E200.7	SW3050	CALCIUM	200000	=	200000	J	39	14100	mg/Kg	SD
SS	BKG049	E200.7	SW3050	CALCIUM	5100	=	5100	J	3.2	1140	mg/Kg	SD
SS	BKG050FD1	E200.7	SW3050	CALCIUM	4900	=	4900	J	3.1	1120	mg/Kg	SD
SS	BKG052	E200.7	SW3050	CALCIUM	3400	=	3400	J	3.2	1130	mg/Kg	SD
SS	BKG053	E200.7	SW3050	CALCIUM	5000	=	5000	J	3.5	1240	mg/Kg	SD
SS	BKG055FD1	E200.7	SW3050	CALCIUM	3700	=	3700	J	3.5	1270	mg/Kg	SD
SS	BKG056	E200.7	SW3050	CALCIUM	4700	=	4700	J	2.9	1040	mg/Kg	SD
SS	BKG057	E200.7	SW3050	CALCIUM	2800	=	2800	J	3.5	1270	mg/Kg	SD
SS	BKG059	E200.7	SW3050	CALCIUM	4900	=	4900	J	3.7	1330	mg/Kg	SD
SS	BKG030	E200.7	SW3050	CALCIUM	45000	=	45000	J	3.6	1280	mg/Kg	SD
SS	BKG034	E200.7	SW3050	CALCIUM	5900	=	5900	J	3.6	1280	mg/Kg	SD
SS	BKG036	E200.7	SW3050	CALCIUM	50000	=	50000	J	3.4	1200	mg/Kg	SD
SS	BKG037	E200.7	SW3050	CALCIUM	210000	=	210000	J	37	13400	mg/Kg	SD
SS	BKG039	E200.7	SW3050	CALCIUM	39000	=	39000	J	3.1	1100	mg/Kg	SD
SS	BKG060	E200.7	SW3050	CALCIUM	7500	=	7500	J	3	1070	mg/Kg	SD
SS	BKG063	E200.7	SW3050	CALCIUM	9100	=	9100	J	3.1	1100	mg/Kg	SD
SS	BKG064	E200.7	SW3050	CALCIUM	3300	=	3300	J	3.3	1190	mg/Kg	SD
SW	BKG083	E200.7	SW3050	CALCIUM	570000	=	570000	J	28	5000	ug/L	SD
SW	BKG084	E200.7	SW3050	CALCIUM	830000	=	830000	J	28	5000	ug/L	SD
SW	BKG085FD1DL2	E200.7	SW3050	CALCIUM	12000000	=	12000000	J	560	5000	ug/L	SD
SW	BKG086DL2	E200.7	SW3050	CALCIUM	8600000	=	8600000	J	560	5000	ug/L	SD
SW	BKG087DL1	E200.7	SW3050	CALCIUM	1600000	=	1600000	J	560	5000	ug/L	SD
WG	BKG025	E200.7	SW3050	CALCIUM	660000	=	660000	J	28	5000	ug/L	SD
WG	BKG026	E200.7	SW3050	CALCIUM	630000	=	630000	J	28	5000	ug/L	SD
WG	BKG045	E200.7	SW3050	CALCIUM	180000	=	180000	J	28	5000	ug/L	SD
WG	BKG046FD1	E200.7	SW3050	CALCIUM	330000	=	330000	J	28	5000	ug/L	SD
WG	BKG047	E200.7	SW3050	CALCIUM	320000	=	320000	J	28	5000	ug/L	SD
WG	BKG025	E200.7	FLDFLT	CALCIUM, DISSOLVED	660000	=	660000	J	28	5000	ug/L	SD
WG	BKG026	E200.7	FLDFLT	CALCIUM, DISSOLVED	650000	=	650000	J	28	5000	ug/L	SD

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
WG	BKG045	E200.7	FLDFLT	CALCIUM, DISSOLVED	180000	=	180000	J	28	5000	ug/L	SD
WG	BKG046FD1	E200.7	FLDFLT	CALCIUM, DISSOLVED	330000	=	330000	J	28	5000	ug/L	SD
WG	BKG047	E200.7	FLDFLT	CALCIUM, DISSOLVED	330000	=	330000	J	28	5000	ug/L	SD
SB	BKG051	E200.7	SW3050	CHROMIUM, TOTAL	52	=	52	J	0.09	2.1	mg/Kg	SD
SB	BKG054	E200.7	SW3050	CHROMIUM, TOTAL	5.7	=	5.7	J	0.09	2.2	mg/Kg	SD
SB	BKG058	E200.7	SW3050	CHROMIUM, TOTAL	6	=	6	J	0.09	2.1	mg/Kg	SD
SS	BKG049	E200.7	SW3050	CHROMIUM, TOTAL	41	=	41	J	0.09	2.3	mg/Kg	SD
SS	BKG050FD1	E200.7	SW3050	CHROMIUM, TOTAL	36	=	36	J	0.09	2.2	mg/Kg	SD
SS	BKG052	E200.7	SW3050	CHROMIUM, TOTAL	3.1	=	3.1	J	0.09	2.3	mg/Kg	SD
SS	BKG053	E200.7	SW3050	CHROMIUM, TOTAL	4	=	4	J	0.11	2.5	mg/Kg	SD
SS	BKG055FD1	E200.7	SW3050	CHROMIUM, TOTAL	4	=	4	J	0.11	2.5	mg/Kg	SD
SS	BKG056	E200.7	SW3050	CHROMIUM, TOTAL	6.2	=	6.2	J	0.09	2.1	mg/Kg	SD
SS	BKG057	E200.7	SW3050	CHROMIUM, TOTAL	3.2	=	3.2	J	0.11	2.5	mg/Kg	SD
SS	BKG059	E200.7	SW3050	CHROMIUM, TOTAL	6.3	=	6.3	J	0.12	2.7	mg/Kg	SD
SB	BKG031FD1	E200.7	SW3050	COPPER	28	=	28	J	0.09	5.8	mg/Kg	SD
SB	BKG032	E200.7	SW3050	COPPER	32	=	32	J	0.11	6.7	mg/Kg	SD
SB	BKG035	E200.7	SW3050	COPPER	46	=	46	J	0.09	5.9	mg/Kg	SD
SB	BKG038	E200.7	SW3050	COPPER	10	=	10	J	0.11	7.1	mg/Kg	SD
SS	BKG030	E200.7	SW3050	COPPER	32	=	32	J	0.1	6.4	mg/Kg	SD
SS	BKG034	E200.7	SW3050	COPPER	26	=	26	J	0.1	6.4	mg/Kg	SD
SS	BKG036	E200.7	SW3050	COPPER	35	=	35	J	0.09	6	mg/Kg	SD
SS	BKG037	E200.7	SW3050	COPPER	12	=	12	J	0.11	6.7	mg/Kg	SD
SS	BKG039	E200.7	SW3050	COPPER	15	=	15	J	0.08	5.5	mg/Kg	SD
SS	BKG060	E200.7	SW3050	COPPER	18	=	18	J	0.08	5.3	mg/Kg	SD
SS	BKG063	E200.7	SW3050	COPPER	32	=	32	J	0.08	5.5	mg/Kg	SD
SS	BKG064	E200.7	SW3050	COPPER	17	=	17	J	0.09	6	mg/Kg	SD
SB	BKG051	E200.7	SW3050	IRON	28000	=	28000	J	2.7	21	mg/Kg	SD
SB	BKG054	E200.7	SW3050	IRON	15000	=	15000	J	2.7	22	mg/Kg	SD
SB	BKG058	E200.7	SW3050	IRON	27000	=	27000	J	2.7	21	mg/Kg	SD
SB	BKG031FD1	E200.7	SW3050	IRON	24000	=	24000	J	2.9	23	mg/Kg	SD
SB	BKG032	E200.7	SW3050	IRON	27000	=	27000	J	3.4	27	mg/Kg	SD
SB	BKG035	E200.7	SW3050	IRON	39000	=	39000	J	3	24	mg/Kg	SD
SB	BKG038	E200.7	SW3050	IRON	4800	=	4800	J	3.6	28	mg/Kg	SD
SS	BKG049	E200.7	SW3050	IRON	26000	=	26000	J	2.9	23	mg/Kg	SD
SS	BKG050FD1	E200.7	SW3050	IRON	25000	=	25000	J	2.8	22	mg/Kg	SD
SS	BKG052	E200.7	SW3050	IRON	17000	=	17000	J	2.9	23	mg/Kg	SD
SS	BKG053	E200.7	SW3050	IRON	23000	=	23000	J	3.1	25	mg/Kg	SD
SS	BKG055FD1	E200.7	SW3050	IRON	21000	=	21000	J	3.2	25	mg/Kg	SD
SS	BKG056	E200.7	SW3050	IRON	17000	=	17000	J	2.6	21	mg/Kg	SD
SS	BKG057	E200.7	SW3050	IRON	14000	=	14000	J	3.2	25	mg/Kg	SD
SS	BKG059	E200.7	SW3050	IRON	24000	=	24000	J	3.4	27	mg/Kg	SD
SS	BKG030	E200.7	SW3050	IRON	12000	=	12000	J	3.2	26	mg/Kg	SD
SS	BKG034	E200.7	SW3050	IRON	25000	=	25000	J	3.2	26	mg/Kg	SD
SS	BKG036	E200.7	SW3050	IRON	18000	=	18000	J	3	24	mg/Kg	SD
SS	BKG037	E200.7	SW3050	IRON	4600	=	4600	J	3.4	27	mg/Kg	SD
SS	BKG039	E200.7	SW3050	IRON	10000	=	10000	J	2.8	22	mg/Kg	SD
SS	BKG060	E200.7	SW3050	IRON	20000	=	20000	J	2.7	21	mg/Kg	SD
SS	BKG063	E200.7	SW3050	IRON	24000	=	24000	J	2.8	22	mg/Kg	SD
SS	BKG064	E200.7	SW3050	IRON	19000	=	19000	J	3	24	mg/Kg	SD
WG	BKG026	E200.7	SW3050	IRON	1300	=	1300	J	25	100	ug/L	SD
WG	BKG045	E200.7	SW3050	IRON	4800	=	4800	J	25	100	ug/L	SD
WG	BKG046FD1	E200.7	SW3050	IRON	440	=	440	J	25	100	ug/L	SD
WG	BKG047	E200.7	SW3050	IRON	480	=	480	J	25	100	ug/L	SD
WG	BKG026	E200.7	FLDFLT	IRON, DISSOLVED	490	=	490	J	25	100	ug/L	SD
WG	BKG046FD1	E200.7	FLDFLT	IRON, DISSOLVED	420	=	420	J	25	100	ug/L	SD
WG	BKG047	E200.7	FLDFLT	IRON, DISSOLVED	420	=	420	J	25	100	ug/L	SD
SB	BKG051	E200.7	SW3050	MAGNESIUM	4400	=	4400	J	0.14	1070	mg/Kg	SD
SB	BKG054	E200.7	SW3050	MAGNESIUM	4800	=	4800	J	0.14	1080	mg/Kg	SD
SB	BKG058	E200.7	SW3050	MAGNESIUM	3500	=	3500	J	0.14	1070	mg/Kg	SD
SB	BKG031FD1	E200.7	SW3050	MAGNESIUM	3300	=	3300	J	0.15	1170	mg/Kg	SD
SB	BKG032	E200.7	SW3050	MAGNESIUM	4000	=	4000	J	0.17	1340	mg/Kg	SD
SB	BKG035	E200.7	SW3050	MAGNESIUM	8300	=	8300	J	0.15	1180	mg/Kg	SD
SB	BKG038	E200.7	SW3050	MAGNESIUM	3800	=	3800	J	0.18	1410	mg/Kg	SD
SS	BKG049	E200.7	SW3050	MAGNESIUM	4300	=	4300	J	0.15	1140	mg/Kg	SD
SS	BKG050FD1	E200.7	SW3050	MAGNESIUM	4200	=	4200	J	0.15	1120	mg/Kg	SD
SS	BKG052	E200.7	SW3050	MAGNESIUM	3000	=	3000	J	0.15	1130	mg/Kg	SD
SS	BKG053	E200.7	SW3050	MAGNESIUM	7100	=	7100	J	0.16	1240	mg/Kg	SD
SS	BKG055FD1	E200.7	SW3050	MAGNESIUM	3400	=	3400	J	0.16	1270	mg/Kg	SD
SS	BKG056	E200.7	SW3050	MAGNESIUM	4000	=	4000	J	0.14	1040	mg/Kg	SD
SS	BKG057	E200.7	SW3050	MAGNESIUM	1500	=	1500	J	0.16	1270	mg/Kg	SD
SS	BKG059	E200.7	SW3050	MAGNESIUM	3700	=	3700	J	0.17	1330	mg/Kg	SD

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SS	BKG030	E200.7	SW3050	MAGNESIUM	3000	=	3000	J	0.17	1280	mg/Kg	SD
SS	BKG034	E200.7	SW3050	MAGNESIUM	4500	=	4500	J	0.17	1280	mg/Kg	SD
SS	BKG036	E200.7	SW3050	MAGNESIUM	11000	=	11000	J	0.16	1200	mg/Kg	SD
SS	BKG037	E200.7	SW3050	MAGNESIUM	3600	=	3600	J	0.17	1340	mg/Kg	SD
SS	BKG039	E200.7	SW3050	MAGNESIUM	2300	=	2300	J	0.14	1100	mg/Kg	SD
SS	BKG060	E200.7	SW3050	MAGNESIUM	3300	=	3300	J	0.14	1070	mg/Kg	SD
SS	BKG063	E200.7	SW3050	MAGNESIUM	7200	=	7200	J	0.14	1100	mg/Kg	SD
SS	BKG064	E200.7	SW3050	MAGNESIUM	2800	=	2800	J	0.16	1190	mg/Kg	SD
SW	BKG022	E200.7	SW3050	MAGNESIUM	1000000	E	1000000	J	13	5000	ug/L	SD
SB	BKG051	E200.7	SW3050	MANGANESE	550	=	550	J	0.03	3.2	mg/Kg	SD
SB	BKG054	E200.7	SW3050	MANGANESE	370	=	370	J	0.03	3.2	mg/Kg	SD
SB	BKG058	E200.7	SW3050	MANGANESE	520	=	520	J	0.03	3.2	mg/Kg	SD
SB	BKG031FD1	E200.7	SW3050	MANGANESE	990	=	990	J	0.03	3.5	mg/Kg	SD
SB	BKG032	E200.7	SW3050	MANGANESE	970	=	970	J	0.04	4	mg/Kg	SD
SB	BKG035	E200.7	SW3050	MANGANESE	870	=	870	J	0.03	3.5	mg/Kg	SD
SB	BKG038	E200.7	SW3050	MANGANESE	110	=	110	J	0.04	4.2	mg/Kg	SD
SS	BKG050FD1	E200.7	SW3050	MANGANESE	640	=	640	J	0.03	3.3	mg/Kg	SD
SS	BKG052	E200.7	SW3050	MANGANESE	290	=	290	J	0.03	3.4	mg/Kg	SD
SS	BKG053	E200.7	SW3050	MANGANESE	540	=	540	J	0.04	3.7	mg/Kg	SD
SS	BKG055FD1	E200.7	SW3050	MANGANESE	360	=	360	J	0.04	3.8	mg/Kg	SD
SS	BKG056	E200.7	SW3050	MANGANESE	440	=	440	J	0.03	3.1	mg/Kg	SD
SS	BKG057	E200.7	SW3050	MANGANESE	1200	=	1200	J	0.04	3.8	mg/Kg	SD
SS	BKG059	E200.7	SW3050	MANGANESE	780	=	780	J	0.04	4	mg/Kg	SD
SS	BKG030	E200.7	SW3050	MANGANESE	260	=	260	J	0.04	3.8	mg/Kg	SD
SS	BKG034	E200.7	SW3050	MANGANESE	620	=	620	J	0.04	3.8	mg/Kg	SD
SS	BKG036	E200.7	SW3050	MANGANESE	360	=	360	J	0.04	3.6	mg/Kg	SD
SS	BKG037	E200.7	SW3050	MANGANESE	120	=	120	J	0.04	4	mg/Kg	SD
SS	BKG039	E200.7	SW3050	MANGANESE	210	=	210	J	0.03	3.3	mg/Kg	SD
SS	BKG060	E200.7	SW3050	MANGANESE	690	=	690	J	0.03	3.2	mg/Kg	SD
SS	BKG063	E200.7	SW3050	MANGANESE	760	=	760	J	0.03	3.3	mg/Kg	SD
SS	BKG064	E200.7	SW3050	MANGANESE	660	=	660	J	0.03	3.6	mg/Kg	SD
SW	BKG083	E200.7	SW3050	MANGANESE	620	=	620	J	0.33	15	ug/L	SD
SW	BKG084	E200.7	SW3050	MANGANESE	7100	=	7100	J	0.33	15	ug/L	SD
SW	BKG085FD1	E200.7	SW3050	MANGANESE	17000	=	17000	J	0.33	15	ug/L	SD
SW	BKG086	E200.7	SW3050	MANGANESE	10000	=	10000	J	0.33	15	ug/L	SD
SW	BKG087	E200.7	SW3050	MANGANESE	5600	=	5600	J	0.33	15	ug/L	SD
WG	BKG025	E200.7	SW3050	MANGANESE	17000	=	17000	J	0.33	15	ug/L	SD
WG	BKG026	E200.7	SW3050	MANGANESE	8600	=	8600	J	0.33	15	ug/L	SD
WG	BKG045	E200.7	SW3050	MANGANESE	3200	=	3200	J	0.33	15	ug/L	SD
WG	BKG046FD1	E200.7	SW3050	MANGANESE	980	=	980	J	0.33	15	ug/L	SD
WG	BKG047	E200.7	SW3050	MANGANESE	910	=	910	J	0.33	15	ug/L	SD
WG	BKG025	E200.7	FLDFLT	MANGANESE, DISSOLVED	18000	=	18000	J	0.33	15	ug/L	SD
WG	BKG026	E200.7	FLDFLT	MANGANESE, DISSOLVED	8700	=	8700	J	0.33	15	ug/L	SD
WG	BKG045	E200.7	FLDFLT	MANGANESE, DISSOLVED	3100	=	3100	J	0.33	15	ug/L	SD
WG	BKG046FD1	E200.7	FLDFLT	MANGANESE, DISSOLVED	1000	=	1000	J	0.33	15	ug/L	SD
WG	BKG047	E200.7	FLDFLT	MANGANESE, DISSOLVED	1100	=	1100	J	0.33	15	ug/L	SD
SB	BKG031FD1	E200.7	SW3050	NICKEL	4.5	B	4.5	J	0.11	9.3	mg/Kg	SD
SB	BKG032	E200.7	SW3050	NICKEL	5.2	B	5.2	J	0.12	11	mg/Kg	SD
SB	BKG035	E200.7	SW3050	NICKEL	40	=	40	J	0.11	9.4	mg/Kg	SD
SB	BKG038	E200.7	SW3050	NICKEL	1.6	B	1.6	J	0.13	11	mg/Kg	SD
SS	BKG030	E200.7	SW3050	NICKEL	2.9	B	2.9	J	0.12	10	mg/Kg	SD
SS	BKG034	E200.7	SW3050	NICKEL	22	=	22	J	0.12	10	mg/Kg	SD
SS	BKG036	E200.7	SW3050	NICKEL	26	=	26	J	0.11	9.6	mg/Kg	SD
SS	BKG037	E200.7	SW3050	NICKEL	1.3	B	1.3	J	0.12	11	mg/Kg	SD
SS	BKG039	E200.7	SW3050	NICKEL	1.9	B	1.9	J	0.1	8.8	mg/Kg	SD
SS	BKG060	E200.7	SW3050	NICKEL	1.7	B	1.7	J	0.09	8.5	mg/Kg	SD
SS	BKG063	E200.7	SW3050	NICKEL	9.6	=	9.6	J	0.1	8.8	mg/Kg	SD
SS	BKG064	E200.7	SW3050	NICKEL	1.3	B	1.3	J	0.11	9.5	mg/Kg	SD
SB	BKG008	E200.7	SW3050	POTASSIUM	1600	=	1600	J	4.3	1440	mg/Kg	SD
SB	BKG014	E200.7	SW3050	POTASSIUM	830	B	830	J	3.9	1300	mg/Kg	SD
SB	BKG015FD1	E200.7	SW3050	POTASSIUM	840	B	840	J	3.9	1290	mg/Kg	SD
SD	BKG017	E200.7	SW3050	POTASSIUM	5200	B	5200	J	16	5290	mg/Kg	SD
SD	BKG018	E200.7	SW3050	POTASSIUM	1400	B	1400	J	5.1	1700	mg/Kg	SD
SD	BKG019FD1	E200.7	SW3050	POTASSIUM	5600	=	5600	J	16	5290	mg/Kg	SD
SD	BKG078	E200.7	SW3050	POTASSIUM	3700	=	3700	J	6.5	2160	mg/Kg	SD
SD	BKG079	E200.7	SW3050	POTASSIUM	1600	=	1600	J	4.7	1560	mg/Kg	SD
SD	BKG080FD1	E200.7	SW3050	POTASSIUM	4300	=	4300	J	6.2	2080	mg/Kg	SD
SD	BKG081	E200.7	SW3050	POTASSIUM	4000	=	4000	J	6.2	2060	mg/Kg	SD
SD	BKG082	E200.7	SW3050	POTASSIUM	1300	B	1300	J	4.5	1500	mg/Kg	SD
SS	BKG013	E200.7	SW3050	POTASSIUM	820	B	820	J	3.7	1230	mg/Kg	SD
SW	BKG022DL1	E200.7	SW3050	POTASSIUM	620000	=	620000	J	300	5000	ug/L	SD

Appendix I-1 - Changes In Qualifier from the Data Validation Process

Matrix	Sample ID	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	Comments
SW	BKG023DL1	E200.7	SW3050	POTASSIUM	810000	=	810000	J	300	5000	ug/L	SD
SW	BKG024FD1DL1	E200.7	SW3050	POTASSIUM	580000	=	580000	J	300	5000	ug/L	SD
WG	BKG026DL2	E200.7	SW3050	POTASSIUM	700000	=	700000	J	30	5000	ug/L	SD
WG	BKG045	E200.7	SW3050	POTASSIUM	10000	=	10000	J	30	5000	ug/L	SD
WG	BKG046FD1	E200.7	SW3050	POTASSIUM	59000	=	59000	J	30	5000	ug/L	SD
WG	BKG047	E200.7	SW3050	POTASSIUM	56000	=	56000	J	30	5000	ug/L	SD
WG	BKG067	E200.7	FLDFLT	POTASSIUM, DISSOLVED	2500	B	2500	J	30	5000	ug/L	SD
WG	BKG068FD1	E200.7	FLDFLT	POTASSIUM, DISSOLVED	2600	B	2600	J	30	5000	ug/L	SD
WG	BKG069	E200.7	FLDFLT	POTASSIUM, DISSOLVED	2000	B	2000	J	30	5000	ug/L	SD
WG	BKG070	E200.7	FLDFLT	POTASSIUM, DISSOLVED	40000	=	40000	J	30	5000	ug/L	SD
WG	BKG025	E200.7	FLDFLT	POTASSIUM, DISSOLVED	400000	=	400000	J	30	5000	ug/L	SD
WG	BKG026DL2	E200.7	FLDFLT	POTASSIUM, DISSOLVED	720000	=	720000	J	30	5000	ug/L	SD
WG	BKG045	E200.7	FLDFLT	POTASSIUM, DISSOLVED	13000	=	13000	J	30	5000	ug/L	SD
WG	BKG046FD1	E200.7	FLDFLT	POTASSIUM, DISSOLVED	60000	=	60000	J	30	5000	ug/L	SD
WG	BKG047	E200.7	FLDFLT	POTASSIUM, DISSOLVED	60000	=	60000	J	30	5000	ug/L	SD
SB	BKG031FD1	E200.7	SW3050	VANADIUM	78	=	78	J	0.08	12	mg/Kg	SD
SB	BKG032	E200.7	SW3050	VANADIUM	88	=	88	J	0.09	13	mg/Kg	SD
SB	BKG035	E200.7	SW3050	VANADIUM	130	=	130	J	0.08	12	mg/Kg	SD
SB	BKG038	E200.7	SW3050	VANADIUM	17	=	17	J	0.09	14	mg/Kg	SD
SS	BKG030	E200.7	SW3050	VANADIUM	36	=	36	J	0.09	13	mg/Kg	SD
SS	BKG034	E200.7	SW3050	VANADIUM	88	=	88	J	0.09	13	mg/Kg	SD
SS	BKG036	E200.7	SW3050	VANADIUM	63	=	63	J	0.08	12	mg/Kg	SD
SS	BKG037	E200.7	SW3050	VANADIUM	14	=	14	J	0.09	13	mg/Kg	SD
SS	BKG039	E200.7	SW3050	VANADIUM	36	=	36	J	0.07	11	mg/Kg	SD
SS	BKG060	E200.7	SW3050	VANADIUM	50	=	50	J	0.07	11	mg/Kg	SD
SS	BKG063	E200.7	SW3050	VANADIUM	68	=	68	J	0.07	11	mg/Kg	SD
SS	BKG064	E200.7	SW3050	VANADIUM	52	=	52	J	0.08	12	mg/Kg	SD
SD	BKG078	E200.7	SW3050	ZINC	30	=	30	J	1.1	8.6	mg/Kg	SD
SD	BKG079	E200.7	SW3050	ZINC	13	=	13	J	0.78	6.2	mg/Kg	SD
SD	BKG080FD1	E200.7	SW3050	ZINC	55	=	55	J	1	8.3	mg/Kg	SD
SD	BKG081	E200.7	SW3050	ZINC	48	=	48	J	1	8.2	mg/Kg	SD
SD	BKG082	E200.7	SW3050	ZINC	12	=	12	J	0.75	6	mg/Kg	SD

Appendix I-2 - Detections Reported in All Blank Types

Matrix	Analytical Method	Preparation Method	Sample ID	Type	Parameter	Lab Result	Lab Qual	RL	DL	Units
SOIL	E200.7	SW3050	18855BLK	LB	CALCIUM	33	B	1000	2.8	mg/Kg
SOIL	E200.7	SW3050	14044BLK	LB	MAGNESIUM	11	B	1000	0.13	mg/Kg
SOIL	E200.7	SW3050	19147BLK	LB	MAGNESIUM	11	B	1000	1.3	mg/Kg
SOIL	E200.7	SW3050	14044BLK	LB	SODIUM	108	B	1000	20	mg/Kg
SOIL	E200.7	SW3050	19147BLK	LB	SODIUM	108	B	1000	20	mg/Kg
SOIL	E200.7	SW3050	18855BLK	LB	ZINC	1.6	B	4	0.5	mg/Kg
WQ	E200.7	SW3050	BKG066EB1	EB1	BARIUM	1.7	B	200	0.13	ug/L
WATER	E200.7	SW3050	20083BLK	LB	CALCIUM	134	B	5000	28	ug/L
WATER	E200.7	SW3050	19313BLK	LB	CALCIUM	292	B	5000	28	ug/L
WQ	E200.7	SW3050	BKG002EB1	EB1	CALCIUM	180	B	5000	28	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	CALCIUM	570	B	5000	28	ug/L
WQ	E200.7	SW3050	BKG044EB1	EB1	CALCIUM	310	B	5000	28	ug/L
WATER	E200.7	FLDFLT	19313BLK	LB	CALCIUM, DISSOLVED	292	B	5000	28	ug/L
WQ	E200.7	SW3050	BKG001AB1	AB1	CHROMIUM, TOTAL	7.8	B	10	0.87	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	CHROMIUM, TOTAL	3.2	B	10	0.87	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	COPPER	3.3	B	25	0.8	ug/L
WATER	E200.7	SW3050	18065BLK	LB	IRON	70	B	100	25	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	IRON	220	=	100	25	ug/L
WATER	E200.7	SW3050	19313BLK	LB	MAGNESIUM	468	B	5000	13	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	MAGNESIUM	49	B	5000	13	ug/L
WQ	E200.7	SW3050	BKG044EB1	EB1	MAGNESIUM	550	B	5000	13	ug/L
WATER	E200.7	FLDFLT	20079BLK	LB	MAGNESIUM, DISSOLVED	108	B	5000	13	ug/L
WATER	E200.7	FLDFLT	19313BLK	LB	MAGNESIUM, DISSOLVED	468	B	5000	13	ug/L
WATER	E200.7	SW3050	19313BLK	LB	MANGANESE	7.69	B	15	0.33	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	MANGANESE	4.5	B	15	0.33	ug/L
WQ	E200.7	SW3050	BKG044EB1	EB1	MANGANESE	3.3	B	15	0.33	ug/L
WATER	E200.7	FLDFLT	19313BLK	LB	MANGANESE, DISSOLVED	7.69	B	15	0.33	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	NICKEL	2	B	40	0.93	ug/L
WQ	E200.7	SW3050	BKG044EB1	EB1	NICKEL	1.6	B	40	0.93	ug/L
WATER	E200.7	SW3050	19313BLK	LB	POTASSIUM	144	B	5000	30	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	POTASSIUM	170	B	5000	30	ug/L
WQ	E200.7	SW3050	BKG044EB1	EB1	POTASSIUM	230	B	5000	30	ug/L
WATER	E200.7	FLDFLT	19313BLK	LB	POTASSIUM, DISSOLVED	144	B	5000	30	ug/L
WATER	E200.7	SW3050	19313BLK	LB	SODIUM	4240	B	5000	200	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	SODIUM	310	B	5000	200	ug/L
WQ	E200.7	SW3050	BKG044EB1	EB1	SODIUM	5100	=	5000	200	ug/L
WATER	E200.7	FLDFLT	20079BLK	LB	SODIUM, DISSOLVED	761	B	5000	200	ug/L
WATER	E200.7	FLDFLT	19313BLK	LB	SODIUM, DISSOLVED	4240	B	5000	200	ug/L
WATER	E200.7	SW3050	18065BLK	LB	THALLIUM	7.4	B	10	3.4	ug/L
WATER	E200.7	SW3050	20083BLK	LB	THALLIUM	6.8	B	10	3.4	ug/L
WATER	E200.7	SW3050	19313BLK	LB	THALLIUM	6.74	B	10	3.4	ug/L
WQ	E200.7	SW3050	BKG001AB1	AB1	THALLIUM	7.7	B	10	3.4	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	THALLIUM	6.2	B	10	3.4	ug/L
WQ	E200.7	SW3050	BKG088EB1	EB1	THALLIUM	5.6	B	10	3.4	ug/L
WATER	E200.7	FLDFLT	19313BLK	LB	THALLIUM, DISSOLVED	6.74	B	10	3.4	ug/L
WQ	E200.7	SW3050	BKG001AB1	AB1	ZINC	24	=	20	5	ug/L
WQ	E200.7	SW3050	BKG002EB1	EB1	ZINC	11	B	20	5	ug/L
WQ	E200.7	SW3050	BKG066EB1	EB1	ZINC	79	=	20	5	ug/L

Appendix I-3 - Total versus Dissolved Metals Comparison

SampleID	Parameter	Total Conc	Total Qual	Dissolved Conc	Dissolved Qual	DL	RL	Units	Total > Dissolved	Results < 5X RL ?	Within 10% ?
BKG025	BERYLLIUM	1.8	J	2.2	J	0.33	0.33	ug/L	**NO**	**NO**	**NO**
BKG026S	MERCURY	1.56	=	2.07	=	0.02	0.02	ug/L	**NO**	**NO**	**NO**
BKG045	POTASSIUM	10000	J	13000	J	30	30	ug/L	**NO**	**NO**	**NO**
BKG047	MANGANESE	910	J	1100	J	0.33	0.33	ug/L	**NO**	**NO**	**NO**
BKG067D	CALCIUM	54200	=	60600	=	28	28	ug/L	**NO**	**NO**	**NO**
BKG067D	MAGNESIUM	33000	=	36700	=	13	13	ug/L	**NO**	**NO**	**NO**
BKG067D	SODIUM	141000	=	157000	=	200	200	ug/L	**NO**	**NO**	**NO**
BKG067S	MERCURY	2.3	=	3	=	0.02	0.02	ug/L	**NO**	**NO**	**NO**
BKG025	ANTIMONY	5.1	J	9.1	J	2.4	2.4	ug/L	NO	Yes	NO
BKG025	NICKEL	2.4	J	3.2	J	0.93	0.93	ug/L	NO	Yes	NO
BKG025	ARSENIC	2.9	U	5.5	J	2.9	2.9	ug/L	NO	Yes	NO
BKG025D	ANTIMONY	5.3	B	8.29	B	2.4	2.4	ug/L	NO	Yes	NO
BKG025D	SELENIUM	4.6	U	13	=	4.6	4.6	ug/L	NO	Yes	NO
BKG025D	SILVER	0.57	U	2.15	B	0.57	0.57	ug/L	NO	Yes	NO
BKG045	THALLIUM	3.4	U	5.5	J	3.4	3.4	ug/L	NO	Yes	NO
BKG047	THALLIUM	4.8	J	7.1	J	3.4	3.4	ug/L	NO	Yes	NO
BKG067	VANADIUM	1.9	J	2.5	J	0.7	0.7	ug/L	NO	Yes	NO
BKG067	ALUMINUM	95	U	220	=	95	95	ug/L	NO	Yes	NO
BKG067D	VANADIUM	2.2	B	3.19	B	0.7	0.7	ug/L	NO	Yes	NO
BKG025	CADMIUM	1	J	1.1	J	0.27	0.27	ug/L	NO		YES
BKG025	CALCIUM	660000	J	660000	J	28	28	ug/L	NO		YES
BKG025	MANGANESE	17000	J	18000	J	0.33	0.33	ug/L	NO		YES
BKG025	ZINC	5	R	5	R	5	5	ug/L	NO		YES
BKG025D	MANGANESE	17400	=	18500	=	0.33	0.33	ug/L	NO		YES
BKG025D	POTASSIUM	482000	=	520000	=	30	30	ug/L	NO		YES
BKG025D	SODIUM	6110000	E	6150000	E	200	200	ug/L	NO		YES
1	ZINC	20	U	20	=	20	20	ug/L	NO		YES
BKG025DL2	MAGNESIUM	1400000	=	1500000	=	260	260	ug/L	NO		YES
BKG025DL2	SODIUM	10000000	=	10000000	=	4000	4000	ug/L	NO		YES
BKG025S	ARSENIC	2350	=	2390	=	2.9	2.9	ug/L	NO		YES
BKG025S	BARIUM	968	=	1010	=	0.13	0.13	ug/L	NO		YES
BKG025S	BERYLLIUM	45	=	48	=	0.33	0.33	ug/L	NO		YES
BKG025S	CADMIUM	45	=	49	=	0.27	0.27	ug/L	NO		YES
BKG025S	CHROMIUM, TOTAL	184	=	191	=	0.87	0.87	ug/L	NO		YES
BKG025S	COBALT	474	=	492	=	0.43	0.43	ug/L	NO		YES
BKG025S	LEAD	475	=	488	=	1.6	1.6	ug/L	NO		YES
BKG025S	MANGANESE	17800	=	18700	=	0.33	0.33	ug/L	NO		YES
BKG025S	NICKEL	433	=	455	=	0.93	0.93	ug/L	NO		YES
BKG025S	THALLIUM	2190	=	2230	=	3.4	3.4	ug/L	NO		YES
BKG025S	VANADIUM	472	=	478	=	0.7	0.7	ug/L	NO		YES
BKG026	BARIUM	390	=	400	=	0.13	0.13	ug/L	NO		YES
BKG026	CALCIUM	630000	J	650000	J	28	28	ug/L	NO		YES
BKG026	MANGANESE	8600	J	8700	J	0.33	0.33	ug/L	NO		YES
BKG026	MAGNESIUM	1400000	R	1400000	R	13	13	ug/L	NO		YES
BKG026	POTASSIUM	30	R	30	R	30	30	ug/L	NO		YES
BKG026	SODIUM	6800000	R	7000000	R	200	200	ug/L	NO		YES
BKG026	ZINC	5	R	5	R	5	5	ug/L	NO		YES
BKG026DL2	MAGNESIUM	1600000	=	1700000	=	13	13	ug/L	NO		YES
BKG026DL2	SODIUM	12000000	=	12000000	=	4000	4000	ug/L	NO		YES
BKG026DL2	POTASSIUM	700000	J	720000	J	30	30	ug/L	NO		YES
BKG045	MAGNESIUM	150000	=	150000	=	13	13	ug/L	NO		YES
BKG045	SODIUM	350000	=	360000	=	200	200	ug/L	NO		YES
BKG045	CALCIUM	180000	J	180000	J	28	28	ug/L	NO		YES
BKG046FD1	BARIUM	220	=	230	=	0.13	0.13	ug/L	NO		YES
BKG046FD1	MAGNESIUM	310000	=	310000	=	13	13	ug/L	NO		YES
BKG046FD1	CALCIUM	330000	J	330000	J	28	28	ug/L	NO		YES
BKG046FD1	MANGANESE	980	J	1000	J	0.33	0.33	ug/L	NO		YES
BKG046FD1	POTASSIUM	59000	J	60000	J	30	30	ug/L	NO		YES
BKG046FD1	THALLIUM	6	J	6.4	J	3.4	3.4	ug/L	NO		YES
BKG046FD1	SODIUM	1300000	R	1300000	R	200	200	ug/L	NO		YES
DL1	SODIUM	1500000	=	1500000	=	4000	4000	ug/L	NO		YES
BKG047	BARIUM	210	=	230	=	0.13	0.13	ug/L	NO		YES
BKG047	MAGNESIUM	290000	=	310000	=	13	13	ug/L	NO		YES
BKG047	CALCIUM	320000	J	330000	J	28	28	ug/L	NO		YES
BKG047	POTASSIUM	56000	J	60000	J	30	30	ug/L	NO		YES
BKG047	SODIUM	1300000	R	1300000	R	200	200	ug/L	NO		YES
BKG047DL1	SODIUM	1400000	=	1500000	=	4000	4000	ug/L	NO		YES
BKG067	CALCIUM	56000	=	56000	=	28	28	ug/L	NO		YES
BKG067	SODIUM	140000	=	150000	=	200	200	ug/L	NO		YES
BKG067	MAGNESIUM	34000	J	34000	=	13	13	ug/L	NO		YES

SampleID	Parameter	Total Conc	Total Qual	Dissolved Conc	Dissolved Qual	DL	RL	Units	Total > Dissolved	Results < 5X RL ?	Within 10% ?
BKG067	NICKEL	1.8	J	1.9	J	0.93	0.93	ug/L	NO		YES
BKG067	BERYLLIUM	0.33	U	0.33	J	0.33	0.33	ug/L	NO		YES
BKG067D	MANGANESE	99	=	102	=	0.33	0.33	ug/L	NO		YES
BKG067D	BARIUM	72	B	77	B	0.13	0.13	ug/L	NO		YES
BKG067D	POTASSIUM	2450	B	2680	B	30	30	ug/L	NO		YES
BKG067D	THALLIUM	7.2	B	7.24	B	3.4	3.4	ug/L	NO		YES
BKG067S	ALUMINUM	2120	=	2140	=	95	95	ug/L	NO		YES
BKG067S	BARIUM	2150	=	2160	=	0.13	0.13	ug/L	NO		YES
BKG067S	ZINC	564	=	581	=	5	5	ug/L	NO		YES
BKG068FD1	CALCIUM	58000	=	59000	=	28	28	ug/L	NO		YES
BKG068FD1	MAGNESIUM	35000	=	36000	=	13	13	ug/L	NO		YES
BKG068FD1	MANGANESE	98	=	98	=	0.33	0.33	ug/L	NO		YES
BKG068FD1	SODIUM	150000	=	150000	=	200	200	ug/L	NO		YES
BKG068FD1	BARIUM	73	J	75	J	0.13	0.13	ug/L	NO		YES
BKG068FD1	NICKEL	1.9	J	2.1	J	0.93	0.93	ug/L	NO		YES
BKG068FD1	POTASSIUM	2500	J	2600	J	30	30	ug/L	NO		YES
BKG068FD1	THALLIUM	7.8	J	8.6	J	3.4	3.4	ug/L	NO		YES
BKG069	CALCIUM	18000	=	19000	=	28	28	ug/L	NO		YES
BKG069	MAGNESIUM	14000	=	15000	=	13	13	ug/L	NO		YES
BKG069	SODIUM	160000	=	170000	=	200	200	ug/L	NO		YES
BKG069	BARIUM	15	J	15	J	0.13	0.13	ug/L	NO		YES
BKG069	POTASSIUM	2000	J	2000	J	30	30	ug/L	NO		YES
BKG070	SODIUM	130000	=	130000	=	200	200	ug/L	NO		YES
BKG070	POTASSIUM	40000	=	40000	J	30	30	ug/L	NO		YES
BKG025	THALLIUM	18	=	16	=	3.4	3.4	ug/L	Yes		
BKG025	POTASSIUM	490000	=	400000	J	30	30	ug/L	Yes		
BKG025	IRON	2700	J	410	=	25	25	ug/L	Yes		
BKG025	BARIUM	960	J	870	J	0.13	0.13	ug/L	Yes		
BKG025	CHROMIUM, TOTAL	5.9	J	4.6	J	0.87	0.87	ug/L	Yes		
BKG025	COBALT	12	J	11	J	0.43	0.43	ug/L	Yes		
BKG025	VANADIUM	7.6	J	3	J	0.7	0.7	ug/L	Yes		
BKG025	COPPER	4.4	J	0.8	U	0.8	0.8	ug/L	Yes		
BKG025	MAGNESIUM	1200000	R	1100000	R	13	13	ug/L	Yes		
BKG025	SODIUM	11000000	R	5600000	R	200	200	ug/L	Yes		
BKG025	ALUMINUM	3000	R	95	U	95	95	ug/L	Yes		
BKG025D	BARIUM	1060	=	333	=	0.13	0.13	ug/L	Yes		
BKG025D	CALCIUM	680000	=	661000	=	28	28	ug/L	Yes		
BKG025D	IRON	3440	=	432	=	25	25	ug/L	Yes		
BKG025D	THALLIUM	16	=	11	=	3.4	3.4	ug/L	Yes		
BKG025D	ALUMINUM	3720	=	95	U	95	95	ug/L	Yes		
BKG025D	BERYLLIUM	2.2	B	1.71	B	0.33	0.33	ug/L	Yes		
BKG025D	CHROMIUM, TOTAL	6.1	B	4.78	B	0.87	0.87	ug/L	Yes		
BKG025D	COBALT	12	B	11	B	0.43	0.43	ug/L	Yes		
BKG025D	VANADIUM	8.9	B	3.77	B	0.7	0.7	ug/L	Yes		
BKG025D	COPPER	5.3	B	0.8	U	0.8	0.8	ug/L	Yes		
BKG025D	MAGNESIUM	1180000	E	1170000	E	13	13	ug/L	Yes		
2	MAGNESIUM	1670000	=	1460000	=	260	260	ug/L	Yes		
2	SODIUM	12300000	=	10200000	=	4000	4000	ug/L	Yes		
BKG025S	ALUMINUM	6130	=	2490	=	95	95	ug/L	Yes		
BKG025S	ANTIMONY	589	=	586	=	2.4	2.4	ug/L	Yes		
BKG025S	COPPER	300	=	273	=	0.8	0.8	ug/L	Yes		
BKG025S	IRON	4180	=	1400	=	25	25	ug/L	Yes		
BKG025S	SELENIUM	2600	=	2570	=	4.6	4.6	ug/L	Yes		
BKG025S	SILVER	65	=	59	=	0.57	0.57	ug/L	Yes		
BKG025S	ZINC	548	=	530	=	5	5	ug/L	Yes		
BKG026	ANTIMONY	5.2	J	3.8	J	2.4	2.4	ug/L	Yes		
BKG026	BERYLLIUM	1.4	J	1	J	0.33	0.33	ug/L	Yes		
BKG026	CHROMIUM, TOTAL	3.7	J	2.9	J	0.87	0.87	ug/L	Yes		
BKG026	COBALT	8.6	J	5.5	J	0.43	0.43	ug/L	Yes		
BKG026	IRON	1300	J	490	J	25	25	ug/L	Yes		
BKG026	NICKEL	3.9	J	2.1	J	0.93	0.93	ug/L	Yes		
BKG026	VANADIUM	8.5	J	5.9	J	0.7	0.7	ug/L	Yes		
BKG026	ALUMINUM	950	J	95	U	95	95	ug/L	Yes		
BKG026	COPPER	2.8	J	0.8	U	0.8	0.8	ug/L	Yes		
BKG026	THALLIUM	6.9	J	3.4	U	3.4	3.4	ug/L	Yes		
BKG045	VANADIUM	75	=	32	J	0.7	0.7	ug/L	Yes		
BKG045	ZINC	60	=	15	J	5	5	ug/L	Yes		
BKG045	BARIUM	180	J	120	J	0.13	0.13	ug/L	Yes		
BKG045	COBALT	20	J	5.7	J	0.43	0.43	ug/L	Yes		
BKG045	MANGANESE	3200	J	3100	J	0.33	0.33	ug/L	Yes		

Appendix I-3 - Total versus Dissolved Metals Comparison

SampleID	Parameter	Total Conc	Total Qual	Dissolved Conc	Dissolved Qual	DL	RL	Units	Total > Dissolved	Results < 5X RL ?	Within 10% ?
BKG045	NICKEL	19	J	12	J	0.93	0.93	ug/L	Yes		
BKG045	ALUMINUM	3500	J	95	U	95	95	ug/L	Yes		
BKG045	CHROMIUM, TOTAL	6.8	J	0.87	U	0.87	0.87	ug/L	Yes		
BKG045	COPPER	15	J	0.8	U	0.8	0.8	ug/L	Yes		
BKG045	IRON	4800	J	25	U	25	25	ug/L	Yes		
BKG046FD1	IRON	440	J	420	J	25	25	ug/L	Yes		
BKG046FD1	NICKEL	2.8	J	2	J	0.93	0.93	ug/L	Yes		
BKG046FD1	VANADIUM	3.2	J	2.6	J	0.7	0.7	ug/L	Yes		
BKG046FD1	COBALT	1.2	J	0.43	U	0.43	0.43	ug/L	Yes		
BKG047	IRON	480	J	420	J	25	25	ug/L	Yes		
BKG047	NICKEL	3.1	J	2.4	J	0.93	0.93	ug/L	Yes		
BKG047	VANADIUM	3.5	J	2.8	J	0.7	0.7	ug/L	Yes		
BKG047	ALUMINUM	130	J	95	U	95	95	ug/L	Yes		
BKG067	MANGANESE	100	=	94	=	0.33	0.33	ug/L	Yes		
BKG067	IRON	3400	=	2800	J	25	25	ug/L	Yes		
BKG067	BARIUM	73	J	71	B	0.13	0.13	ug/L	Yes		
BKG067	POTASSIUM	2600	J	2500	J	30	30	ug/L	Yes		
BKG067	THALLIUM	7.2	J	6.3	J	3.4	3.4	ug/L	Yes		
BKG067	ZINC	8.4	J	6.7	J	5	5	ug/L	Yes		
BKG067D	IRON	3320	=	3000	=	25	25	ug/L	Yes		
BKG067D	SELENIUM	5.3	=	4.6	U	4.6	4.6	ug/L	Yes		
BKG067S	ANTIMONY	544	=	534	=	2.4	2.4	ug/L	Yes		
BKG067S	ARSENIC	2170	=	2100	=	2.9	2.9	ug/L	Yes		
BKG067S	BERYLLIUM	56	=	54	=	0.33	0.33	ug/L	Yes		
BKG067S	CADMIUM	54	=	53	=	0.27	0.27	ug/L	Yes		
BKG067S	CHROMIUM, TOTAL	214	=	209	=	0.87	0.87	ug/L	Yes		
BKG067S	COBALT	530	=	518	=	0.43	0.43	ug/L	Yes		
BKG067S	COPPER	260	=	254	=	0.8	0.8	ug/L	Yes		
BKG067S	IRON	4860	=	4100	=	25	25	ug/L	Yes		
BKG067S	LEAD	556	=	553	=	1.6	1.6	ug/L	Yes		
BKG067S	MANGANESE	641	=	614	=	0.33	0.33	ug/L	Yes		
BKG067S	NICKEL	541	=	528	=	0.93	0.93	ug/L	Yes		
BKG067S	SELENIUM	2470	=	2370	=	4.6	4.6	ug/L	Yes		
BKG067S	SILVER	53	=	52	=	0.57	0.57	ug/L	Yes		
BKG067S	THALLIUM	2270	=	2190	=	3.4	3.4	ug/L	Yes		
BKG067S	VANADIUM	537	=	522	=	0.7	0.7	ug/L	Yes		
BKG068FD1	IRON	3500	J	2900	J	25	25	ug/L	Yes		
BKG068FD1	VANADIUM	3.2	J	3	J	0.7	0.7	ug/L	Yes		
BKG068FD1	ZINC	9.9	J	5.6	J	5	5	ug/L	Yes		
BKG069	MANGANESE	300	=	210	=	0.33	0.33	ug/L	Yes		
BKG069	IRON	23000	J	4300	J	25	25	ug/L	Yes		
BKG069	NICKEL	2.9	J	1.9	J	0.93	0.93	ug/L	Yes		
BKG069	THALLIUM	6	J	5.1	J	3.4	3.4	ug/L	Yes		
BKG069	VANADIUM	2.2	J	1.9	J	0.7	0.7	ug/L	Yes		
BKG069	ZINC	14	J	10	J	5	5	ug/L	Yes		
BKG069	CHROMIUM, TOTAL	2	J	0.87	U	0.87	0.87	ug/L	Yes		
BKG070	CALCIUM	25000	=	24000	=	28	28	ug/L	Yes		
BKG070	MAGNESIUM	13000	=	12000	=	13	13	ug/L	Yes		
BKG070	MANGANESE	1600	=	1400	=	0.33	0.33	ug/L	Yes		
BKG070	ALUMINUM	320	=	95	U	95	95	ug/L	Yes		
BKG070	LEAD	4.7	=	1.6	U	1.6	1.6	ug/L	Yes		
BKG070	ZINC	1300	=	5	U	5	5	ug/L	Yes		
BKG070	BARIUM	71	J	62	J	0.13	0.13	ug/L	Yes		
BKG070	IRON	29000	J	14000	J	25	25	ug/L	Yes		
BKG070	NICKEL	5.7	J	1.8	J	0.93	0.93	ug/L	Yes		
BKG070	THALLIUM	8.8	J	5.4	J	3.4	3.4	ug/L	Yes		
BKG070	CHROMIUM, TOTAL	1.6	J	0.87	U	0.87	0.87	ug/L	Yes		
BKG070	COBALT	1.5	J	0.43	U	0.43	0.43	ug/L	Yes		
BKG070	VANADIUM	1.8	J	0.7	U	0.7	0.7	ug/L	Yes		

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
SB	E200.7	SW3050	NDE112	MANGANESE	530	=	265	=	114	mg/Kg	-232
SS	E200.7	SW3050	NDE023	MANGANESE	720	=	486	=	108	mg/Kg	-220
SB	E200.7	SW3050	BKG032	MANGANESE	970	=	880	=	134	mg/Kg	-68
SD	E200.7	SW3050	NDE118	MANGANESE	250	=	227	=	138	mg/Kg	**-17**
WG	E200.7	SW3050	BKG025	BARIUM	960	=	968	=	2000	ug/L	**0**
WG	E200.7	FLDFLT	BKG025	BARIUM, DISSOLVED	870	=	1010	=	2000	ug/L	**7**
SS	E200.7	SW3050	NDE153	MANGANESE	580	=	540	=	100	mg/Kg	18
SS	E200.7	SW3050	NDE133	ANTIMONY	0.83	J	27	=	100	mg/Kg	**26**
SS	E200.7	SW3050	NDE066	MANGANESE	570	=	601.266	=	105	mg/Kg	30
SB	E200.7	SW3050	BKG032	ANTIMONY	0.59	B	46	=	134	mg/Kg	**34**
SS	E200.7	SW3050	NDE145	MANGANESE	600	=	600	=	100	mg/Kg	35
SS	E200.7	SW3050	NDE153	ANTIMONY	0.82	J	37	=	100	mg/Kg	**36**
SS	E200.7	SW3050	BKG049	ANTIMONY	1.2	B	43	=	114	mg/Kg	**37**
SS	E200.7	SW3050	NDE169	ANTIMONY	0.67	B	62	=	164	mg/Kg	**37**
SB	E200.7	SW3050	NDE038	ANTIMONY	0.44	B	44	=	112	mg/Kg	**39**
RK	E200.7	SW3050	BKG075	ANTIMONY	0.24	U	41	=	101	mg/Kg	**41**
SS	E200.7	SW3050	NDE169	CHROMIUM, TOTAL	38	=	66	=	66	mg/Kg	**42**
SS	E200.7	SW3050	NDE024FD1	ANTIMONY	0.27	U	49	=	114	mg/Kg	**43**
SS	E200.7	SW3050	NDE023	ANTIMONY	0.47	B	48	=	108	mg/Kg	**44**
SS	E200.7	SW3050	NDE102	ANTIMONY	0.4	B	46	=	102	mg/Kg	**45**
SS	E200.7	SW3050	NDE145	ANTIMONY	2.1	J	47	=	100	mg/Kg	**45**
SS	E200.7	SW3050	NDE194	ANTIMONY	0.73	B	61	=	128	mg/Kg	**48**
SB	E200.7	SW3050	NDE112	ANTIMONY	0.27	U	56	=	114	mg/Kg	**49**
SB	E200.7	SW3050	NDE112	ANTIMONY	0.27	U	56	=	114	mg/Kg	**49**
WG	E245.2	METHOD	BKG026	MERCURY	0.025	U	1.56	=	3	ug/L	**52**
SD	E200.7	SW3050	BKG078	ANTIMONY	0.52	U	113	=	216	mg/Kg	**52**
SS	E200.7	SW3050	NDE133	MANGANESE	580	=	570	=	100	mg/Kg	53
SS	E200.7	SW3050	NDE145	CHROMIUM, TOTAL	64	=	82	=	40	mg/Kg	**56**
SS	E200.7	SW3050	NDE066	ANTIMONY	1.5	J	61.181	=	105	mg/Kg	**57**
WG	E200.7	SW3050	BKG026	MANGANESE	8600	=	8900	=	500	ug/L	60
SB	E200.7	SW3050	NDE016	ANTIMONY	0.38	B	65	=	100	mg/Kg	**65**
WG	E245.2	METHOD	BKG025	MERCURY	0.025	U	1.94	=	3	ug/L	**65**
SB	E200.7	SW3050	BKG032	BARIUM	320	=	670	=	535	mg/Kg	**65**
SW	E245.2	METHOD	BKG022	MERCURY	0.025	U	2	=	3	ug/L	**67**
WG	E245.2	FLDFLT	BKG026	MERCURY, DISSOLVED	0.025	U	2.07	=	3	ug/L	**69**
SS	E200.7	SW3050	NDE145	LEAD	75	=	140	=	100	mg/Kg	**73**
SS	E200.7	SW3050	NDE023	CHROMIUM, TOTAL	16	=	48	=	43	mg/Kg	**74**
SS	E200.7	SW3050	NDE066	CHROMIUM, TOTAL	42	=	73.84	=	42	mg/Kg	76
WG	E245.2	METHOD	BKG067	MERCURY	0.025	U	2.3	=	3	ug/L	77
WG	E245.2	FLDFLT	NDE215	MERCURY, DISSOLVED	0.025	U	2.3	=	3	ug/L	77
SS	E200.7	SW3050	NDE145	COPPER	67	=	100	=	50	mg/Kg	77
SB	E245.5	METHOD	BKG032	MERCURY	0.0084	B	0.321	=	0	mg/Kg	78
SS	E245.5	METHOD	NDE066	MERCURY	0.0026	U	0.23	=	0	mg/Kg	78
SW	E245.2	METHOD	NDE171	MERCURY	0.049	J	2.4	=	3	ug/L	78
SS	E200.7	SW3050	NDE023	COPPER	87	=	130	=	54	mg/Kg	79
SS	E200.7	SW3050	NDE153	VANADIUM	59	=	130	=	100	mg/Kg	79
SS	E200.7	SW3050	NDE153	ZINC	40	=	110	=	100	mg/Kg	79
SS	E245.5	METHOD	NDE194	MERCURY	0.0099	B	0.31	=	0	mg/Kg	79
SB	E200.7	SW3050	NDE112	BARIUM	110	=	472	=	346	mg/Kg	79
SB	E200.7	SW3050	NDE112	BARIUM	110	=	472	=	456	mg/Kg	79
SS	E200.7	SW3050	NDE066	VANADIUM	85	=	168.776	=	105	mg/Kg	79
SD	E245.5	METHOD	BKG017	MERCURY	0.052	B	1.32	=	2	mg/Kg	80
SB	E200.7	SW3050	NDE016	MANGANESE	150	=	230	=	100	mg/Kg	80
SD	E200.7	SW3050	NDE118	ANTIMONY	0.33	U	111	=	138	mg/Kg	80
SS	E200.7	SW3050	BKG006	ANTIMONY	0.35	U	118	=	146	mg/Kg	80
SS	E200.7	SW3050	BKG049	CHROMIUM, TOTAL	41	=	78	=	45	mg/Kg	80
SS	E200.7	SW3050	NDE024FD1	MANGANESE	360	=	452	=	114	mg/Kg	80
WG	E200.7	SW3050	BKG026	BARIUM	390	=	2000	=	2000	ug/L	81
SS	E200.7	SW3050	BKG049	ARSENIC	1.2	B	369	=	454	mg/Kg	81
SD	E200.7	SW3050	BKG017	ANTIMONY	1.3	U	439	=	529	mg/Kg	83
SS	E200.7	SW3050	NDE153	CHROMIUM, TOTAL	20	=	51	=	40	mg/Kg	83

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
SS	E200.7	SW3050	NDE023	LEAD	29	=	119	=	108	mg/Kg	83
SS	E200.7	SW3050	NDE023	VANADIUM	62	=	151	=	108	mg/Kg	83
SS	E200.7	SW3050	NDE066	ZINC	39	=	126.582	=	105	mg/Kg	83
SS	E245.5	METHOD	BKG006	MERCURY	0.011	B	0.26	=	0	mg/Kg	83
SS	E200.7	SW3050	BKG049	ZINC	37	=	132	=	114	mg/Kg	83
SS	E200.7	SW3050	BKG049	VANADIUM	74	=	169	=	114	mg/Kg	84
SS	E200.7	SW3050	NDE023	ARSENIC	67	=	432	=	432	mg/Kg	84
SS	E200.7	SW3050	BKG049	COPPER	30	=	78	=	57	mg/Kg	84
WG	E200.7	SW3050	BKG026	NICKEL	3.9	B	426	=	500	ug/L	84
SS	E200.7	SW3050	NDE133	COPPER	44	=	82	=	50	mg/Kg	85
SS	E200.7	SW3050	NDE133	VANADIUM	62	=	140	=	100	mg/Kg	85
SS	E200.7	SW3050	NDE066	COPPER	49	=	93.882	=	53	mg/Kg	85
SS	E200.7	SW3050	BKG049	MANGANESE	640	=	737	=	114	mg/Kg	85
SS	E200.7	SW3050	NDE102	ZINC	18	=	105	=	102	mg/Kg	85
SS	E200.7	SW3050	BKG049	CADMIUM	0.031	U	9.7	=	11	mg/Kg	85
SB	E200.7	SW3050	BKG032	ARSENIC	0.71	B	459	=	535	mg/Kg	86
SS	E200.7	SW3050	NDE066	COBALT	15	=	105.485	=	105	mg/Kg	86
SS	E200.7	SW3050	BKG049	SELENIUM	0.52	U	389	=	454	mg/Kg	86
SS	E245.5	METHOD	NDE023	MERCURY	0.035	B	0.31	=	0	mg/Kg	86
SB	E200.7	SW3050	NDE016	COPPER	10	=	53	=	50	mg/Kg	86
SS	E200.7	SW3050	NDE145	ZINC	42	=	130	=	100	mg/Kg	86
WG	E200.7	SW3050	BKG025	NICKEL	2.4	B	433	=	500	ug/L	86
SS	E200.7	SW3050	BKG049	NICKEL	13	=	111	=	114	mg/Kg	86
SS	E200.7	SW3050	NDE066	NICKEL	25	=	116.034	=	105	mg/Kg	86
WG	E200.7	SW3050	BKG025	BERYLLIUM	1.8	B	45	=	50	ug/L	86
SS	E200.7	SW3050	BKG049	THALLIUM	0.39	U	393	=	454	mg/Kg	87
SS	E200.7	SW3050	BKG049	BARIUM	61	=	454	=	454	mg/Kg	87
SS	E200.7	SW3050	BKG049	LEAD	4.2	=	102	=	114	mg/Kg	87
SS	E200.7	SW3050	NDE066	CADMIUM	0.029	U	9.177	=	11	mg/Kg	87
SS	E200.7	SW3050	BKG049	COBALT	13	=	111	=	114	mg/Kg	87
SB	E245.5	METHOD	NDE016	MERCURY	0.0026	U	0.274	=	0	mg/Kg	87
SS	E200.7	SW3050	BKG049	BERYLLIUM	0.17	B	10	=	11	mg/Kg	87
RK	E200.7	SW3050	BKG075	ARSENIC	0.29	U	351	=	403	mg/Kg	87
SS	E200.7	SW3050	NDE133	ARSENIC	0.64	J	350	=	400	mg/Kg	87
SS	E200.7	SW3050	NDE169	ARSENIC	0.74	B	573	=	655	mg/Kg	87
SS	E200.7	SW3050	NDE169	BERYLLIUM	0.17	B	15	=	17	mg/Kg	87
SS	E200.7	SW3050	NDE145	COBALT	16	=	100	=	100	mg/Kg	87
SS	E200.7	SW3050	NDE145	NICKEL	26	=	110	=	100	mg/Kg	87
SS	E200.7	SW3050	NDE169	SELENIUM	1.3	=	573	=	655	mg/Kg	87
WG	E200.7	SW3050	BKG026	BERYLLIUM	1.4	B	45	=	50	ug/L	87
SB	E200.7	SW3050	NDE016	SELENIUM	0.79	B	350	=	400	mg/Kg	87
SB	E200.7	SW3050	BKG032	ZINC	29	=	146	=	134	mg/Kg	87
SS	E200.7	SW3050	BKG049	SILVER	0.065	U	9.9	=	11	mg/Kg	87
SB	E245.5	METHOD	NDE038	MERCURY	0.0088	B	0.304	=	0	mg/Kg	87
SB	E200.7	SW3050	NDE016	ARSENIC	0.31	U	350	=	400	mg/Kg	88
SB	E200.7	SW3050	NDE038	ARSENIC	0.88	B	396	=	450	mg/Kg	88
SS	E200.7	SW3050	NDE102	ARSENIC	0.3	U	358	=	408	mg/Kg	88
SS	E200.7	SW3050	NDE145	ARSENIC	1.8	J	350	=	400	mg/Kg	88
SS	E200.7	SW3050	NDE145	CADMIUM	0.029	U	8.9	=	10	mg/Kg	88
SS	E200.7	SW3050	NDE169	CADMIUM	0.032	U	15	=	17	mg/Kg	88
SS	E200.7	SW3050	NDE133	CHROMIUM, TOTAL	19	=	52	=	40	mg/Kg	88
SS	E200.7	SW3050	NDE169	SILVER	0.067	U	15	=	17	mg/Kg	88
WG	E200.7	SW3050	BKG025	CADMIUM	1	B	45	=	50	ug/L	88
WG	E200.7	SW3050	BKG026	CADMIUM	0.27	U	44	=	50	ug/L	88
SW	E200.7	SW3050	BKG022	BARIUM	37	B	1800	=	2000	ug/L	88
WG	E200.7	SW3050	BKG026	CHROMIUM, TOTAL	3.7	B	180	=	200	ug/L	88
SB	E200.7	SW3050	BKG032	SELENIUM	1.1	B	473	=	535	mg/Kg	88
SS	E200.7	SW3050	NDE023	BERYLLIUM	0.26	B	10	=	11	mg/Kg	89
SS	E200.7	SW3050	NDE024FD1	ARSENIC	43	=	450	=	458	mg/Kg	89
SS	E200.7	SW3050	NDE194	ARSENIC	1.1	B	457	=	512	mg/Kg	89
SB	E200.7	SW3050	BKG032	COBALT	16	=	135	=	134	mg/Kg	89

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
SS	E200.7	SW3050	NDE153	COPPER	41	=	81	=	50	mg/Kg	89
SS	E200.7	SW3050	NDE133	NICKEL	13	=	100	=	100	mg/Kg	89
SS	E200.7	SW3050	NDE153	NICKEL	12	=	100	=	100	mg/Kg	89
SS	E200.7	SW3050	NDE169	NICKEL	7.9	B	154	=	164	mg/Kg	89
WG	E200.7	SW3050	BKG025	CHROMIUM, TOTAL	5.9	B	184	=	200	ug/L	89
SD	E200.7	SW3050	NDE118	ARSENIC	0.4	U	494	=	553	mg/Kg	89
SD	E200.7	SW3050	BKG078	MANGANESE	150	=	343	=	216	mg/Kg	89
SB	E200.7	SW3050	NDE038	SELENIUM	1	B	404	=	450	mg/Kg	90
WG	E200.7	SW3050	NDE215	BARIUM	300	=	2090	=	2000	ug/L	90
SS	E200.7	SW3050	NDE066	ARSENIC	1.3	J	379.747	=	422	mg/Kg	90
SS	E200.7	SW3050	NDE024FD1	COPPER	110	=	161	=	57	mg/Kg	90
SS	E200.7	SW3050	NDE066	SELENIUM	1.1	=	379.747	=	422	mg/Kg	90
SS	E200.7	SW3050	NDE066	THALLIUM	0.36	U	379.747	=	422	mg/Kg	90
SS	E200.7	SW3050	NDE153	ARSENIC	0.81	J	360	=	400	mg/Kg	90
SS	E200.7	SW3050	NDE145	BARIUM	51	=	410	=	400	mg/Kg	90
SS	E200.7	SW3050	NDE145	BERYLLIUM	0.23	J	9.2	=	10	mg/Kg	90
SS	E200.7	SW3050	NDE133	COBALT	12	=	100	=	100	mg/Kg	90
SS	E200.7	SW3050	NDE153	COBALT	10	J	99	=	100	mg/Kg	90
RK	E200.7	SW3050	BKG075	SELENIUM	0.46	U	362	=	403	mg/Kg	90
SS	E200.7	SW3050	NDE023	SELENIUM	0.82	B	389	=	432	mg/Kg	90
SS	E200.7	SW3050	NDE133	SELENIUM	0.8	J	360	=	400	mg/Kg	90
SS	E200.7	SW3050	NDE145	VANADIUM	79	=	160	=	100	mg/Kg	90
SB	E200.7	SW3050	NDE016	ZINC	20	=	110	=	100	mg/Kg	90
SS	E200.7	SW3050	NDE133	ZINC	45	=	130	=	100	mg/Kg	90
SW	E200.7	SW3050	NDE171	BARIUM	300	=	2100	=	2000	ug/L	90
SB	E200.7	SW3050	BKG032	CADMIUM	0.036	U	12	=	13	mg/Kg	90
SB	E200.7	SW3050	NDE016	LEAD	5.7	=	96	=	100	mg/Kg	90
SS	E200.7	SW3050	NDE102	SELENIUM	0.71	B	369	=	408	mg/Kg	90
WG	E245.2	METHOD	NDE219	MERCURY	0.025	U	2.71	=	3	ug/L	90
SS	E200.7	SW3050	NDE066	LEAD	1.7	=	97.046	=	105	mg/Kg	90
WG	E200.7	FLDFLT	BKG025	NICKEL, DISSOLVED	3.2	B	455	=	500	ug/L	90
SB	E200.7	SW3050	NDE112	ARSENIC	0.33	U	413	=	456	mg/Kg	91
SB	E200.7	SW3050	NDE112	ARSENIC	0.33	U	413	=	456	mg/Kg	91
SS	E200.7	SW3050	NDE066	BARIUM	39	J	421.941	=	422	mg/Kg	91
SD	E200.7	SW3050	BKG078	CADMIUM	0.058	U	20	=	22	mg/Kg	91
SS	E200.7	SW3050	NDE023	CADMIUM	0.029	U	10	=	11	mg/Kg	91
SS	E200.7	SW3050	NDE023	SILVER	0.062	U	10	=	11	mg/Kg	91
SD	E200.7	SW3050	NDE118	ZINC	7.5	=	133	=	138	mg/Kg	91
SS	E200.7	SW3050	NDE133	BERYLLIUM	0.25	J	9.4	=	10	mg/Kg	91
SS	E200.7	SW3050	NDE133	CADMIUM	0.03	U	8.7	=	10	mg/Kg	91
SB	E200.7	SW3050	BKG032	CHROMIUM, TOTAL	9.9	=	59	=	53	mg/Kg	91
SS	E200.7	SW3050	NDE023	COBALT	9	B	107	=	108	mg/Kg	91
SD	E200.7	SW3050	NDE118	SELENIUM	0.64	U	503	=	553	mg/Kg	91
SS	E200.7	SW3050	NDE024FD1	SELENIUM	0.53	U	416	=	458	mg/Kg	91
SS	E200.7	SW3050	NDE153	SELENIUM	0.95	J	370	=	400	mg/Kg	91
SS	E200.7	SW3050	NDE145	THALLIUM	0.36	U	360	=	400	mg/Kg	91
RK	E200.7	SW3050	BKG075	ZINC	42	=	134	=	101	mg/Kg	91
WG	E245.2	METHOD	NDE215	MERCURY	0.025	U	2.73	=	3	ug/L	91
SB	E200.7	SW3050	BKG032	NICKEL	5.2	B	127	=	134	mg/Kg	91
SS	E200.7	SW3050	NDE024FD1	BARIUM	63	=	481	=	458	mg/Kg	91
SB	E200.7	SW3050	NDE038	VANADIUM	65	=	168	=	112	mg/Kg	91
SD	E200.7	SW3050	BKG078	VANADIUM	40	=	237	=	216	mg/Kg	91
SS	E200.7	SW3050	NDE066	BERYLLIUM	0.18	J	9.81	=	11	mg/Kg	91
SB	E200.7	SW3050	NDE016	CHROMIUM, TOTAL	6.4	=	43	=	40	mg/Kg	92
WG	E200.7	FLDFLT	NDE215	BARIUM, DISSOLVED	190	B	2020	=	2000	ug/L	92
WG	E200.7	SW3050	BKG026	COBALT	8.6	B	466	=	500	ug/L	92
SS	E200.7	SW3050	NDE024FD1	CHROMIUM, TOTAL	8.1	=	50	=	46	mg/Kg	92
WG	E200.7	FLDFLT	BKG025	BERYLLIUM, DISSOLVED	2.2	B	48	=	50	ug/L	92
SB	E200.7	SW3050	NDE038	CADMIUM	0.03	U	10	=	11	mg/Kg	92
SS	E200.7	SW3050	NDE024FD1	VANADIUM	46	=	151	=	114	mg/Kg	92
SS	E200.7	SW3050	NDE066	SILVER	0.12	J	9.81	=	11	mg/Kg	92

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
SS	E200.7	SW3050	NDE133	BARIUM	69	=	430	=	400	mg/Kg	92
SS	E200.7	SW3050	NDE153	BARIUM	54	=	420	=	400	mg/Kg	92
SS	E200.7	SW3050	NDE133	LEAD	14	=	100	=	100	mg/Kg	92
SS	E200.7	SW3050	NDE153	LEAD	5.2	=	96	=	100	mg/Kg	92
SS	E200.7	SW3050	NDE169	LEAD	3.7	=	154	=	164	mg/Kg	92
SS	E200.7	SW3050	NDE023	NICKEL	7.2	B	107	=	108	mg/Kg	92
SS	E200.7	SW3050	NDE145	SELENIUM	0.49	U	370	=	400	mg/Kg	92
SS	E200.7	SW3050	NDE133	THALLIUM	0.38	U	370	=	400	mg/Kg	92
SS	E200.7	SW3050	NDE023	ZINC	95	=	194	=	108	mg/Kg	92
SB	E200.7	SW3050	NDE038	ZINC	28	=	132	=	112	mg/Kg	92
SB	E200.7	SW3050	NDE038	COPPER	25	=	77	=	56	mg/Kg	92
SB	E200.7	SW3050	BKG032	VANADIUM	88	=	211	=	134	mg/Kg	92
SB	E200.7	SW3050	BKG032	LEAD	4.8	=	128	=	134	mg/Kg	92
WG	E200.7	SW3050	BKG025	COBALT	12	B	474	=	500	ug/L	92
SB	E200.7	SW3050	NDE016	BARIUM	20	B	390	=	400	mg/Kg	93
SB	E200.7	SW3050	NDE038	BARIUM	81	=	497	=	450	mg/Kg	93
SS	E200.7	SW3050	NDE024FD1	NICKEL	4.4	B	110	=	114	mg/Kg	93
SB	E200.7	SW3050	NDE016	THALLIUM	0.36	U	370	=	400	mg/Kg	93
SS	E200.7	SW3050	NDE024FD1	THALLIUM	0.39	U	423	=	458	mg/Kg	93
WG	E200.7	FLDFLT	NDE215	MANGANESE, DISSOLVED	92	=	555	=	500	ug/L	93
RK	E200.7	SW3050	BKG075	LEAD	1.3	=	95	=	101	mg/Kg	93
WG	E245.2	FLDFLT	NDE219	MERCURY, DISSOLVED	0.025	U	2.78	=	3	ug/L	93
SS	E200.7	SW3050	NDE102	LEAD	2.5	=	97	=	102	mg/Kg	93
SD	E200.7	SW3050	NDE118	BERYLLIUM	0.046	U	13	=	14	mg/Kg	93
SD	E200.7	SW3050	NDE118	CADMIUM	0.037	U	13	=	14	mg/Kg	93
SS	E200.7	SW3050	NDE024FD1	COBALT	6.9	B	113	=	114	mg/Kg	93
SD	E200.7	SW3050	NDE118	SILVER	0.079	U	13	=	14	mg/Kg	93
WG	E200.7	SW3050	BKG025	VANADIUM	7.6	B	472	=	500	ug/L	93
SB	E200.7	SW3050	NDE016	CADMIUM	0.028	U	9.3	=	10	mg/Kg	93
SS	E200.7	SW3050	NDE169	COBALT	7.2	B	159	=	164	mg/Kg	93
SS	E200.7	SW3050	NDE194	SELENIUM	0.59	U	475	=	512	mg/Kg	93
SB	E200.7	SW3050	NDE016	SILVER	0.06	U	9.3	=	10	mg/Kg	93
SS	E200.7	SW3050	NDE133	SILVER	0.064	U	9.3	=	10	mg/Kg	93
SS	E200.7	SW3050	NDE153	SILVER	0.064	U	9.3	=	10	mg/Kg	93
RK	E200.7	SW3050	BKG075	THALLIUM	0.34	U	375	=	403	mg/Kg	93
SS	E200.7	SW3050	NDE153	THALLIUM	0.38	U	370	=	400	mg/Kg	93
SS	E200.7	SW3050	NDE169	THALLIUM	0.4	U	606	=	655	mg/Kg	93
SS	E200.7	SW3050	NDE194	THALLIUM	0.44	U	478	=	512	mg/Kg	93
SB	E200.7	SW3050	NDE016	VANADIUM	27	=	120	=	100	mg/Kg	93
SB	E200.7	SW3050	NDE112	ZINC	17	=	123	=	114	mg/Kg	93
SB	E200.7	SW3050	NDE112	ZINC	17	=	123	=	97	mg/Kg	93
SW	E200.7	SW3050	BKG022	NICKEL	5.2	B	470	=	500	ug/L	93
SD	E200.7	SW3050	BKG078	NICKEL	2	B	203	=	216	mg/Kg	93
SS	E200.7	SW3050	NDE024FD1	ZINC	88	=	195	=	114	mg/Kg	93
WG	E200.7	FLDFLT	BKG025	CHROMIUM, DISSOLVED	4.6	B	191	=	200	ug/L	93
SD	E200.7	SW3050	BKG078	ARSENIC	0.63	U	804	=	862	mg/Kg	93
SB	E200.7	SW3050	NDE038	CHROMIUM, TOTAL	10	=	52	=	45	mg/Kg	93
SS	E200.7	SW3050	NDE024FD1	SILVER	0.065	U	11	=	11	mg/Kg	93
SB	E245.5	METHOD	NDE112	MERCURY	0.0029	U	0.32	=	0	mg/Kg	93
SB	E200.7	SW3050	BKG032	BERYLLIUM	0.46	B	13	=	13	mg/Kg	93
SB	E200.7	SW3050	NDE112	SELENIUM	0.52	U	426	=	456	mg/Kg	93
SB	E200.7	SW3050	NDE112	SELENIUM	0.52	U	426	=	456	mg/Kg	93
SS	E200.7	SW3050	BKG006	ARSENIC	1.2	B	549	=	586	mg/Kg	94
SB	E200.7	SW3050	BKG032	THALLIUM	0.45	U	500	=	535	mg/Kg	94
SS	E200.7	SW3050	NDE024FD1	BERYLLIUM	0.17	B	11	=	11	mg/Kg	94
SD	E200.7	SW3050	BKG078	CHROMIUM, TOTAL	5.4	=	86	=	86	mg/Kg	94
SS	E200.7	SW3050	BKG006	COPPER	7.1	B	76	=	73	mg/Kg	94
SB	E200.7	SW3050	NDE038	SILVER	0.064	U	11	=	11	mg/Kg	94
WG	E200.7	SW3050	BKG026	VANADIUM	8.5	B	477	=	500	ug/L	94
SS	E200.7	SW3050	NDE102	CADMIUM	0.028	U	9.6	=	10	mg/Kg	94
SB	E200.7	SW3050	NDE016	COBALT	3.1	B	97	=	100	mg/Kg	94

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
SS	E200.7	SW3050	NDE153	BERYLLIUM	0.17	J	9.6	=	10	mg/Kg	94
SS	E200.7	SW3050	NDE194	BERYLLIUM	0.042	U	12	=	13	mg/Kg	94
RK	E200.7	SW3050	BKG075	CADMIUM	0.027	U	9.4	=	10	mg/Kg	94
SS	E200.7	SW3050	NDE153	CADMIUM	0.03	U	9.2	=	10	mg/Kg	94
SB	E200.7	SW3050	NDE038	COBALT	9	B	115	=	112	mg/Kg	94
RK	E200.7	SW3050	BKG075	SILVER	0.057	U	9.4	=	10	mg/Kg	94
SB	E200.7	SW3050	BKG032	SILVER	0.076	U	13	=	13	mg/Kg	94
SS	E200.7	SW3050	NDE102	THALLIUM	0.35	U	383	=	408	mg/Kg	94
WG	E200.7	SW3050	NDE219	BERYLLIUM	0.33	U	47	=	50	ug/L	94
SD	E200.7	SW3050	NDE118	COPPER	6.1	J	71	=	69	mg/Kg	94
SD	E200.7	SW3050	BKG078	COBALT	4.5	B	208	=	216	mg/Kg	94
SB	E200.7	SW3050	NDE038	BERYLLIUM	0.26	B	11	=	11	mg/Kg	94
SB	E200.7	SW3050	NDE038	THALLIUM	0.38	U	424	=	450	mg/Kg	94
SS	E200.7	SW3050	NDE024FD1	CADMIUM	0.031	U	11	=	11	mg/Kg	94
SB	E200.7	SW3050	NDE038	NICKEL	4.2	B	110	=	112	mg/Kg	94
SB	E200.7	SW3050	NDE112	CHROMIUM, TOTAL	5.5	=	49	=	41	mg/Kg	95
WG	E200.7	SW3050	NDE219	COBALT	0.43	U	473	=	500	ug/L	95
SB	E200.7	SW3050	NDE112	VANADIUM	38	=	146	=	76	mg/Kg	95
SB	E200.7	SW3050	NDE112	VANADIUM	38	=	146	=	114	mg/Kg	95
SS	E200.7	SW3050	NDE102	BERYLLIUM	0.14	B	9.8	=	10	mg/Kg	95
SD	E200.7	SW3050	NDE118	COBALT	3	J	134	=	138	mg/Kg	95
SB	E200.7	SW3050	NDE016	NICKEL	3.1	B	98	=	100	mg/Kg	95
SS	E200.7	SW3050	NDE102	SILVER	0.058	U	9.7	=	10	mg/Kg	95
SD	E200.7	SW3050	BKG078	ZINC	30	=	235	=	216	mg/Kg	95
SS	E200.7	SW3050	NDE194	CADMIUM	0.035	U	12	=	13	mg/Kg	95
RK	E200.7	SW3050	BKG075	COBALT	4.6	B	101	=	101	mg/Kg	95
SS	E200.7	SW3050	NDE145	SILVER	0.061	U	9.5	=	10	mg/Kg	95
SS	E200.7	SW3050	NDE194	SILVER	0.073	U	12	=	128	mg/Kg	95
SS	E200.7	SW3050	NDE023	THALLIUM	0.37	U	410	=	432	mg/Kg	95
SS	E200.7	SW3050	NDE169	VANADIUM	42	=	197	=	164	mg/Kg	95
WG	E200.7	SW3050	NDE219	CHROMIUM, TOTAL	0.87	U	190	=	200	ug/L	95
WG	E200.7	SW3050	BKG025	LEAD	1.6	U	475	=	500	ug/L	95
WG	E200.7	SW3050	NDE219	MANGANESE	22	=	497	=	500	ug/L	95
WG	E200.7	SW3050	NDE219	NICKEL	0.93	U	475	=	500	ug/L	95
WG	E200.7	FLDFLT	BKG025	VANADIUM, DISSOLVED	3	B	478	=	500	ug/L	95
SS	E200.7	SW3050	BKG006	BARIUM	12	B	570	=	586	mg/Kg	95
SS	E200.7	SW3050	BKG006	MANGANESE	67	=	206	=	146	mg/Kg	95
SD	E200.7	SW3050	BKG017	ARSENIC	1.5	U	2020	=	2120	mg/Kg	95
SS	E200.7	SW3050	NDE102	NICKEL	1.9	B	99	=	102	mg/Kg	95
WG	E200.7	FLDFLT	NDE215	VANADIUM, DISSOLVED	9.6	B	486	=	500	ug/L	95
SB	E200.7	SW3050	NDE112	CHROMIUM, TOTAL	5.5	=	49	=	46	mg/Kg	95
SS	E200.7	SW3050	NDE102	CHROMIUM, TOTAL	3.3	=	42	=	41	mg/Kg	95
SD	E200.7	SW3050	BKG078	COPPER	18	=	121	=	108	mg/Kg	95
SB	E200.7	SW3050	NDE038	LEAD	1.9	=	109	=	112	mg/Kg	95
SD	E200.7	SW3050	BKG078	BERYLLIUM	0.071	U	21	=	22	mg/Kg	96
SB	E200.7	SW3050	BKG032	COPPER	32	=	96	=	67	mg/Kg	96
SS	E200.7	SW3050	BKG006	SELENIUM	0.67	U	559	=	586	mg/Kg	96
SD	E200.7	SW3050	NDE118	THALLIUM	0.47	U	528	=	553	mg/Kg	96
WG	E200.7	FLDFLT	NDE215	CHROMIUM, DISSOLVED	0.87	U	191	=	200	ug/L	96
SD	E200.7	SW3050	NDE118	LEAD	1.1	=	133	=	138	mg/Kg	96
WG	E200.7	FLDFLT	BKG025	CADMIUM, DISSOLVED	1.1	B	49	=	50	ug/L	96
RK	E200.7	SW3050	BKG075	COPPER	13	=	61	=	50	mg/Kg	96
SS	E200.7	SW3050	NDE194	LEAD	4.1	=	128	=	128	mg/Kg	96
RK	E200.7	SW3050	BKG075	NICKEL	1.8	B	99	=	101	mg/Kg	96
SS	E200.7	SW3050	NDE194	NICKEL	2.7	B	126	=	128	mg/Kg	96
SS	E200.7	SW3050	NDE169	ZINC	23	=	180	=	164	mg/Kg	96
WG	E200.7	FLDFLT	BKG067	ALUMINUM, DISSOLVED	220	=	2140	=	2000	ug/L	96
SW	E200.7	SW3050	NDE171	BERYLLIUM	0.33	U	48	=	50	ug/L	96
WG	E200.7	FLDFLT	NDE215	BERYLLIUM, DISSOLVED	0.33	U	48	=	50	ug/L	96
WG	E200.7	SW3050	NDE219	CADMIUM	0.27	U	48	=	50	ug/L	96
SW	E200.7	SW3050	NDE171	CHROMIUM, TOTAL	0.87	U	192	=	200	ug/L	96

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
SW	E200.7	SW3050	NDE171	MANGANESE	2300	=	2780	=	500	ug/L	96
SD	E200.7	SW3050	BKG078	LEAD	6.5	=	214	=	216	mg/Kg	96
SD	E200.7	SW3050	NDE118	BARIUM	7.2	J	539	=	553	mg/Kg	96
WG	E200.7	FLDFLT	BKG025	COBALT, DISSOLVED	11	B	492	=	500	ug/L	96
SD	E200.7	SW3050	BKG078	BARIUM	69	B	899	=	862	mg/Kg	96
SS	E200.7	SW3050	NDE102	COBALT	5.8	B	104	=	102	mg/Kg	96
SD	E200.7	SW3050	BKG017	BARIUM	6.9	B	2050	=	2120	mg/Kg	96
SD	E200.7	SW3050	BKG017	ZINC	24	=	534	=	529	mg/Kg	96
SW	E200.7	SW3050	NDE171	NICKEL	2.8	J	485	=	500	ug/L	96
SB	E200.7	SW3050	NDE112	BERYLLIUM	0.038	U	11	=	11	mg/Kg	97
SB	E200.7	SW3050	NDE112	CADMIUM	0.031	U	11	=	11	mg/Kg	97
SD	E200.7	SW3050	NDE118	CHROMIUM, TOTAL	1.9	J	55	=	55	mg/Kg	97
SS	E200.7	SW3050	NDE102	COPPER	14	=	63	=	51	mg/Kg	97
SB	E200.7	SW3050	NDE112	SILVER	0.065	U	11	=	11	mg/Kg	97
WG	E200.7	FLDFLT	NDE219	CHROMIUM, DISSOLVED	0.87	U	193	=	200	ug/L	97
SD	E200.7	SW3050	BKG017	SELENIUM	2.4	U	2050	=	2120	mg/Kg	97
WG	E200.7	FLDFLT	NDE219	COBALT, DISSOLVED	0.43	U	484	=	500	ug/L	97
WG	E200.7	FLDFLT	NDE219	NICKEL, DISSOLVED	2.8	B	487	=	500	ug/L	97
WG	E200.7	SW3050	NDE219	VANADIUM	12	B	496	=	500	ug/L	97
WG	E200.7	FLDFLT	NDE219	MANGANESE, DISSOLVED	7.4	B	492	=	500	ug/L	97
RK	E200.7	SW3050	BKG075	BARIUM	62	=	454	=	403	mg/Kg	97
SS	E200.7	SW3050	NDE169	BARIUM	52	=	687	=	655	mg/Kg	97
SS	E200.7	SW3050	NDE194	BARIUM	54	=	550	=	512	mg/Kg	97
SS	E200.7	SW3050	NDE194	CHROMIUM, TOTAL	6.4	=	56	=	51	mg/Kg	97
SD	E200.7	SW3050	BKG078	SELENIUM	0.99	U	836	=	862	mg/Kg	97
RK	E200.7	SW3050	BKG075	VANADIUM	23	=	121	=	101	mg/Kg	97
WG	E200.7	FLDFLT	NDE215	NICKEL, DISSOLVED	0.93	U	485	=	500	ug/L	97
SD	E200.7	SW3050	NDE118	VANADIUM	20	=	154	=	138	mg/Kg	97
SD	E200.7	SW3050	NDE118	NICKEL	0.89	J	135	=	138	mg/Kg	97
WG	E200.7	SW3050	NDE219	LEAD	1.6	U	486	=	500	ug/L	97
RK	E200.7	SW3050	BKG075	CHROMIUM, TOTAL	2	B	41	=	40	mg/Kg	98
SB	E200.7	SW3050	NDE112	THALLIUM	0.39	U	445	=	456	mg/Kg	98
SB	E200.7	SW3050	NDE112	THALLIUM	0.39	U	445	=	456	mg/Kg	98
SS	E200.7	SW3050	BKG006	ZINC	24	=	167	=	146	mg/Kg	98
SW	E200.7	SW3050	BKG022	COBALT	2	B	490	=	500	ug/L	98
WG	E200.7	SW3050	BKG026	LEAD	1.6	U	488	=	500	ug/L	98
WG	E200.7	FLDFLT	BKG025	LEAD, DISSOLVED	1.6	U	488	=	500	ug/L	98
SS	E200.7	SW3050	BKG006	SILVER	0.083	U	14	=	15	mg/Kg	98
WG	E200.7	SW3050	NDE219	BARIUM	94	B	2050	=	2000	ug/L	98
WG	E200.7	SW3050	NDE219	ZINC	5	U	489	=	500	ug/L	98
SW	E200.7	SW3050	BKG022	CHROMIUM, TOTAL	4.3	B	200	=	200	ug/L	98
WG	E200.7	SW3050	NDE215	CHROMIUM, TOTAL	5.2	B	201	=	200	ug/L	98
WG	E200.7	FLDFLT	NDE215	IRON, DISSOLVED	25	U	979	=	1000	ug/L	98
SW	E200.7	SW3050	NDE171	VANADIUM	1.5	J	491	=	500	ug/L	98
RK	E200.7	SW3050	BKG075	BERYLLIUM	0.033	U	9.8	=	10	mg/Kg	98
SS	E200.7	SW3050	NDE194	COBALT	5.1	B	131	=	128	mg/Kg	98
SS	E200.7	SW3050	NDE169	COPPER	18	=	98	=	81	mg/Kg	98
SB	E200.7	SW3050	NDE112	NICKEL	2.2	B	114	=	114	mg/Kg	98
SS	E245.5	METHOD	NDE169	MERCURY	0.016	B	0.31	=	0	mg/Kg	98
WG	E200.7	FLDFLT	NDE219	BERYLLIUM, DISSOLVED	0.33	U	49	=	50	ug/L	98
WG	E200.7	FLDFLT	NDE215	CADMIUM, DISSOLVED	0.27	U	49	=	50	ug/L	98
WG	E200.7	FLDFLT	NDE219	CADMIUM, DISSOLVED	0.27	U	49	=	50	ug/L	98
WG	E200.7	FLDFLT	NDE215	COBALT, DISSOLVED	0.43	U	490	=	500	ug/L	98
WG	E200.7	FLDFLT	NDE215	COPPER, DISSOLVED	0.8	U	245	=	250	ug/L	98
WG	E200.7	FLDFLT	NDE215	SILVER, DISSOLVED	0.57	U	49	=	50	ug/L	98
SB	E200.7	SW3050	NDE112	NICKEL	2.2	B	114	=	112	mg/Kg	98
SB	E200.7	SW3050	NDE112	COPPER	13	=	69	=	44	mg/Kg	98
SB	E200.7	SW3050	NDE112	COPPER	13	=	69	=	57	mg/Kg	98
SB	E200.7	SW3050	NDE112	COBALT	4.9	B	117	=	109	mg/Kg	98
SB	E200.7	SW3050	NDE112	COBALT	4.9	B	117	=	114	mg/Kg	98
SB	E200.7	SW3050	NDE112	LEAD	2.9	=	115	=	114	mg/Kg	98

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
SB	E200.7	SW3050	NDE112	LEAD	2.9	=	115	=	111	mg/Kg	98
SD	E245.5	METHOD	BKG078	MERCURY	0.0054	U	0.636	=	1	mg/Kg	98
SS	E200.7	SW3050	BKG006	COBALT	1	B	145	=	146	mg/Kg	98
WG	E200.7	SW3050	NDE219	ARSENIC	2.9	U	1970	=	2000	ug/L	99
SD	E200.7	SW3050	BKG017	LEAD	6.4	=	529	=	529	mg/Kg	99
SS	E200.7	SW3050	BKG006	NICKEL	1.2	B	146	=	146	mg/Kg	99
SS	E200.7	SW3050	NDE102	VANADIUM	47	=	148	=	102	mg/Kg	99
SB	E200.7	SW3050	NDE016	BERYLLIUM	0.035	U	9.9	=	10	mg/Kg	99
SS	E200.7	SW3050	BKG006	CHROMIUM, TOTAL	3.8	=	62	=	59	mg/Kg	99
RK	E245.5	METHOD	BKG075	MERCURY	0.003	B	0.3	=	0	mg/Kg	99
WG	E200.7	SW3050	NDE219	ANTIMONY	2.4	U	495	=	500	ug/L	99
WG	E200.7	FLDFLT	BKG025	IRON, DISSOLVED	410	=	1400	=	1000	ug/L	99
SD	E200.7	SW3050	BKG078	THALLIUM	0.73	U	856	=	862	mg/Kg	99
WG	E200.7	FLDFLT	NDE219	VANADIUM, DISSOLVED	8	B	505	=	500	ug/L	99
SS	E200.7	SW3050	BKG006	THALLIUM	0.5	U	583	=	586	mg/Kg	100
WG	E200.7	SW3050	NDE219	COPPER	5.1	B	254	=	250	ug/L	100
SS	E200.7	SW3050	BKG006	VANADIUM	12	B	158	=	146	mg/Kg	100
SW	E200.7	SW3050	BKG022	BERYLLIUM	1.1	B	51	=	50	ug/L	100
SW	E200.7	SW3050	BKG022	CADMIUM	1.1	B	51	=	50	ug/L	100
SS	E200.7	SW3050	BKG006	CADMIUM	0.04	U	15	=	15	mg/Kg	100
SB	E200.7	SW3050	NDE112	BERYLLIUM	0.038	U	11	=	11	mg/Kg	100
SD	E200.7	SW3050	BKG017	BERYLLIUM	0.17	U	53	=	53	mg/Kg	100
SB	E200.7	SW3050	NDE112	CADMIUM	0.031	U	11	=	11	mg/Kg	100
SD	E200.7	SW3050	BKG017	CADMIUM	0.14	U	53	=	53	mg/Kg	100
SB	E200.7	SW3050	NDE112	SILVER	0.065	U	11	=	11	mg/Kg	100
SD	E200.7	SW3050	BKG017	SILVER	0.3	U	53	=	53	mg/Kg	100
SD	E200.7	SW3050	BKG078	SILVER	0.12	U	22	=	22	mg/Kg	100
SS	E200.7	SW3050	NDE194	VANADIUM	35	=	163	=	128	mg/Kg	100
SS	E200.7	SW3050	NDE194	ZINC	29	=	157	=	128	mg/Kg	100
WG	E200.7	SW3050	NDE215	BERYLLIUM	0.33	U	50	=	50	ug/L	100
SW	E200.7	SW3050	NDE171	CADMIUM	0.27	U	50	=	50	ug/L	100
SW	E200.7	SW3050	NDE171	COBALT	0.43	U	500	=	500	ug/L	100
WG	E200.7	SW3050	NDE219	SILVER	0.57	U	50	=	50	ug/L	100
WG	E200.7	FLDFLT	NDE219	SILVER, DISSOLVED	0.57	U	50	=	50	ug/L	100
WG	E245.2	FLDFLT	BKG067	MERCURY, DISSOLVED	0.025	U	3	=	3	ug/L	100
SD	E200.7	SW3050	BKG017	CHROMIUM, TOTAL	7.8	B	220	=	212	mg/Kg	100
SD	E200.7	SW3050	BKG017	NICKEL	4.1	B	534	=	529	mg/Kg	100
WG	E200.7	FLDFLT	NDE219	ZINC, DISSOLVED	5	U	501	=	500	ug/L	100
SS	E200.7	SW3050	BKG006	LEAD	6.9	=	154	=	146	mg/Kg	100
SW	E200.7	SW3050	BKG022	VANADIUM	8.3	B	510	=	500	ug/L	100
WG	E200.7	SW3050	NDE215	COPPER	16	B	267	=	250	ug/L	100
WG	E200.7	SW3050	NDE215	NICKEL	9	B	511	=	500	ug/L	100
SD	E200.7	SW3050	BKG017	COBALT	2.3	B	534	=	529	mg/Kg	101
WG	E200.7	FLDFLT	NDE219	LEAD, DISSOLVED	1.6	U	503	=	500	ug/L	101
WG	E200.7	SW3050	NDE215	VANADIUM	28	B	531	=	500	ug/L	101
SD	E200.7	SW3050	BKG017	MANGANESE	49	=	582	=	529	mg/Kg	101
WG	E200.7	FLDFLT	NDE219	ARSENIC, DISSOLVED	2.9	U	2020	=	2000	ug/L	101
SW	E200.7	SW3050	BKG022	MANGANESE	85	=	590	=	500	ug/L	101
WG	E200.7	FLDFLT	NDE219	BARIUM, DISSOLVED	92	B	2120	=	2000	ug/L	101
WG	E200.7	SW3050	NDE215	COBALT	12	B	519	=	500	ug/L	101
SD	E200.7	SW3050	BKG017	COPPER	23	B	292	=	265	mg/Kg	102
WG	E200.7	FLDFLT	BKG067	COPPER, DISSOLVED	0.8	U	254	=	250	ug/L	102
SD	E200.7	SW3050	BKG017	THALLIUM	1.8	U	2160	=	2120	mg/Kg	102
SS	E245.5	METHOD	NDE153	MERCURY	0.011	J	0.36	=	0	mg/Kg	102
WG	E200.7	SW3050	NDE215	CADMIUM	0.27	U	51	=	50	ug/L	102
WG	E200.7	SW3050	NDE215	SILVER	0.57	U	51	=	50	ug/L	102
SD	E200.7	SW3050	BKG017	VANADIUM	29	B	571	=	529	mg/Kg	103
WG	E200.7	FLDFLT	NDE215	ARSENIC, DISSOLVED	2.9	U	2050	=	2000	ug/L	103
SS	E200.7	SW3050	BKG006	BERYLLIUM	0.21	B	15	=	15	mg/Kg	103
WG	E200.7	FLDFLT	NDE215	LEAD, DISSOLVED	1.6	U	513	=	500	ug/L	103
WG	E200.7	SW3050	NDE215	ZINC	19	B	532	=	500	ug/L	103

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
WG	E200.7	FLDFLT	NDE219	COPPER, DISSOLVED	3.2	B	260	=	250	ug/L	103
SS	E200.7	SW3050	NDE194	COPPER	16	=	82	=	64	mg/Kg	103
SS	E200.7	SW3050	NDE024FD1	LEAD	24	=	142	=	114	mg/Kg	103
WG	E200.7	FLDFLT	NDE215	ANTIMONY, DISSOLVED	2.4	U	515	=	500	ug/L	103
WG	E200.7	FLDFLT	NDE219	IRON, DISSOLVED	25	U	1030	=	1000	ug/L	103
WG	E200.7	SW3050	NDE215	ANTIMONY	2.4	U	516	=	500	ug/L	103
WG	E200.7	FLDFLT	NDE219	ANTIMONY, DISSOLVED	2.4	U	516	=	500	ug/L	103
WG	E200.7	SW3050	BKG026	ZINC	5	U	517	=	505	ug/L	103
SD	E245.5	METHOD	NDE118	MERCURY	0.013	J	0.44	=	0	mg/Kg	104
WG	E200.7	FLDFLT	BKG067	COBALT, DISSOLVED	0.43	U	518	=	500	ug/L	104
WG	E200.7	SW3050	NDE215	LEAD	1.6	U	518	=	500	ug/L	104
WG	E200.7	FLDFLT	NDE215	ZINC, DISSOLVED	5	U	518	=	500	ug/L	104
WG	E200.7	SW3050	BKG067	BARIUM	73	B	2150	=	2000	ug/L	104
WG	E200.7	FLDFLT	BKG067	VANADIUM, DISSOLVED	2.5	B	522	=	500	ug/L	104
WG	E200.7	SW3050	NDE219	ALUMINUM	910	=	2990	=	2000	ug/L	104
WG	E200.7	SW3050	BKG067	COPPER	0.8	U	260	=	250	ug/L	104
SW	E200.7	SW3050	NDE171	LEAD	1.6	U	520	=	500	ug/L	104
WG	E200.7	SW3050	NDE215	MANGANESE	1100	=	1620	=	500	ug/L	104
WG	E200.7	FLDFLT	BKG067	MANGANESE, DISSOLVED	94	=	614	=	500	ug/L	104
WG	E200.7	FLDFLT	BKG067	SILVER, DISSOLVED	0.57	U	52	=	50	ug/L	104
WG	E200.7	SW3050	NDE219	THALLIUM	3.4	U	2080	=	2000	ug/L	104
WG	E200.7	FLDFLT	NDE219	ALUMINUM, DISSOLVED	95	U	2090	=	2000	ug/L	105
WG	E200.7	FLDFLT	BKG067	BARIUM, DISSOLVED	71	B	2160	=	2000	ug/L	105
WG	E200.7	FLDFLT	BKG067	CHROMIUM, DISSOLVED	0.87	U	209	=	200	ug/L	105
SS	E200.7	SW3050	NDE102	BARIUM	67	=	493	=	408	mg/Kg	105
WG	E200.7	FLDFLT	NDE219	THALLIUM, DISSOLVED	5.3	B	2100	=	2000	ug/L	105
WG	E200.7	FLDFLT	BKG067	ARSENIC, DISSOLVED	2.9	U	2100	=	2000	ug/L	105
SW	E200.7	SW3050	NDE171	IRON	200	=	1250	=	1000	ug/L	105
WG	E200.7	FLDFLT	BKG067	NICKEL, DISSOLVED	1.9	B	528	=	500	ug/L	105
SS	E245.5	METHOD	NDE024FD1	MERCURY	0.033	B	0.35	=	0	mg/Kg	106
SS	E245.5	METHOD	NDE110	MERCURY	0.028	B	0.42	=	0	mg/Kg	106
SS	E245.5	METHOD	NDE133	MERCURY	0.012	J	0.36	=	0	mg/Kg	106
WG	E200.7	SW3050	BKG067	ALUMINUM	95	U	2120	=	2000	ug/L	106
WG	E200.7	SW3050	NDE215	ARSENIC	2.9	U	2120	=	2000	ug/L	106
WG	E200.7	FLDFLT	BKG067	CADMIUM, DISSOLVED	0.27	U	53	=	50	ug/L	106
WG	E200.7	SW3050	BKG067	COBALT	0.43	U	530	=	500	ug/L	106
SW	E200.7	SW3050	NDE171	COPPER	3	J	268	=	250	ug/L	106
WG	E200.7	SW3050	NDE219	IRON	1100	=	2160	=	1000	ug/L	106
SW	E200.7	SW3050	BKG022	LEAD	1.6	U	530	=	500	ug/L	106
WG	E200.7	SW3050	BKG067	SILVER	0.57	U	53	=	50	ug/L	106
WG	E200.7	FLDFLT	BKG025	ZINC, DISSOLVED	5	U	530	=	505	ug/L	106
SW	E200.7	SW3050	NDE171	ZINC	5	U	531	=	500	ug/L	106
WG	E200.7	FLDFLT	BKG067	ANTIMONY, DISSOLVED	2.4	U	534	=	500	ug/L	107
WG	E200.7	SW3050	BKG067	CHROMIUM, TOTAL	0.87	U	214	=	200	ug/L	107
WG	E200.7	SW3050	BKG067	VANADIUM	1.9	B	537	=	500	ug/L	107
WG	E200.7	SW3050	BKG026	THALLIUM	6.9	B	2150	=	2000	ug/L	107
WG	E200.7	SW3050	BKG067	NICKEL	1.8	B	541	=	500	ug/L	108
WG	E200.7	FLDFLT	BKG067	BERYLLIUM, DISSOLVED	0.33	U	54	=	50	ug/L	108
WG	E200.7	SW3050	BKG067	CADMIUM	0.27	U	54	=	50	ug/L	108
SW	E200.7	SW3050	BKG022	ZINC	5	U	540	=	500	ug/L	108
WG	E200.7	SW3050	BKG067	MANGANESE	100	=	641	=	500	ug/L	108
WG	E200.7	SW3050	BKG067	ARSENIC	2.9	U	2170	=	2000	ug/L	109
WG	E200.7	FLDFLT	NDE215	THALLIUM, DISSOLVED	3.4	U	2170	=	2000	ug/L	109
WG	E200.7	SW3050	BKG025	THALLIUM	18	=	2190	=	2000	ug/L	109
WG	E200.7	SW3050	BKG067	ANTIMONY	2.4	U	544	=	500	ug/L	109
WG	E200.7	FLDFLT	BKG025	COPPER, DISSOLVED	0.8	U	273	=	250	ug/L	109
WG	E200.7	FLDFLT	BKG067	THALLIUM, DISSOLVED	6.3	B	2190	=	2000	ug/L	109
WG	E200.7	SW3050	BKG025	ZINC	5	U	548	=	505	ug/L	110
SD	E245.5	METHOD	NDE114	MERCURY	0.0034	U	0.453	=	0	mg/Kg	110
SW	E200.7	SW3050	BKG022	COPPER	14	B	290	=	250	ug/L	110
WG	E200.7	FLDFLT	BKG067	LEAD, DISSOLVED	1.6	U	553	=	500	ug/L	111

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	MS Lab Result	MS Lab Qual	MS Spike Added	Units	MS %Rec
WG	E200.7	FLDFLT	BKG025	THALLIUM, DISSOLVED	16	=	2230	=	2000	ug/L	111
WG	E200.7	SW3050	BKG067	ZINC	8.4	B	564	=	500	ug/L	111
WG	E200.7	SW3050	BKG067	LEAD	1.6	U	556	=	500	ug/L	111
SW	E200.7	SW3050	NDE171	ANTIMONY	2.4	U	558	=	500	ug/L	112
WG	E200.7	SW3050	BKG067	BERYLLIUM	0.33	U	56	=	50	ug/L	112
SW	E200.7	SW3050	NDE171	THALLIUM	17	=	2260	=	2000	ug/L	112
SW	E200.7	SW3050	NDE171	ARSENIC	2.9	U	2250	=	2000	ug/L	113
WG	E200.7	SW3050	NDE215	THALLIUM	10	=	2260	=	2000	ug/L	113
WG	E200.7	SW3050	BKG026	IRON	1300	=	2430	=	1000	ug/L	113
WG	E200.7	SW3050	BKG067	THALLIUM	7.2	B	2270	=	2000	ug/L	113
SB	E200.7	SW3050	NDE038	MANGANESE	420	=	548	=	112	mg/Kg	114
SW	E200.7	SW3050	NDE171	ALUMINUM	300	=	2580	=	2000	ug/L	114
WG	E200.7	SW3050	NDE219	SELENIUM	4.6	U	2280	=	2000	ug/L	114
SW	E200.7	SW3050	NDE171	SILVER	0.57	U	57	=	50	ug/L	114
SW	E200.7	SW3050	BKG022	THALLIUM	9.7	B	2300	=	2000	ug/L	115
WG	E200.7	FLDFLT	BKG067	ZINC, DISSOLVED	6.7	B	581	=	500	ug/L	115
WG	E200.7	FLDFLT	BKG025	ANTIMONY, DISSOLVED	9.1	B	586	=	500	ug/L	115
SS	E200.7	SW3050	NDE194	MANGANESE	150	=	299	=	128	mg/Kg	116
WG	E200.7	SW3050	BKG025	ANTIMONY	5.1	B	589	=	500	ug/L	117
WG	E200.7	SW3050	BKG025	ARSENIC	2.9	U	2350	=	2000	ug/L	118
WG	E200.7	SW3050	BKG026	ARSENIC	2.9	U	2350	=	2000	ug/L	118
WG	E200.7	FLDFLT	NDE219	SELENIUM, DISSOLVED	4.6	U	2350	=	2000	ug/L	118
SW	E200.7	SW3050	BKG022	ANTIMONY	2.4	U	590	=	500	ug/L	118
WG	E200.7	FLDFLT	BKG025	SILVER, DISSOLVED	0.56	U	59	=	50	ug/L	118
WG	E200.7	SW3050	BKG025	COPPER	4.4	B	300	=	250	ug/L	118
WG	E200.7	FLDFLT	BKG067	SELENIUM, DISSOLVED	4.6	U	2370	=	2000	ug/L	119
WG	E200.7	FLDFLT	NDE215	SELENIUM, DISSOLVED	4.6	U	2380	=	2000	ug/L	119
WG	E200.7	FLDFLT	BKG025	ARSENIC, DISSOLVED	5.5	B	2390	=	2000	ug/L	119
SW	E200.7	SW3050	BKG022	ARSENIC	15	=	2400	=	2000	ug/L	119
WG	E200.7	SW3050	BKG026	COPPER	2.8	B	301	=	250	ug/L	119
WG	E200.7	SW3050	NDE215	ALUMINUM	3800	=	6200	=	2000	ug/L	120
WG	E200.7	SW3050	BKG026	ANTIMONY	5.2	B	609	=	500	ug/L	121
WG	E200.7	SW3050	NDE215	SELENIUM	4.6	U	2420	=	2000	ug/L	121
WG	E200.7	SW3050	BKG067	SELENIUM	4.6	U	2470	=	2000	ug/L	124
WG	E200.7	FLDFLT	BKG025	ALUMINUM, DISSOLVED	95	U	2490	=	2000	ug/L	125
SW	E200.7	SW3050	NDE171	SELENIUM	4.6	U	2490	=	2000	ug/L	125
SW	E200.7	SW3050	BKG022	SELENIUM	4.6	U	2500	=	2000	ug/L	125
WG	E200.7	SW3050	BKG026	SELENIUM	4.6	U	2550	=	2000	ug/L	**128**
WG	E200.7	FLDFLT	BKG025	SELENIUM, DISSOLVED	4.6	U	2570	=	2000	ug/L	**129**
SW	E200.7	SW3050	BKG022	IRON	4900	=	6200	=	1000	ug/L	130
WG	E200.7	FLDFLT	BKG067	IRON, DISSOLVED	2800	=	4100	=	1000	ug/L	**130**
WG	E200.7	SW3050	BKG025	SELENIUM	4.6	U	2600	=	2000	ug/L	**130**
WG	E200.7	SW3050	BKG025	SILVER	0.57	U	65	=	50	ug/L	**130**
SS	E200.7	SW3050	NDE023	BARIUM	290	=	864	=	432	mg/Kg	**133**
WG	E200.7	SW3050	BKG026	SILVER	0.57	U	67	=	50	ug/L	**134**
WG	E200.7	SW3050	NDE215	IRON	4500	=	5850	=	1000	ug/L	135
SW	E200.7	SW3050	BKG022	SILVER	0.57	U	68	=	50	ug/L	**136**
WG	E200.7	SW3050	BKG026	ALUMINUM	950	=	3740	=	2000	ug/L	**140**
SW	E200.7	SW3050	BKG022	ALUMINUM	5000	=	7800	=	2000	ug/L	**140**
WG	E200.7	FLDFLT	BKG025	MANGANESE, DISSOLVED	18000	=	18700	=	500	ug/L	140
WG	E200.7	FLDFLT	NDE215	ALUMINUM, DISSOLVED	95	U	2920	=	2000	ug/L	**146**
WG	E200.7	SW3050	BKG067	IRON	3400	=	4860	=	1000	ug/L	**146**
WG	E200.7	SW3050	BKG025	IRON	2700	=	4180	=	1000	ug/L	**148**
WG	E200.7	SW3050	BKG025	ALUMINUM	3000	=	6130	=	2000	ug/L	**157**
WG	E200.7	SW3050	BKG025	MANGANESE	17000	=	17800	=	500	ug/L	160
RK	E200.7	SW3050	BKG075	MANGANESE	580	=	746	=	101	mg/Kg	165
SS	E200.7	SW3050	NDE169	MANGANESE	610	=	950	=	164	mg/Kg	**207**
SS	E200.7	SW3050	NDE102	MANGANESE	480	=	822	=	102	mg/Kg	335

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
WS	E245.2	METHOD	NDE171	MERCURY	0.049	J	0	U	0.2	0.02	ug/L	200%
WS	E200.7	SW3050	NDE171	COPPER	3	J	1	U	25	0.8	ug/L	200%
WS	E200.7	SW3050	NDE171	NICKEL	2.8	J	1	U	40	0.93	ug/L	200%
WS	E200.7	SW3050	NDE171	VANADIUM	1.5	J	1	U	50	0.7	ug/L	200%
WS	E200.7	SW3050	BKG022	CADMIUM	1.1	B	0	U	5	0.27	ug/L	200%
WS	E200.7	SW3050	BKG022	COBALT	2	B	0	U	50	0.43	ug/L	200%
WS	E200.7	SW3050	BKG022	NICKEL	5.2	B	1	U	40	0.93	ug/L	200%
WS	E200.7	SW3050	BKG022	SODIUM	8900000	E	5100000	E	5000	200	ug/L	**54%**
WS	E200.7	SW3050	NDE171	THALLIUM	17	=	12	=	10	3.4	ug/L	34%
WG	E200.7	FLDFLT	NDE219	COPPER, DISSOLVED	3.2	B	1	U	25	0.8	ug/L	200%
WG	E200.7	FLDFLT	NDE219	NICKEL, DISSOLVED	2.8	B	1	U	40	0.93	ug/L	200%
WG	E200.7	FLDFLT	NDE219	THALLIUM, DISSOLVED	5.3	B	3	U	10	3.4	ug/L	200%
WG	E200.7	FLDFLT	NDE215	ALUMINUM, DISSOLVED	95	U	708	=	200	95	ug/L	200%
WG	E200.7	FLDFLT	NDE215	THALLIUM, DISSOLVED	3.4	U	8	B	10	3.4	ug/L	200%
WG	E200.7	FLDFLT	BKG067	ALUMINUM, DISSOLVED	220	=	95	U	200	95	ug/L	200%
WG	E200.7	SW3050	BKG067	NICKEL	1.8	B	1	U	40	0.93	ug/L	200%
WG	E200.7	FLDFLT	BKG067	NICKEL, DISSOLVED	1.9	B	1	U	40	0.93	ug/L	200%
WG	E200.7	SW3050	BKG067	SELENIUM	4.6	U	5	=	5	4.6	ug/L	200%
WG	E200.7	SW3050	BKG067	ZINC	8.4	B	5	U	20	5	ug/L	200%
WG	E200.7	FLDFLT	BKG067	ZINC, DISSOLVED	6.7	B	5	U	20	5	ug/L	200%
WG	E200.7	SW3050	BKG026	ANTIMONY	5.2	B	2	U	60	2.4	ug/L	200%
WG	E200.7	SW3050	BKG026	COPPER	2.8	B	1	U	25	0.8	ug/L	200%
WG	E200.7	SW3050	BKG026	NICKEL	3.9	B	1	U	40	0.93	ug/L	200%
WG	E200.7	SW3050	BKG026	SILVER	0.57	U	1	B	10	0.57	ug/L	200%
WG	E200.7	FLDFLT	BKG025	ARSENIC, DISSOLVED	5.5	B	3	U	10	2.9	ug/L	200%
WG	E200.7	SW3050	BKG025	CADMIUM	1	B	0	U	5	0.27	ug/L	200%
WG	E200.7	FLDFLT	BKG025	CADMIUM, DISSOLVED	1.1	B	0	U	5	0.27	ug/L	200%
WG	E200.7	SW3050	BKG025	NICKEL	2.4	B	1	U	40	0.93	ug/L	200%
WG	E200.7	FLDFLT	BKG025	NICKEL, DISSOLVED	3.2	B	1	U	40	0.93	ug/L	200%
WG	E200.7	FLDFLT	BKG025	SELENIUM, DISSOLVED	4.6	U	13	=	5	4.6	ug/L	200%
WG	E200.7	FLDFLT	BKG025	SILVER, DISSOLVED	0.56	U	2	B	10	0.56	ug/L	200%
WG	E200.7	FLDFLT	BKG025	BARIUM, DISSOLVED	870	=	333	=	200	0.13	ug/L	**89%**
WG	E200.7	SW3050	BKG025	SODIUM	11000000	E	6110000	E	5000	200	ug/L	**57%**
WG	E200.7	FLDFLT	BKG025	THALLIUM, DISSOLVED	16	=	11	=	10	3.4	ug/L	37%
WG	E200.7	SW3050	BKG026	ALUMINUM	950	=	1300	=	200	95	ug/L	**31%**
WG	E200.7	SW3050	BKG026	THALLIUM	6.9	B	9	B	10	3.4	ug/L	28%
WG	E200.7	FLDFLT	BKG025	POTASSIUM, DISSOLVED	400000	=	520000	=	5000	30	ug/L	**26%**
WG	E200.7	FLDFLT	BKG025	BERYLLIUM, DISSOLVED	2.2	B	2	B	5	0.33	ug/L	25%
WG	E200.7	SW3050	NDE219	VANADIUM	12	B	9	B	50	0.7	ug/L	24%
WG	E200.7	FLDFLT	BKG067	VANADIUM, DISSOLVED	2.5	B	3	B	50	0.7	ug/L	24%
WG	E200.7	SW3050	BKG025	IRON	2700	=	3440	=	100	25	ug/L	**24%**
WG	E200.7	FLDFLT	BKG025	VANADIUM, DISSOLVED	3	B	4	B	50	0.7	ug/L	23%
WG	E200.7	SW3050	BKG025	ALUMINUM	3000	=	3720	=	200	95	ug/L	**21%**
WG	E200.7	SW3050	BKG026	IRON	1300	=	1610	=	100	25	ug/L	**21%**
SS	E245.5	METHOD	NDE194	MERCURY	0.0099	B	0	U	0.05	0.0032	mg/Kg	200%
SS	E200.7	SW3050	NDE194	ANTIMONY	0.73	B	0	U	15	0.31	mg/Kg	200%
SS	E200.7	SW3050	NDE194	SELENIUM	0.59	U	1	B	1.3	0.59	mg/Kg	200%
SS	E245.5	METHOD	NDE169	MERCURY	0.016	B	0	U	0.04	0.0035	mg/Kg	200%
SS	E200.7	SW3050	NDE169	ANTIMONY	0.67	B	0	U	14	0.28	mg/Kg	200%
SS	E200.7	SW3050	NDE153	ARSENIC	0.81	J	0	U	2.3	0.33	mg/Kg	200%
SS	E200.7	SW3050	NDE102	ANTIMONY	0.4	B	0	U	12	0.24	mg/Kg	200%
SS	E200.7	SW3050	NDE095	CADMIUM	0.03	U	0	B	1.1	0.03	mg/Kg	200%
SS	E200.7	SW3050	NDE095	SILVER	0.063	U	0	B	2.2	0.06	mg/Kg	200%
SS	E200.7	SW3050	NDE095	THALLIUM	0.37	U	0	B	2.2	0.37	mg/Kg	200%
SS	E200.7	SW3050	NDE066	SILVER	0.12	J	0	U	2.1	0.06	mg/Kg	200%
SS	E200.7	SW3050	NDE024FD1	SELENIUM	0.53	U	1	B	1.1	0.53	mg/Kg	200%
SS	E200.7	SW3050	BKG049	SELENIUM	0.52	U	1	B	1.1	0.52	mg/Kg	200%
SS	E245.5	METHOD	BKG009	MERCURY	0.014	B	0	U	0.04	0.0027	mg/Kg	200%
SS	E245.5	METHOD	BKG006	MERCURY	0.011	B	0	U	0.05	0.0037	mg/Kg	200%
SS	E200.7	SW3050	NDE169	CHROMIUM, TOTAL	38	=	4	=	2.4	0.1	mg/Kg	**165%**
SS	E200.7	SW3050	NDE169	NICKEL	7.9	B	2	B	9.4	0.11	mg/Kg	120%
SS	E200.7	SW3050	NDE023	BARIUM	290	=	91	=	43	0.01	mg/Kg	**104%**
SS	E200.7	SW3050	NDE095	BERYLLIUM	0.12	B	0	B	1.1	0.03	mg/Kg	101%
SS	E200.7	SW3050	NDE169	SODIUM	140	B	53	B	1180	24	mg/Kg	90%
SS	E200.7	SW3050	NDE153	SODIUM	220	J	92	J	1130	23	mg/Kg	82%
SS	E200.7	SW3050	NDE153	CALCIUM	16000	=	7500	=	1130	3.2	mg/Kg	**72%**
SS	E200.7	SW3050	NDE153	MANGANESE	580	=	1200	=	3.4	0.03	mg/Kg	**70%**
SS	E200.7	SW3050	NDE023	CHROMIUM, TOTAL	16	=	8	=	2.2	0.09	mg/Kg	**63%**
SS	E200.7	SW3050	NDE153	MAGNESIUM	5800	=	3100	=	1130	0.15	mg/Kg	**61%**

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
SS	E200.7	SW3050	NDE169	SELENIUM	1.3	=	1	B	1.2	0.54	mg/Kg	59%
SS	E200.7	SW3050	NDE095	SELENIUM	1.3	=	1	B	1.1	0.51	mg/Kg	59%
SS	E200.7	SW3050	NDE023	MANGANESE	720	=	400	=	3.2	0.03	mg/Kg	**57%**
SS	E200.7	SW3050	NDE153	NICKEL	12	=	7	J	9	0.1	mg/Kg	54%
SS	E200.7	SW3050	NDE095	ARSENIC	1.9	B	3	=	2.2	0.32	mg/Kg	54%
SS	E200.7	SW3050	NDE153	CHROMIUM, TOTAL	20	=	12	=	2.3	0.09	mg/Kg	**50%**
SS	E200.7	SW3050	BKG006	ARSENIC	1.2	B	2	B	2.9	0.42	mg/Kg	50%
SS	E200.7	SW3050	NDE066	LEAD	1.7	=	3	=	0.63	0.17	mg/Kg	47%
SS	E200.7	SW3050	NDE023	LEAD	29	=	18	=	0.65	0.17	mg/Kg	**47%**
SS	E200.7	SW3050	BKG009	BARIUM	62	=	99	=	43	0.01	mg/Kg	46%
SS	E200.7	SW3050	NDE145	CHROMIUM, TOTAL	64	=	41	=	2.1	0.09	mg/Kg	**44%**
SS	E200.7	SW3050	NDE102	BARIUM	67	=	43	=	41	0.01	mg/Kg	44%
SS	E200.7	SW3050	BKG009	ARSENIC	0.79	B	1	B	2.1	0.31	mg/Kg	42%
SS	E200.7	SW3050	NDE066	SELENIUM	1.1	=	1	J	1.1	0.49	mg/Kg	42%
SS	E200.7	SW3050	NDE024FD1	SODIUM	230	B	152	B	1140	23	mg/Kg	41%
SS	E200.7	SW3050	NDE169	ALUMINUM	7500	=	5005	=	47	11	mg/Kg	**40%**
SS	E200.7	SW3050	BKG009	COPPER	38	=	56	=	5.3	0.08	mg/Kg	**39%**
SS	E200.7	SW3050	NDE061	SELENIUM	0.75	J	1	=	1.1	0.49	mg/Kg	38%
SS	E200.7	SW3050	NDE194	SODIUM	52	B	76	B	1280	26	mg/Kg	38%
SS	E200.7	SW3050	NDE169	CALCIUM	4100	=	2807	=	1180	3.3	mg/Kg	37%
SS	E200.7	SW3050	NDE024FD1	LEAD	24	=	35	=	0.69	0.18	mg/Kg	**37%**
SS	E200.7	SW3050	BKG009	MANGANESE	430	=	626	=	3.2	0.03	mg/Kg	**37%**
SS	E200.7	SW3050	NDE023	BERYLLIUM	0.26	B	0	B	1.1	0.03	mg/Kg	36%
SS	E200.7	SW3050	NDE153	BARIUM	54	=	77	=	45	0.01	mg/Kg	35%
SS	E200.7	SW3050	BKG006	NICKEL	1.2	B	2	B	12	0.14	mg/Kg	34%
SS	E245.5	METHOD	NDE023	MERCURY	0.035	B	0	B	0.04	0.0027	mg/Kg	33%
SS	E200.7	SW3050	NDE023	NICKEL	7.2	B	5	B	8.6	0.1	mg/Kg	30%
SS	E200.7	SW3050	NDE066	ARSENIC	1.3	J	1	J	2.1	0.31	mg/Kg	30%
SS	E200.7	SW3050	NDE194	ARSENIC	1.1	B	1	B	2.6	0.37	mg/Kg	29%
SS	E200.7	SW3050	NDE095	LEAD	9.9	=	13	=	0.66	0.18	mg/Kg	29%
SS	E200.7	SW3050	NDE194	COBALT	5.1	B	7	B	13	0.05	mg/Kg	28%
SS	E200.7	SW3050	NDE153	COPPER	41	=	31	=	5.6	0.02	mg/Kg	28%
SS	E200.7	SW3050	NDE066	BERYLLIUM	0.18	J	0	J	1.1	0.03	mg/Kg	27%
SS	E200.7	SW3050	NDE153	ALUMINUM	11000	=	8400	=	45	11	mg/Kg	27%
SS	E200.7	SW3050	NDE066	ANTIMONY	1.5	J	1	J	13	0.25	mg/Kg	26%
SS	E200.7	SW3050	NDE145	COPPER	67	=	52	=	5.3	0.02	mg/Kg	25%
SS	E200.7	SW3050	NDE095	CHROMIUM, TOTAL	48	=	37	=	2.2	0.09	mg/Kg	25%
SS	E245.5	METHOD	NDE153	MERCURY	0.011	J	0	J	0.04	0.0028	mg/Kg	24%
SS	E200.7	SW3050	NDE153	ANTIMONY	0.82	J	1	J	14	0.27	mg/Kg	23%
SS	E200.7	SW3050	BKG009	COBALT	9.4	B	12	=	11	0.04	mg/Kg	22%
SS	E200.7	SW3050	NDE102	MANGANESE	480	=	384	=	3.1	0.03	mg/Kg	22%
SS	E200.7	SW3050	BKG049	MANGANESE	640	=	800	=	3.4	0.03	mg/Kg	22%
SS	E200.7	SW3050	NDE095	SODIUM	370	B	297	B	1100	22	mg/Kg	22%
SS	E245.5	METHOD	NDE127	MERCURY	0.033	J	0	J	0.04	0.0028	mg/Kg	22%
SS	E200.7	SW3050	NDE194	LEAD	4.1	=	3	=	0.77	0.2	mg/Kg	22%
SS	E200.7	SW3050	NDE023	VANADIUM	62	=	50	=	11	0.07	mg/Kg	21%
SS	E200.7	SW3050	NDE127	SELENIUM	0.78	J	1	J	1.1	0.52	mg/Kg	21%
SS	E200.7	SW3050	BKG009	CHROMIUM, TOTAL	21	=	26	=	2.1	0.09	mg/Kg	21%
SS	E200.7	SW3050	NDE194	ALUMINUM	4300	=	5306	=	51	12	mg/Kg	21%
SS	E200.7	SW3050	NDE023	COBALT	9	B	7	B	11	0.04	mg/Kg	21%
SS	E200.7	SW3050	NDE127	CALCIUM	7280	=	8970	=	1120	3.1	mg/Kg	21%
SS	E200.7	SW3050	NDE145	COBALT	16	=	13	=	11	0.04	mg/Kg	21%
SD	E245.5	METHOD	NDE118	MERCURY	0.013	J	0	U	0.05	0.0035	mg/Kg	200%
SD	E200.7	SW3050	NDE118	SELENIUM	0.64	U	1	J	1.4	0.64	mg/Kg	200%
SD	E200.7	SW3050	BKG078	BERYLLIUM	0.071	U	0	B	2.2	0.07	mg/Kg	200%
SD	E200.7	SW3050	BKG078	SELENIUM	0.99	U	2	B	2.2	0.99	mg/Kg	200%
SD	E245.5	METHOD	BKG017	MERCURY	0.052	B	0	U	0.21	0.01	mg/Kg	200%
SD	E200.7	SW3050	BKG017	COBALT	2.3	B	0	U	53	0.23	mg/Kg	200%
SD	E200.7	SW3050	NDE118	CALCIUM	5400	=	1230	J	1380	3.9	mg/Kg	**126%**
SD	E200.7	SW3050	NDE118	MANGANESE	250	=	94	=	4.1	0.04	mg/Kg	**91%**
SD	E200.7	SW3050	NDE118	NICKEL	0.89	J	2	J	11	0.13	mg/Kg	63%
SD	E200.7	SW3050	BKG078	LEAD	6.5	=	4	=	1.3	0.34	mg/Kg	48%
SD	E200.7	SW3050	NDE118	SODIUM	1600	=	1100	J	1400	28	mg/Kg	37%
SD	E200.7	SW3050	NDE118	BARIUM	7.2	J	5	J	55	0.01	mg/Kg	36%
SD	E200.7	SW3050	NDE118	MAGNESIUM	910	J	1150	J	1380	1.8	mg/Kg	23%
SD	E200.7	SW3050	NDE118	CHROMIUM, TOTAL	1.9	J	2	J	2.8	0.12	mg/Kg	23%
SD	E200.7	SW3050	NDE118	ALUMINUM	1500	=	1850	=	55	13	mg/Kg	**21%**
SB	E200.7	SW3050	NDE112	BERYLLIUM	0.038	U	0	J	1.1	0.038	mg/Kg	200%
SB	E200.7	SW3050	NDE112	BERYLLIUM	0.038	U	0	B	1.1	0.038	mg/Kg	200%

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
SB	E245.5	METHOD	NDE038	MERCURY	0.0088	B	0	U	0.04	0.0028	mg/Kg	200%
SB	E200.7	SW3050	NDE038	ANTIMONY	0.44	B	0	U	13	0.27	mg/Kg	200%
SB	E200.7	SW3050	NDE016	ANTIMONY	0.38	B	0	U	13	0.25	mg/Kg	200%
SB	E200.7	SW3050	NDE016	ARSENIC	0.31	U	1	B	2.1	0.31	mg/Kg	200%
SB	E245.5	METHOD	BKG032	MERCURY	0.0084	B	0	U	0.05	0.0033	mg/Kg	200%
SB	E200.7	SW3050	BKG032	ANTIMONY	0.59	B	0	U	16	0.32	mg/Kg	200%
SB	E200.7	SW3050	BKG032	THALLIUM	0.45	U	1	B	2.7	0.45	mg/Kg	200%
SB	E200.7	SW3050	NDE112	COBALT	4.9	B	8	J	11	0.049	mg/Kg	44%
SB	E200.7	SW3050	NDE112	COBALT	4.9	B	8	B	11	0.049	mg/Kg	44%
SB	E200.7	SW3050	NDE016	CALCIUM	2700	=	4100	=	1050	3	mg/Kg	41%
SB	E200.7	SW3050	NDE016	SELENIUM	0.79	B	1	B	1.1	0.48	mg/Kg	39%
SB	E200.7	SW3050	NDE038	ARSENIC	0.88	B	1	B	2.2	0.33	mg/Kg	39%
SB	E200.7	SW3050	BKG032	BARIUM	320	=	222	=	53	0.01	mg/Kg	36%
SB	E200.7	SW3050	NDE112	BARIUM	110	=	154	=	46	0.015	mg/Kg	33%
SB	E200.7	SW3050	NDE112	BARIUM	110	=	154	=	46	0.015	mg/Kg	33%
SB	E200.7	SW3050	BKG032	SELENIUM	1.1	B	2	=	1.3	0.61	mg/Kg	31%
SB	E200.7	SW3050	NDE112	MANGANESE	530	=	697	=	3.4	0.038	mg/Kg	27%
SB	E200.7	SW3050	NDE112	MANGANESE	530	=	697	=	3.4	0.038	mg/Kg	27%
SB	E200.7	SW3050	NDE016	BARIUM	20	B	26	B	42	0.01	mg/Kg	26%
SB	E200.7	SW3050	NDE016	COBALT	3.1	B	4	B	11	0.04	mg/Kg	25%
SB	E200.7	SW3050	NDE016	MANGANESE	150	=	190	=	3.2	0.03	mg/Kg	24%
SB	E200.7	SW3050	NDE112	VANADIUM	38	=	48	=	11	0.08	mg/Kg	23%
SB	E200.7	SW3050	NDE112	VANADIUM	38	=	48	=	11	0.08	mg/Kg	23%
SB	E200.7	SW3050	NDE016	NICKEL	3.1	B	4	B	8.4	0.09	mg/Kg	23%
SB	E200.7	SW3050	NDE112	LEAD	2.9	=	4	=	0.68	0.18	mg/Kg	22%
SB	E200.7	SW3050	NDE112	LEAD	2.9	=	4	=	0.68	0.18	mg/Kg	22%
RK	E245.5	METHOD	BKG075	MERCURY	0.003	B	0	U	0.04	0.0025	mg/Kg	200%
RK	E200.7	SW3050	BKG075	LEAD	1.3	=	0	U	0.6	0.16	mg/Kg	200%
RK	E200.7	SW3050	BKG075	SELENIUM	0.46	U	1	B	1	0.46	mg/Kg	200%
RK	E200.7	SW3050	BKG075	POTASSIUM	370	B	932	B	1010	3	mg/Kg	86%
RK	E200.7	SW3050	BKG075	NICKEL	1.8	B	3	B	8.1	0.09	mg/Kg	47%
RK	E200.7	SW3050	BKG075	BARIUM	62	=	96	=	40	0.01	mg/Kg	43%
RK	E200.7	SW3050	BKG075	COPPER	13	=	19	=	5	0.08	mg/Kg	38%
RK	E200.7	SW3050	BKG075	MANGANESE	580	=	815	=	3	0.03	mg/Kg	34%
RK	E200.7	SW3050	BKG075	COBALT	4.6	B	6	B	10	0.04	mg/Kg	31%
RK	E200.7	SW3050	BKG075	IRON	10000	=	13500	=	20	2.5	mg/Kg	30%
RK	E200.7	SW3050	BKG075	VANADIUM	23	=	31	=	10	0.07	mg/Kg	30%
RK	E200.7	SW3050	BKG075	SODIUM	580	B	751	B	1010	20	mg/Kg	26%
WG	E200.7	SW3050	NDE215	IRON	4500	=	5500	=	100	25	ug/L	20%
WG	E200.7	SW3050	BKG025	BERYLLIUM	1.8	B	2	B	5	0.33	ug/L	20%
WG	E200.7	SW3050	NDE215	ALUMINUM	3800	=	4640	=	200	95	ug/L	20%
SS	E200.7	SW3050	NDE127	ANTIMONY	0.5	J	1	J	13	0.27	mg/Kg	20%
RK	E200.7	SW3050	BKG075	MAGNESIUM	3300	=	4010	=	1010	0.13	mg/Kg	19%
SS	E200.7	SW3050	NDE023	IRON	21000	=	17300	=	22	2.7	mg/Kg	19%
SS	E200.7	SW3050	NDE169	MAGNESIUM	1500	=	1238	=	1180	0.15	mg/Kg	19%
SS	E200.7	SW3050	NDE194	IRON	11000	=	13290	=	26	3.2	mg/Kg	19%
WG	E200.7	SW3050	BKG025	COPPER	4.4	B	5	B	25	0.8	ug/L	19%
RK	E200.7	SW3050	BKG075	ALUMINUM	4400	=	5290	=	40	9.6	mg/Kg	18%
SS	E200.7	SW3050	NDE194	MANGANESE	150	=	180	=	3.8	0.04	mg/Kg	18%
SS	E200.7	SW3050	NDE061	ARSENIC	1.2	J	1	J	2.1	0.31	mg/Kg	18%
RK	E200.7	SW3050	BKG075	CHROMIUM, TOTAL	2	B	2	=	2	0.08	mg/Kg	18%
SS	E200.7	SW3050	NDE127	ARSENIC	0.51	J	1	J	2.2	0.33	mg/Kg	18%
SS	E200.7	SW3050	NDE169	IRON	14000	=	11730	=	24	3	mg/Kg	18%
SS	E200.7	SW3050	NDE153	POTASSIUM	680	J	570	J	1130	3.4	mg/Kg	18%
SS	E200.7	SW3050	NDE024FD1	ALUMINUM	7700	=	6460	=	46	11	mg/Kg	18%
SS	E200.7	SW3050	NDE023	ANTIMONY	0.47	B	1	B	13	0.26	mg/Kg	17%
RK	E200.7	SW3050	BKG075	ZINC	42	=	50	=	4	0.5	mg/Kg	17%
SS	E200.7	SW3050	NDE153	IRON	19000	=	16000	=	23	2.8	mg/Kg	17%
SS	E200.7	SW3050	NDE194	NICKEL	2.7	B	3	B	10	0.12	mg/Kg	17%
SD	E200.7	SW3050	NDE118	POTASSIUM	410	J	346	J	1380	4.1	mg/Kg	17%
SS	E200.7	SW3050	BKG006	CHROMIUM, TOTAL	3.8	=	5	=	2.9	0.13	mg/Kg	17%
SS	E200.7	SW3050	NDE145	SODIUM	490	J	580	J	1070	21	mg/Kg	17%
SS	E200.7	SW3050	NDE145	NICKEL	26	=	22	=	8.5	0.09	mg/Kg	17%
SS	E200.7	SW3050	BKG049	BARIUM	61	=	72	=	45	0.01	mg/Kg	17%
SS	E200.7	SW3050	NDE153	VANADIUM	59	=	50	=	11	0.07	mg/Kg	17%
SS	E245.5	METHOD	NDE024FD1	MERCURY	0.033	B	0	B	0.04	0.0029	mg/Kg	16%
SS	E200.7	SW3050	NDE095	ZINC	43	=	51	=	4.4	0.55	mg/Kg	16%
SS	E200.7	SW3050	NDE153	ZINC	40	=	34	=	4.5	0.56	mg/Kg	16%
SS	E200.7	SW3050	NDE023	MAGNESIUM	2800	=	2380	=	1080	0.14	mg/Kg	16%

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
WG	E200.7	SW3050	BKG026	VANADIUM	8.5	B	10	B	50	0.7	ug/L	16%
SS	E200.7	SW3050	BKG009	NICKEL	11	=	13	=	8.6	0.09	mg/Kg	16%
SS	E200.7	SW3050	NDE023	ZINC	95	=	81	=	4.3	0.54	mg/Kg	16%
SS	E200.7	SW3050	NDE194	VANADIUM	35	=	41	=	13	0.09	mg/Kg	16%
WG	E200.7	SW3050	BKG025	VANADIUM	7.6	B	9	B	50	0.7	ug/L	16%
SS	E200.7	SW3050	NDE127	BERYLLIUM	0.14	J	0	J	1.1	0.03	mg/Kg	15%
SS	E200.7	SW3050	NDE102	BERYLLIUM	0.14	B	0	B	1	0.03	mg/Kg	15%
SS	E200.7	SW3050	NDE145	ANTIMONY	2.1	J	2	J	13	0.26	mg/Kg	15%
SS	E200.7	SW3050	NDE145	ZINC	42	=	36	=	4.3	0.53	mg/Kg	15%
SS	E200.7	SW3050	NDE061	LEAD	1.8	=	2	=	0.63	0.17	mg/Kg	15%
SS	E200.7	SW3050	NDE023	CALCIUM	9000	=	10500	=	1080	3	mg/Kg	15%
SS	E200.7	SW3050	NDE194	MAGNESIUM	1100	B	1280	=	1280	0.17	mg/Kg	15%
WS	E200.7	SW3050	BKG022	CHROMIUM, TOTAL	4.3	B	4	B	10	0.87	ug/L	15%
SS	E200.7	SW3050	BKG049	SODIUM	130	B	151	B	1140	23	mg/Kg	15%
SS	E200.7	SW3050	NDE153	SELENIUM	0.95	J	1	J	1.1	0.52	mg/Kg	15%
WG	E200.7	SW3050	BKG067	VANADIUM	1.9	B	2	B	50	0.7	ug/L	15%
SS	E200.7	SW3050	NDE145	BARIUM	51	=	59	=	43	0.01	mg/Kg	15%
SS	E200.7	SW3050	NDE023	ARSENIC	67	=	58	=	2.2	0.31	mg/Kg	14%
SS	E200.7	SW3050	NDE169	POTASSIUM	870	B	754	B	1180	3.5	mg/Kg	14%
SB	E200.7	SW3050	NDE112	COPPER	13	=	15	=	5.7	0.091	mg/Kg	14%
SB	E200.7	SW3050	NDE112	COPPER	13	=	15	=	5.7	0.091	mg/Kg	14%
SS	E200.7	SW3050	BKG049	COBALT	13	=	15	=	11	0.04	mg/Kg	14%
WS	E200.7	SW3050	BKG022	ARSENIC	15	=	13	=	10	2.9	ug/L	14%
WG	E200.7	SW3050	NDE215	CHROMIUM, TOTAL	5.2	B	6	B	10	0.87	ug/L	14%
SS	E200.7	SW3050	NDE066	POTASSIUM	680	J	591	J	1050	3.2	mg/Kg	14%
SB	E200.7	SW3050	NDE016	ZINC	20	=	23	=	4.2	0.53	mg/Kg	14%
WG	E200.7	FLDFLT	BKG067	THALLIUM, DISSOLVED	6.3	B	7	B	10	3.4	ug/L	14%
SS	E200.7	SW3050	BKG009	ZINC	34	=	39	=	4.3	0.53	mg/Kg	14%
WG	E200.7	SW3050	BKG026	BERYLLIUM	1.4	B	1	B	5	0.33	ug/L	14%
SB	E200.7	SW3050	NDE112	CALCIUM	5900	=	6760	=	1140	3.2	mg/Kg	14%
SB	E200.7	SW3050	NDE112	CALCIUM	5900	=	6760	=	1140	3.2	mg/Kg	14%
SB	E200.7	SW3050	NDE016	MAGNESIUM	1400	=	1600	=	1050	0.14	mg/Kg	13%
SB	E200.7	SW3050	BKG032	COBALT	16	=	14	=	13	0.05	mg/Kg	13%
SS	E200.7	SW3050	BKG006	CALCIUM	45000	=	51400	=	1460	4.1	mg/Kg	13%
SS	E200.7	SW3050	NDE095	POTASSIUM	690	B	605	B	1100	3.3	mg/Kg	13%
SB	E200.7	SW3050	NDE112	IRON	13000	=	14800	=	23	2.9	mg/Kg	13%
SB	E200.7	SW3050	NDE112	IRON	13000	=	14800	=	23	2.9	mg/Kg	13%
SS	E200.7	SW3050	NDE169	VANADIUM	42	=	37	=	12	0.08	mg/Kg	13%
SS	E200.7	SW3050	BKG009	BERYLLIUM	0.16	B	0	B	1.1	0.03	mg/Kg	13%
SS	E200.7	SW3050	NDE095	MAGNESIUM	15000	=	13201	=	1100	0.14	mg/Kg	13%
SS	E200.7	SW3050	BKG006	SODIUM	470	B	533	B	1460	29	mg/Kg	13%
SS	E200.7	SW3050	NDE024FD1	BERYLLIUM	0.17	B	0	B	1.1	0.03	mg/Kg	13%
SB	E200.7	SW3050	NDE038	BERYLLIUM	0.26	B	0	B	1.1	0.03	mg/Kg	12%
WG	E200.7	SW3050	NDE215	THALLIUM	10	=	9	B	10	3.4	ug/L	12%
WG	E200.7	SW3050	NDE219	POTASSIUM	6200	=	5510	=	5000	30	ug/L	12%
SS	E200.7	SW3050	BKG009	LEAD	4.6	=	5	=	0.64	0.17	mg/Kg	12%
WG	E200.7	SW3050	BKG025	THALLIUM	18	=	16	=	10	3.4	ug/L	12%
SB	E200.7	SW3050	NDE038	SODIUM	190	B	169	B	1120	22	mg/Kg	12%
SS	E200.7	SW3050	NDE023	SELENIUM	0.82	B	1	B	1.1	0.5	mg/Kg	12%
SB	E200.7	SW3050	NDE112	CHROMIUM, TOTAL	5.5	=	5	=	2.3	0.099	mg/Kg	12%
SB	E200.7	SW3050	NDE112	CHROMIUM, TOTAL	5.5	=	5	=	2.3	0.099	mg/Kg	12%
SS	E200.7	SW3050	NDE169	COPPER	18	=	16	=	5.9	0.09	mg/Kg	12%
SS	E200.7	SW3050	NDE169	ZINC	23	=	21	=	4.7	0.59	mg/Kg	11%
SS	E200.7	SW3050	NDE061	SODIUM	560	J	500	J	1060	21	mg/Kg	11%
WG	E200.7	SW3050	NDE219	SODIUM	170000	=	152000	=	5000	200	ug/L	11%
SB	E200.7	SW3050	NDE112	ZINC	17	=	19	=	4.6	0.57	mg/Kg	11%
SB	E200.7	SW3050	NDE112	ZINC	17	=	19	=	4.6	0.57	mg/Kg	11%
SB	E200.7	SW3050	NDE038	LEAD	1.9	=	2	=	0.67	0.18	mg/Kg	11%
SB	E200.7	SW3050	BKG032	LEAD	4.8	=	4	=	0.8	0.21	mg/Kg	11%
SD	E200.7	SW3050	BKG017	BARIUM	6.9	B	8	B	212	0.06	mg/Kg	11%
SD	E200.7	SW3050	BKG017	CHROMIUM, TOTAL	7.8	B	9	B	11	0.46	mg/Kg	11%
SS	E200.7	SW3050	NDE023	ALUMINUM	7100	=	6370	=	43	10	mg/Kg	11%
SS	E200.7	SW3050	NDE095	BARIUM	38	B	34	B	44	0.01	mg/Kg	11%
SB	E200.7	SW3050	NDE112	ALUMINUM	9700	=	10800	=	46	11	mg/Kg	11%
SB	E200.7	SW3050	NDE112	ALUMINUM	9700	=	10800	=	46	11	mg/Kg	11%
SS	E200.7	SW3050	NDE194	POTASSIUM	680	B	757	B	1280	3.8	mg/Kg	11%
SS	E200.7	SW3050	NDE145	POTASSIUM	790	J	710	J	1070	3.2	mg/Kg	11%
SS	E200.7	SW3050	NDE194	BARIUM	54	=	60	=	51	0.01	mg/Kg	11%
SS	E200.7	SW3050	NDE145	MANGANESE	600	=	540	=	3.2	0.03	mg/Kg	11%

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
SS	E200.7	SW3050	NDE061	ALUMINUM	20000	=	18000	=	42	10	mg/Kg	11%
SS	E200.7	SW3050	NDE061	CALCIUM	20000	=	18000	=	1060	3	mg/Kg	11%
SS	E200.7	SW3050	NDE061	NICKEL	30	=	27	=	8.5	0.09	mg/Kg	11%
SS	E200.7	SW3050	BKG006	IRON	4200	=	4660	=	29	3.7	mg/Kg	10%
SB	E200.7	SW3050	NDE016	CHROMIUM, TOTAL	6.4	=	7	=	2.1	0.09	mg/Kg	10%
SS	E200.7	SW3050	BKG049	CHROMIUM, TOTAL	41	=	37	=	2.3	0.09	mg/Kg	10%
SS	E200.7	SW3050	NDE066	SODIUM	420	J	380	J	1050	21	mg/Kg	10%
WG	E200.7	SW3050	NDE219	BARIUM	94	B	85	B	200	0.13	ug/L	10%
SD	E200.7	SW3050	BKG017	CALCIUM	8900	=	9840	=	5290	15	mg/Kg	10%
WG	E200.7	SW3050	NDE219	IRON	1100	=	995	=	100	25	ug/L	10%
WG	E200.7	SW3050	NDE219	CALCIUM	82000	=	74200	=	5000	28	ug/L	10%
SS	E200.7	SW3050	BKG009	POTASSIUM	1400	=	1546	=	1070	3.2	mg/Kg	10%
SS	E200.7	SW3050	NDE194	COPPER	16	=	18	=	6.4	0.1	mg/Kg	10%
WG	E200.7	SW3050	BKG025	BARIUM	960	=	1060	=	200	0.13	ug/L	10%
SS	E200.7	SW3050	BKG009	VANADIUM	62	=	68	=	11	0.07	mg/Kg	10%
WG	E200.7	SW3050	NDE219	MAGNESIUM	51000	=	46200	=	5000	13	ug/L	10%
SS	E245.5	METHOD	NDE110	MERCURY	0.028	B	0	B	0.04	0.0031	mg/Kg	10%
SS	E200.7	SW3050	BKG006	COBALT	1	B	1	B	15	0.06	mg/Kg	10%
WG	E200.7	SW3050	NDE219	MANGANESE	22	=	20	=	15	0.33	ug/L	10%
SS	E200.7	SW3050	NDE127	BARIUM	40	J	44	J	45	0.01	mg/Kg	10%
SB	E200.7	SW3050	NDE112	MAGNESIUM	2000	=	2200	=	1140	1.5	mg/Kg	10%
SB	E200.7	SW3050	NDE112	MAGNESIUM	2000	=	2200	=	1140	1.5	mg/Kg	10%
WS	E200.7	SW3050	BKG022	MAGNESIUM	1000000	E	1100000	E	5000	13	ug/L	10%
WG	E200.7	FLDFLT	BKG025	SODIUM, DISSOLVED	5600000	E	6150000	E	5000	200	ug/L	9%
WG	E200.7	FLDFLT	BKG025	ANTIMONY, DISSOLVED	9.1	B	8	B	60	2.4	ug/L	9%
SS	E200.7	SW3050	NDE145	VANADIUM	79	=	72	=	11	0.07	mg/Kg	9%
SS	E200.7	SW3050	NDE145	BERYLLIUM	0.23	J	0	J	1.1	0.03	mg/Kg	9%
SS	E200.7	SW3050	NDE024FD1	CHROMIUM, TOTAL	8.1	=	7	=	2.3	0.1	mg/Kg	9%
SS	E200.7	SW3050	NDE194	CALCIUM	1200	B	1312	=	1280	3.6	mg/Kg	9%
SB	E200.7	SW3050	NDE016	SODIUM	59	B	54	B	1050	21	mg/Kg	9%
SD	E200.7	SW3050	NDE118	LEAD	1.1	=	1	=	0.83	0.22	mg/Kg	9%
SS	E200.7	SW3050	BKG049	ARSENIC	1.2	B	1	B	2.3	0.33	mg/Kg	9%
SS	E200.7	SW3050	NDE095	IRON	30000	=	27503	=	22	2.8	mg/Kg	9%
SS	E200.7	SW3050	NDE095	ALUMINUM	18000	=	16502	=	44	10	mg/Kg	9%
WG	E200.7	FLDFLT	NDE215	BARIUM, DISSOLVED	190	B	207	=	200	0.13	ug/L	9%
SS	E200.7	SW3050	NDE023	COPPER	87	=	80	=	5.4	0.08	mg/Kg	8%
SS	E200.7	SW3050	NDE066	BARIUM	39	J	36	J	42	0.01	mg/Kg	8%
SD	E200.7	SW3050	BKG078	SODIUM	21000	=	22800	=	2200	43	mg/Kg	8%
SB	E200.7	SW3050	BKG032	ALUMINUM	19000	=	17500	=	53	13	mg/Kg	8%
WG	E200.7	FLDFLT	BKG067	MANGANESE, DISSOLVED	94	=	102	=	15	0.33	ug/L	8%
WS	E200.7	SW3050	NDE171	IRON	200	=	217	=	100	25	ug/L	8%
WG	E200.7	FLDFLT	BKG067	BARIUM, DISSOLVED	71	B	77	B	200	0.13	ug/L	8%
SS	E200.7	SW3050	NDE169	COBALT	7.2	B	7	B	12	0.05	mg/Kg	8%
SB	E200.7	SW3050	NDE112	SODIUM	1900	=	2060	=	1100	23	mg/Kg	8%
SB	E200.7	SW3050	NDE112	SODIUM	1900	=	2060	=	1100	23	mg/Kg	8%
SS	E200.7	SW3050	NDE145	IRON	26000	=	24000	=	21	2.7	mg/Kg	8%
SS	E200.7	SW3050	BKG006	BARIUM	12	B	13	B	59	0.01	mg/Kg	8%
SS	E200.7	SW3050	BKG006	VANADIUM	12	B	13	B	15	0.1	mg/Kg	8%
SD	E200.7	SW3050	BKG017	ALUMINUM	6400	=	6930	=	212	50	mg/Kg	8%
WG	E200.7	FLDFLT	BKG067	CALCIUM, DISSOLVED	56000	=	60600	=	5000	28	ug/L	8%
SS	E200.7	SW3050	NDE194	CHROMIUM, TOTAL	6.4	=	7	=	2.6	0.11	mg/Kg	8%
SS	E200.7	SW3050	NDE102	LEAD	2.5	=	3	=	0.61	0.16	mg/Kg	8%
WG	E200.7	FLDFLT	BKG067	MAGNESIUM, DISSOLVED	34000	=	36700	=	5000	13	ug/L	8%
SS	E200.7	SW3050	NDE061	VANADIUM	96	=	89	=	11	0.07	mg/Kg	8%
SS	E200.7	SW3050	BKG006	ALUMINUM	2200	=	2370	=	59	14	mg/Kg	7%
SS	E200.7	SW3050	NDE066	NICKEL	25	=	23	=	8.4	0.09	mg/Kg	7%
SS	E200.7	SW3050	NDE061	BERYLLIUM	0.14	J	0	J	1.1	0.03	mg/Kg	7%
SS	E200.7	SW3050	NDE145	MAGNESIUM	14000	=	13000	=	1070	0.14	mg/Kg	7%
SS	E200.7	SW3050	NDE023	SODIUM	130	B	140	B	1080	22	mg/Kg	7%
WS	E200.7	SW3050	BKG022	COPPER	14	B	13	B	25	0.8	ug/L	7%
SS	E200.7	SW3050	NDE061	ANTIMONY	1.4	J	1	J	13	0.25	mg/Kg	7%
WG	E200.7	FLDFLT	NDE219	SODIUM, DISSOLVED	170000	=	158000	=	5000	200	ug/L	7%
SB	E200.7	SW3050	NDE038	ALUMINUM	9400	=	8740	=	45	11	mg/Kg	7%
SB	E200.7	SW3050	NDE016	IRON	9300	=	10000	=	21	2.7	mg/Kg	7%
SS	E200.7	SW3050	BKG009	IRON	21000	=	22567	=	21	2.7	mg/Kg	7%
SS	E200.7	SW3050	NDE066	ALUMINUM	17000	=	15823	=	42	10	mg/Kg	7%
SB	E200.7	SW3050	NDE016	VANADIUM	27	=	29	=	11	0.07	mg/Kg	7%
SS	E200.7	SW3050	NDE102	COBALT	5.8	B	5	B	10	0.04	mg/Kg	7%
SS	E200.7	SW3050	NDE024FD1	NICKEL	4.4	B	4	B	9.2	0.11	mg/Kg	7%

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
SS	E200.7	SW3050	NDE095	MANGANESE	590	=	550	=	3.3	0.03	mg/Kg	7%
SS	E200.7	SW3050	NDE061	POTASSIUM	740	J	690	J	1060	3.2	mg/Kg	7%
WG	E200.7	FLDFLT	BKG067	POTASSIUM, DISSOLVED	2500	B	2680	B	5000	30	ug/L	7%
WG	E200.7	SW3050	NDE215	VANADIUM	28	B	30	B	50	0.7	ug/L	7%
SS	E200.7	SW3050	NDE061	MAGNESIUM	15000	=	14000	=	1060	0.14	mg/Kg	7%
SB	E200.7	SW3050	NDE016	POTASSIUM	560	B	600	B	1050	3.2	mg/Kg	7%
WG	E200.7	FLDFLT	BKG067	IRON, DISSOLVED	2800	=	3000	=	100	25	ug/L	7%
SS	E200.7	SW3050	BKG049	COPPER	30	=	28	=	5.7	0.09	mg/Kg	7%
SS	E200.7	SW3050	BKG049	LEAD	4.2	=	5	=	0.68	0.18	mg/Kg	7%
SS	E200.7	SW3050	NDE102	CALCIUM	4700	=	4390	=	1020	2.9	mg/Kg	7%
SD	E200.7	SW3050	NDE118	COPPER	6.1	J	6	J	6.9	0.11	mg/Kg	7%
SS	E200.7	SW3050	NDE024FD1	ARSENIC	43	=	46	=	2.3	0.33	mg/Kg	7%
SS	E200.7	SW3050	NDE127	CHROMIUM, TOTAL	7.3	=	8	=	2.2	0.09	mg/Kg	7%
SS	E200.7	SW3050	NDE127	POTASSIUM	1320	=	1410	=	1120	3.4	mg/Kg	7%
SS	E200.7	SW3050	NDE061	CHROMIUM, TOTAL	47	=	44	=	2.1	0.09	mg/Kg	7%
SB	E200.7	SW3050	BKG032	POTASSIUM	980	B	918	B	1340	4	mg/Kg	7%
SS	E200.7	SW3050	NDE095	NICKEL	27	=	25	=	8.8	0.1	mg/Kg	6%
WS	E200.7	SW3050	NDE171	POTASSIUM	240000	=	256000	=	5000	30	ug/L	6%
SD	E200.7	SW3050	NDE118	IRON	6300	=	5910	=	28	3.5	mg/Kg	6%
SS	E200.7	SW3050	NDE127	MANGANESE	340	=	362	=	3.4	0.03	mg/Kg	6%
WG	E200.7	FLDFLT	NDE219	VANADIUM, DISSOLVED	8	B	8	B	50	0.7	ug/L	6%
SS	E200.7	SW3050	NDE102	VANADIUM	47	=	50	=	10	0.07	mg/Kg	6%
WG	E200.7	FLDFLT	BKG025	MAGNESIUM, DISSOLVED	1100000	E	1170000	E	5000	13	ug/L	6%
WS	E200.7	SW3050	NDE171	BARIUM	300	=	319	=	200	0.13	ug/L	6%
WG	E200.7	SW3050	NDE215	COPPER	16	B	17	B	25	0.8	ug/L	6%
SS	E200.7	SW3050	NDE066	IRON	28000	=	26371	=	21	2.7	mg/Kg	6%
SS	E200.7	SW3050	NDE024FD1	COBALT	6.9	B	7	B	11	0.04	mg/Kg	6%
WG	E200.7	SW3050	BKG067	POTASSIUM	2600	B	2450	B	5000	30	ug/L	6%
WG	E200.7	FLDFLT	NDE219	POTASSIUM, DISSOLVED	6100	=	5750	=	5000	30	ug/L	6%
SS	E200.7	SW3050	NDE127	MAGNESIUM	1810	=	1920	=	1120	0.15	mg/Kg	6%
SS	E200.7	SW3050	NDE102	CHROMIUM, TOTAL	3.3	=	4	=	2	0.08	mg/Kg	6%
SS	E200.7	SW3050	NDE066	VANADIUM	85	=	80	=	11	0.07	mg/Kg	6%
WG	E200.7	FLDFLT	NDE219	MANGANESE, DISSOLVED	7.4	B	7	B	15	0.33	ug/L	6%
SS	E200.7	SW3050	NDE023	POTASSIUM	1600	=	1510	=	1080	3.2	mg/Kg	6%
SS	E200.7	SW3050	NDE145	ARSENIC	1.8	J	2	J	2.1	0.31	mg/Kg	6%
SS	E200.7	SW3050	NDE102	ZINC	18	=	17	=	4.1	0.51	mg/Kg	6%
SS	E200.7	SW3050	NDE061	COBALT	18	=	17	=	11	0.04	mg/Kg	6%
SS	E200.7	SW3050	BKG049	BERYLLIUM	0.17	B	0	B	1.1	0.03	mg/Kg	6%
WG	E200.7	FLDFLT	NDE219	MAGNESIUM, DISSOLVED	51000	=	48200	=	5000	13	ug/L	6%
SB	E200.7	SW3050	NDE038	IRON	22000	=	20800	=	22	2.8	mg/Kg	6%
RK	E200.7	SW3050	BKG075	CALCIUM	2200	=	2080	=	1010	2.8	mg/Kg	6%
SD	E200.7	SW3050	BKG078	MAGNESIUM	8900	=	9400	=	2160	2.8	mg/Kg	5%
SS	E200.7	SW3050	NDE145	ALUMINUM	19000	=	18000	=	43	10	mg/Kg	5%
WG	E200.7	FLDFLT	NDE219	CALCIUM, DISSOLVED	82000	=	77700	=	5000	28	ug/L	5%
SS	E200.7	SW3050	NDE127	SODIUM	91	J	96	J	1120	22	mg/Kg	5%
SS	E200.7	SW3050	NDE066	CALCIUM	17000	=	17932	=	1050	3	mg/Kg	5%
SS	E200.7	SW3050	NDE061	COPPER	55	=	58	=	5.3	0.02	mg/Kg	5%
WG	E200.7	FLDFLT	BKG025	IRON, DISSOLVED	410	=	432	=	100	25	ug/L	5%
SB	E200.7	SW3050	BKG032	CHROMIUM, TOTAL	9.9	=	9	=	2.7	0.12	mg/Kg	5%
WG	E200.7	SW3050	NDE215	ZINC	19	B	20	=	20	5	ug/L	5%
SS	E200.7	SW3050	NDE153	COBALT	10	J	10	J	11	0.04	mg/Kg	5%
SD	E200.7	SW3050	NDE118	VANADIUM	20	=	19	=	14	0.09	mg/Kg	5%
SB	E200.7	SW3050	NDE038	CHROMIUM, TOTAL	10	=	10	=	2.2	0.09	mg/Kg	5%
SD	E200.7	SW3050	BKG078	IRON	12000	=	11400	=	43	5.4	mg/Kg	5%
SS	E200.7	SW3050	NDE127	COBALT	5.8	J	6	J	11	0.04	mg/Kg	5%
WG	E200.7	SW3050	NDE219	ALUMINUM	910	=	866	=	200	95	ug/L	5%
SS	E200.7	SW3050	NDE127	COPPER	20	=	21	=	5.6	0.02	mg/Kg	5%
SS	E200.7	SW3050	BKG006	BERYLLIUM	0.21	B	0	B	1.5	0.04	mg/Kg	5%
WG	E200.7	SW3050	BKG026	CHROMIUM, TOTAL	3.7	B	4	B	10	0.87	ug/L	5%
SB	E200.7	SW3050	NDE038	VANADIUM	65	=	62	=	11	0.07	mg/Kg	5%
SS	E200.7	SW3050	NDE066	CHROMIUM, TOTAL	42	=	40	=	2.1	0.09	mg/Kg	5%
SB	E200.7	SW3050	NDE112	NICKEL	2.2	B	2	B	9.1	0.11	mg/Kg	5%
SB	E200.7	SW3050	NDE112	NICKEL	2.2	B	2	J	9.1	0.11	mg/Kg	5%
SB	E200.7	SW3050	NDE038	MANGANESE	420	=	440	=	3.4	0.03	mg/Kg	5%
WG	E200.7	FLDFLT	BKG067	SODIUM, DISSOLVED	150000	=	157000	=	5000	200	ug/L	5%
SB	E200.7	SW3050	BKG032	IRON	27000	=	25800	=	27	3.4	mg/Kg	5%
WS	E200.7	SW3050	NDE171	MAGNESIUM	500000	=	523000	=	5000	13	ug/L	4%
SD	E200.7	SW3050	BKG017	IRON	7300	=	6980	=	106	13	mg/Kg	4%
SS	E200.7	SW3050	NDE102	POTASSIUM	620	B	593	B	1020	3.1	mg/Kg	4%

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
SB	E200.7	SW3050	BKG032	BERYLLIUM	0.46	B	0	B	1.3	0.04	mg/Kg	4%
WG	E200.7	FLDFLT	NDE219	BARIUM, DISSOLVED	92	B	88	B	200	0.13	ug/L	4%
SS	E200.7	SW3050	NDE169	LEAD	3.7	=	4	=	0.71	0.19	mg/Kg	4%
SS	E200.7	SW3050	BKG006	MANGANESE	67	=	70	=	4.4	0.04	mg/Kg	4%
SS	E200.7	SW3050	NDE102	SELENIUM	0.71	B	1	B	1	0.47	mg/Kg	4%
SS	E200.7	SW3050	NDE127	ALUMINUM	6350	=	6630	=	45	11	mg/Kg	4%
SS	E200.7	SW3050	NDE024FD1	VANADIUM	46	=	48	=	11	0.08	mg/Kg	4%
SD	E200.7	SW3050	BKG017	COPPER	23	B	24	B	26	0.42	mg/Kg	4%
SS	E200.7	SW3050	BKG006	LEAD	6.9	=	7	=	0.88	0.23	mg/Kg	4%
SB	E200.7	SW3050	BKG032	ARSENIC	0.71	B	1	B	2.7	0.39	mg/Kg	4%
SB	E200.7	SW3050	NDE038	SELENIUM	1	B	1	B	1.1	0.52	mg/Kg	4%
SS	E200.7	SW3050	NDE102	ALUMINUM	4500	=	4320	=	41	9.7	mg/Kg	4%
SB	E200.7	SW3050	NDE038	COPPER	25	=	24	=	5.6	0.09	mg/Kg	4%
SS	E200.7	SW3050	BKG049	POTASSIUM	1200	=	1250	=	1140	3.4	mg/Kg	4%
SD	E200.7	SW3050	BKG017	ZINC	24	=	25	=	21	2.6	mg/Kg	4%
SS	E200.7	SW3050	BKG006	ZINC	24	=	25	=	5.9	0.73	mg/Kg	4%
SB	E200.7	SW3050	NDE038	POTASSIUM	1800	=	1730	=	1120	3.4	mg/Kg	4%
WS	E200.7	SW3050	NDE171	SODIUM	3000000	E	3120000	E	5000	200	ug/L	4%
SS	E200.7	SW3050	NDE127	IRON	12600	=	13100	=	22	2.8	mg/Kg	4%
WG	E200.7	SW3050	BKG025	ANTIMONY	5.1	B	5	B	60	2.4	ug/L	4%
WG	E200.7	FLDFLT	BKG025	CHROMIUM, DISSOLVED	4.6	B	5	B	10	0.87	ug/L	4%
WS	E200.7	SW3050	NDE171	MANGANESE	2300	=	2390	=	15	0.33	ug/L	4%
SS	E200.7	SW3050	NDE102	MAGNESIUM	1600	=	1540	=	1020	0.13	mg/Kg	4%
SS	E200.7	SW3050	BKG006	MAGNESIUM	1600	=	1540	=	1460	0.19	mg/Kg	4%
SS	E200.7	SW3050	BKG009	SODIUM	210	B	202	B	1070	21	mg/Kg	4%
WG	E200.7	SW3050	NDE215	NICKEL	9	B	9	B	40	0.93	ug/L	4%
SS	E200.7	SW3050	NDE095	COBALT	16	=	15	=	11	0.04	mg/Kg	4%
SD	E200.7	SW3050	BKG017	POTASSIUM	5200	B	5400	=	5290	16	mg/Kg	4%
SD	E200.7	SW3050	BKG078	CALCIUM	66000	=	68500	=	2160	6	mg/Kg	4%
SB	E200.7	SW3050	NDE038	ZINC	28	=	27	=	4.5	0.56	mg/Kg	4%
SS	E200.7	SW3050	BKG006	POTASSIUM	490	B	508	B	1460	4.4	mg/Kg	4%
WG	E200.7	SW3050	NDE215	MANGANESE	1100	=	1140	=	15	0.33	ug/L	4%
WG	E200.7	SW3050	BKG026	BARIUM	390	=	404	=	200	0.13	ug/L	4%
SB	E200.7	SW3050	BKG032	ZINC	29	=	28	=	5.3	0.67	mg/Kg	4%
SS	E200.7	SW3050	BKG049	CALCIUM	5100	=	5280	=	1140	3.2	mg/Kg	3%
SB	E200.7	SW3050	BKG032	VANADIUM	88	=	85	=	13	0.09	mg/Kg	3%
SS	E200.7	SW3050	NDE102	SODIUM	200	B	207	B	1020	20	mg/Kg	3%
SB	E200.7	SW3050	NDE038	CALCIUM	3300	=	3190	=	1120	3.1	mg/Kg	3%
SS	E200.7	SW3050	NDE066	MAGNESIUM	12000	=	11603	=	1050	0.14	mg/Kg	3%
SS	E200.7	SW3050	NDE024FD1	ZINC	88	=	91	=	4.6	0.57	mg/Kg	3%
SS	E200.7	SW3050	NDE095	VANADIUM	91	=	88	=	11	0.07	mg/Kg	3%
WG	E200.7	SW3050	BKG025	CHROMIUM, TOTAL	5.9	B	6	B	10	0.87	ug/L	3%
WG	E200.7	FLDFLT	NDE215	VANADIUM, DISSOLVED	9.6	B	9	B	50	0.7	ug/L	3%
SS	E200.7	SW3050	NDE061	IRON	31000	=	30000	=	21	2.7	mg/Kg	3%
SD	E200.7	SW3050	BKG078	ZINC	30	=	31	=	8.6	1.1	mg/Kg	3%
WG	E200.7	SW3050	BKG067	CALCIUM	56000	=	54200	=	5000	28	ug/L	3%
SS	E200.7	SW3050	NDE024FD1	BARIUM	63	=	61	=	46	0.01	mg/Kg	3%
WS	E200.7	SW3050	BKG022	POTASSIUM	610000	E	630000	E	5000	30	ug/L	3%
SS	E200.7	SW3050	NDE066	COPPER	49	=	47	=	5.3	0.02	mg/Kg	3%
SB	E200.7	SW3050	NDE112	POTASSIUM	930	B	960	J	1140	3.4	mg/Kg	3%
SB	E200.7	SW3050	NDE112	POTASSIUM	930	B	960	B	1140	3.4	mg/Kg	3%
SB	E200.7	SW3050	NDE016	ALUMINUM	3100	=	3200	=	42	10	mg/Kg	3%
SB	E200.7	SW3050	BKG032	COPPER	32	=	31	=	6.7	0.11	mg/Kg	3%
WS	E200.7	SW3050	NDE171	CALCIUM	220000	=	227000	=	5000	28	ug/L	3%
SB	E200.7	SW3050	NDE016	COPPER	10	=	10	=	5.3	0.08	mg/Kg	3%
WS	E200.7	SW3050	BKG022	THALLIUM	9.7	B	10	E	10	3.4	ug/L	3%
SB	E200.7	SW3050	NDE038	MAGNESIUM	3000	=	2910	=	1120	0.15	mg/Kg	3%
WG	E200.7	SW3050	BKG067	MAGNESIUM	34000	=	33000	=	5000	13	ug/L	3%
WG	E200.7	SW3050	BKG025	CALCIUM	660000	=	680000	=	5000	28	ug/L	3%
SS	E200.7	SW3050	BKG009	CALCIUM	4700	=	4842	=	1070	3	mg/Kg	3%
SD	E200.7	SW3050	BKG078	POTASSIUM	3700	=	3810	=	2160	6.5	mg/Kg	3%
SS	E200.7	SW3050	NDE127	NICKEL	3.4	J	4	J	9	0.1	mg/Kg	3%
SS	E200.7	SW3050	NDE024FD1	IRON	17000	=	17500	=	23	2.9	mg/Kg	3%
SD	E200.7	SW3050	BKG017	MAGNESIUM	14000	=	14400	=	5290	6.9	mg/Kg	3%
SB	E200.7	SW3050	BKG032	SODIUM	760	B	739	B	1340	27	mg/Kg	3%
SS	E200.7	SW3050	NDE024FD1	COPPER	110	=	107	=	5.7	0.09	mg/Kg	3%
SS	E200.7	SW3050	NDE127	VANADIUM	36	=	37	=	11	0.07	mg/Kg	3%
SS	E200.7	SW3050	BKG049	VANADIUM	74	=	72	=	11	0.07	mg/Kg	3%
WG	E200.7	FLDFLT	BKG025	MANGANESE, DISSOLVED	18000	=	18500	=	15	0.33	ug/L	3%

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
SS	E200.7	SW3050	NDE194	ZINC	29	=	30	=	5.1	0.64	mg/Kg	3%
SS	E200.7	SW3050	BKG049	ZINC	37	=	38	=	4.5	0.57	mg/Kg	3%
SD	E200.7	SW3050	NDE118	ZINC	7.5	=	8	=	5.5	0.69	mg/Kg	3%
WG	E200.7	FLDFLT	NDE215	POTASSIUM, DISSOLVED	12000	=	11700	=	5000	30	ug/L	3%
SS	E200.7	SW3050	NDE169	BARIUM	52	=	51	=	47	0.01	mg/Kg	3%
SB	E200.7	SW3050	NDE038	NICKEL	4.2	B	4	B	9	0.1	mg/Kg	2%
SS	E200.7	SW3050	NDE024FD1	MAGNESIUM	2100	=	2050	=	1140	0.15	mg/Kg	2%
SS	E200.7	SW3050	NDE169	BERYLLIUM	0.17	B	0	B	1.2	0.03	mg/Kg	2%
WG	E200.7	SW3050	BKG067	IRON	3400	=	3320	=	100	25	ug/L	2%
WS	E200.7	SW3050	NDE171	ALUMINUM	300	=	293	=	200	95	ug/L	2%
SS	E200.7	SW3050	NDE061	BARIUM	42	=	43	=	42	0.01	mg/Kg	2%
WG	E200.7	SW3050	NDE215	POTASSIUM	13000	=	12700	=	5000	30	ug/L	2%
WG	E200.7	SW3050	BKG025	MANGANESE	17000	=	17400	=	15	0.33	ug/L	2%
SB	E200.7	SW3050	NDE038	COBALT	9	B	9	B	11	0.04	mg/Kg	2%
SS	E200.7	SW3050	NDE095	CALCIUM	18000	=	17602	=	1100	3.1	mg/Kg	2%
SS	E200.7	SW3050	NDE169	MANGANESE	610	=	597	=	3.5	0.03	mg/Kg	2%
WG	E200.7	FLDFLT	NDE215	MANGANESE, DISSOLVED	92	=	90	=	15	0.33	ug/L	2%
SD	E200.7	SW3050	BKG078	COBALT	4.5	B	5	B	22	0.09	mg/Kg	2%
WG	E200.7	SW3050	BKG026	MAGNESIUM	1400000	E	1370000	E	5000	13	ug/L	2%
SD	E200.7	SW3050	BKG017	MANGANESE	49	=	48	=	16	0.17	mg/Kg	2%
WG	E200.7	SW3050	NDE215	CALCIUM	200000	=	196000	=	5000	28	ug/L	2%
SB	E200.7	SW3050	BKG032	MAGNESIUM	4000	=	4080	=	1340	0.17	mg/Kg	2%
SD	E200.7	SW3050	BKG017	SODIUM	67000	=	68300	=	5300	110	mg/Kg	2%
SS	E200.7	SW3050	NDE153	LEAD	5.2	=	5	=	0.68	0.18	mg/Kg	2%
SB	E200.7	SW3050	BKG032	NICKEL	5.2	B	5	B	11	0.12	mg/Kg	2%
SB	E200.7	SW3050	BKG032	MANGANESE	970	=	988	=	4	0.04	mg/Kg	2%
SS	E200.7	SW3050	NDE145	CALCIUM	55000	=	54000	=	1070	3	mg/Kg	2%
SS	E200.7	SW3050	NDE024FD1	CALCIUM	11000	=	10800	=	1140	3.2	mg/Kg	2%
SS	E200.7	SW3050	NDE095	COPPER	56	=	55	=	5.5	0.02	mg/Kg	2%
SB	E200.7	SW3050	NDE016	LEAD	5.7	=	6	=	0.63	0.17	mg/Kg	2%
SS	E200.7	SW3050	NDE127	ZINC	57	=	56	=	4.5	0.56	mg/Kg	2%
SS	E200.7	SW3050	NDE024FD1	MANGANESE	360	=	354	=	3.4	0.03	mg/Kg	2%
WG	E200.7	SW3050	BKG025	MAGNESIUM	1200000	E	1180000	E	5000	13	ug/L	2%
WG	E200.7	SW3050	BKG025	POTASSIUM	490000	=	482000	=	5000	30	ug/L	2%
SS	E200.7	SW3050	NDE066	COBALT	15	=	15	=	11	0.04	mg/Kg	2%
SD	E200.7	SW3050	BKG017	LEAD	6.4	=	7	=	3.2	0.85	mg/Kg	2%
SS	E200.7	SW3050	NDE061	MANGANESE	670	=	680	=	3.2	0.03	mg/Kg	1%
SS	E200.7	SW3050	BKG009	MAGNESIUM	4600	=	4535	=	1070	0.14	mg/Kg	1%
SS	E200.7	SW3050	BKG006	COPPER	7.1	B	7	B	7.3	0.12	mg/Kg	1%
WG	E200.7	SW3050	BKG026	MANGANESE	8600	=	8720	=	15	0.33	ug/L	1%
WG	E200.7	SW3050	BKG067	BARIUM	73	B	72	B	200	0.13	ug/L	1%
SS	E200.7	SW3050	NDE145	LEAD	75	=	74	=	0.64	0.17	mg/Kg	1%
SD	E200.7	SW3050	BKG078	MANGANESE	150	=	148	=	6.5	0.07	mg/Kg	1%
SS	E200.7	SW3050	NDE127	LEAD	7.8	=	8	=	0.67	0.18	mg/Kg	1%
SB	E200.7	SW3050	NDE038	BARIUM	81	=	82	=	45	0.01	mg/Kg	1%
WS	E200.7	SW3050	BKG022	VANADIUM	8.3	B	8	B	50	0.7	ug/L	1%
WS	E200.7	SW3050	BKG022	MANGANESE	85	=	86	=	15	0.33	ug/L	1%
WG	E200.7	FLDFLT	NDE215	CALCIUM, DISSOLVED	180000	=	178000	=	5000	28	ug/L	1%
WG	E200.7	SW3050	BKG067	MANGANESE	100	=	99	=	15	0.33	ug/L	1%
SS	E200.7	SW3050	BKG049	MAGNESIUM	4300	=	4340	=	1140	0.15	mg/Kg	1%
SS	E200.7	SW3050	NDE102	IRON	13000	=	12900	=	20	2.6	mg/Kg	1%
WG	E200.7	SW3050	BKG067	SODIUM	140000	=	141000	=	5000	200	ug/L	1%
SS	E200.7	SW3050	NDE024FD1	POTASSIUM	1500	=	1490	=	1140	3.4	mg/Kg	1%
WG	E200.7	FLDFLT	NDE215	MAGNESIUM, DISSOLVED	97000	=	96400	=	5000	13	ug/L	1%
SS	E200.7	SW3050	NDE169	ARSENIC	0.74	B	1	B	2.4	0.34	mg/Kg	1%
WG	E200.7	FLDFLT	NDE215	SODIUM, DISSOLVED	830000	=	826000	=	5000	200	ug/L	0%
SS	E200.7	SW3050	BKG009	ANTIMONY	0.73	B	1	B	13	0.26	mg/Kg	0%
SS	E200.7	SW3050	BKG049	IRON	26000	=	25900	=	23	2.9	mg/Kg	0%
SS	E200.7	SW3050	BKG009	ALUMINUM	13000	=	13048	=	43	10	mg/Kg	0%
WG	E200.7	SW3050	NDE215	BARIUM	300	=	301	=	200	0.13	ug/L	0%
SB	E200.7	SW3050	BKG032	CALCIUM	32000	=	32100	=	1340	3.7	mg/Kg	0%
WG	E200.7	SW3050	NDE215	SODIUM	890000	=	888000	=	5000	200	ug/L	0%
SD	E200.7	SW3050	BKG078	ALUMINUM	10000	=	9980	=	86	20	mg/Kg	0%
WG	E200.7	SW3050	BKG026	CALCIUM	630000	=	629000	=	5000	28	ug/L	0%
WG	E200.7	FLDFLT	BKG025	CALCIUM, DISSOLVED	660000	=	661000	=	5000	28	ug/L	0%
WG	E200.7	SW3050	BKG026	SODIUM	6800000	E	6810000	E	5000	200	ug/L	0%
WG	E200.7	SW3050	BKG026	COBALT	8.6	B	9	B	50	0.43	ug/L	0%
SS	E200.7	SW3050	NDE066	ZINC	39	=	39	=	4.2	0.53	mg/Kg	0%
SS	E200.7	SW3050	NDE066	MANGANESE	570	=	570	=	3.2	0.03	mg/Kg	0%

Appendix I-5 - Laboratory Duplicate Precision

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Lab Dup Result	Lab Dup Qual	RL	DL	Units	RPD
SS	E200.7	SW3050	NDE095	ANTIMONY	1.1	B	1	B	13	0.26	mg/Kg	0%
WG	E200.7	SW3050	NDE219	COPPER	5.1	B	5	B	25	0.8	ug/L	0%
WG	E200.7	SW3050	NDE215	COBALT	12	B	12	B	50	0.43	ug/L	0%
WG	E200.7	SW3050	NDE215	MAGNESIUM	110000	=	110000	=	5000	13	ug/L	0%
WS	E300	NONE	NDE171	PERCHLORATE	12.5	=	13	=	2.5	0.8	ug/L	0%
SS	E200.7	SW3050	NDE153	BERYLLIUM	0.17	J	0	J	1.1	0.03	mg/Kg	0%
SD	E200.7	SW3050	NDE118	COBALT	3	J	3	J	14	0.05	mg/Kg	0%
SS	E200.7	SW3050	NDE102	COPPER	14	=	14	=	5.1	0.08	mg/Kg	0%
SS	E200.7	SW3050	NDE102	NICKEL	1.9	B	2	B	8.2	0.09	mg/Kg	0%
SS	E200.7	SW3050	NDE061	ZINC	42	=	42	=	4.2	0.53	mg/Kg	0%
SD	E200.7	SW3050	BKG078	BARIUM	69	B	69	B	86	0.02	mg/Kg	0%
SD	E200.7	SW3050	BKG078	CHROMIUM, TOTAL	5.4	=	5	=	4.3	0.19	mg/Kg	0%
SD	E200.7	SW3050	BKG078	COPPER	18	=	18	=	11	0.17	mg/Kg	0%
SD	E200.7	SW3050	BKG078	NICKEL	2	B	2	B	17	0.2	mg/Kg	0%
SD	E200.7	SW3050	BKG078	VANADIUM	40	=	40	=	22	0.15	mg/Kg	0%
WG	E200.7	SW3050	BKG067	THALLIUM	7.2	B	7	B	10	3.4	ug/L	0%
SS	E200.7	SW3050	BKG049	ALUMINUM	18000	=	18000	=	45	11	mg/Kg	0%
SS	E200.7	SW3050	BKG049	ANTIMONY	1.2	B	1	B	14	0.27	mg/Kg	0%
SS	E200.7	SW3050	BKG049	NICKEL	13	=	13	=	9.1	0.11	mg/Kg	0%
WG	E200.7	SW3050	BKG025	COBALT	12	B	12	B	50	0.43	ug/L	0%
WG	E200.7	FLDFLT	BKG025	COBALT, DISSOLVED	11	B	11	B	50	0.43	ug/L	0%
WS	E200.7	SW3050	BKG022	ALUMINUM	5000	=	5000	=	200	95	ug/L	0%
WS	E200.7	SW3050	BKG022	BARIUM	37	B	37	B	200	0.13	ug/L	0%
WS	E200.7	SW3050	BKG022	BERYLLIUM	1.1	B	1	B	5	0.33	ug/L	0%
WS	E200.7	SW3050	BKG022	CALCIUM	390000	=	390000	=	5000	28	ug/L	0%
WS	E200.7	SW3050	BKG022	IRON	4900	=	4900	=	100	25	ug/L	0%
SD	E200.7	SW3050	BKG017	NICKEL	4.1	B	4	B	42	0.49	mg/Kg	0%
SD	E200.7	SW3050	BKG017	VANADIUM	29	B	29	B	53	0.37	mg/Kg	0%

Appendix I-6 - Field Duplicate Precision

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Field Dup Lab Result	Field Dup Lab Qual	DL	RL	Units	RPD
SW	E200.7	SW3050	BKG086DL2	CALCIUM	8600000	J	12000000	J	560	5000	ug/L	33%
SW	E200.7	SW3050	BKG086DL2	CALCIUM	8600000	J	1400000	R	560	5000	ug/L	200%
SW	E200.7	SW3050	BKG086DL2	MAGNESIUM	13000000	=	1800000	R	260	5000	ug/L	200
SW	E200.7	SW3050	BKG086DL2	MAGNESIUM	13000000	=	14000000	=	260	5000	ug/L	7%
SW	E200.7	SW3050	BKG086DL2	POTASSIUM	5800000	=	30	R	600	5000	ug/L	200%
SW	E200.7	SW3050	BKG086DL2	POTASSIUM	5800000	=	6300000	=	600	5000	ug/L	8%
SW	E200.7	SW3050	BKG086DL2	SODIUM	64000000	=	7700000	R	4000	5000	ug/L	200%
SW	E200.7	SW3050	BKG086DL2	SODIUM	64000000	=	65000000	=	4000	5000	ug/L	2%
SW	E200.7	SW3050	BKG086	ANTIMONY	10	J	13	J	2.4	60	ug/L	26%
SW	E200.7	SW3050	BKG086	ARSENIC	18	=	19	=	2.9	10	ug/L	5%
SW	E200.7	SW3050	BKG086	BARIUM	760	J	1200	J	0.13	200	ug/L	45%
SW	E200.7	SW3050	BKG086	BERYLLIUM	8.4	=	11	=	0.33	5	ug/L	27%
SW	E200.7	SW3050	BKG086	CADMIUM	23	=	39	=	0.27	5	ug/L	52%
SW	E200.7	SW3050	BKG086	CALCIUM	1200000	R	12000000	J	28	5000	ug/L	200%
SW	E200.7	SW3050	BKG086	CHROMIUM, TOTAL	78	=	120	=	0.87	10	ug/L	42%
SW	E200.7	SW3050	BKG086	COBALT	76	=	120	=	0.43	50	ug/L	45%
SW	E200.7	SW3050	BKG086	COPPER	610	=	970	=	0.8	25	ug/L	46%
SW	E200.7	SW3050	BKG086	IRON	230000	J	340000	J	25	100	ug/L	39%
SW	E200.7	SW3050	BKG086	LEAD	93	=	150	=	1.6	3	ug/L	47%
SW	E200.7	SW3050	BKG086	MAGNESIUM	1800000	R	14000000	=	13	5000	ug/L	200%
SW	E200.7	SW3050	BKG086	MANGANESE	10000	J	17000	J	0.33	15	ug/L	52%
SW	E200.7	SW3050	BKG086	NICKEL	43	=	61	=	0.93	40	ug/L	35%
SW	E200.7	SW3050	BKG086	POTASSIUM	30	R	6300000	=	30	5000	ug/L	200%
SW	E200.7	SW3050	BKG086	SILVER	1.3	J	2.4	J	0.57	10	ug/L	59%
SW	E200.7	SW3050	BKG086	SODIUM	8200000	R	65000000	=	200	5000	ug/L	200%
SW	E200.7	SW3050	BKG086	VANADIUM	450	=	690	=	0.7	50	ug/L	42%
SW	E200.7	SW3050	BKG086	ZINC	1000	=	1600	=	5	20	ug/L	46%
SD	E245.5	METHOD	BKG081	MERCURY	0.013	J	0.013	J	0.0051	0.08	mg/Kg	0%
SD	E200.7	SW3050	BKG081	ALUMINUM	10000	=	11000	=	20	82	mg/Kg	10%
SD	E200.7	SW3050	BKG081	BARIUM	49	J	47	J	0.02	82	mg/Kg	4%
SD	E200.7	SW3050	BKG081	BERYLLIUM	0.24	J	0.23	J	0.06	2.1	mg/Kg	4%
SD	E200.7	SW3050	BKG081	CALCIUM	80000	=	57000	=	5.8	2060	mg/Kg	34%
SD	E200.7	SW3050	BKG081	CHROMIUM, TOTAL	5.1	=	5.4	=	0.18	4.1	mg/Kg	6%
SD	E200.7	SW3050	BKG081	COBALT	4.7	J	5.1	J	0.08	21	mg/Kg	8%
SD	E200.7	SW3050	BKG081	COPPER	26	=	29	=	0.16	10	mg/Kg	11%
SD	E200.7	SW3050	BKG081	IRON	14000	=	15000	=	5.2	41	mg/Kg	7%
SD	E200.7	SW3050	BKG081	LEAD	8	=	9.2	=	0.33	1.2	mg/Kg	14%
SD	E200.7	SW3050	BKG081	MAGNESIUM	12000	=	13000	=	2.7	2060	mg/Kg	8%
SD	E200.7	SW3050	BKG081	MANGANESE	350	=	390	=	0.06	6.2	mg/Kg	11%
SD	E200.7	SW3050	BKG081	NICKEL	2	J	2.4	J	0.19	16	mg/Kg	18%
SD	E200.7	SW3050	BKG081	POTASSIUM	4000	J	4300	J	6.2	2060	mg/Kg	7%
SD	E200.7	SW3050	BKG081	SELENIUM	1.1	J	1.1	J	0.95	2.1	mg/Kg	0%
SD	E200.7	SW3050	BKG081	SODIUM	17000	=	17000	=	41	2100	mg/Kg	0%
SD	E200.7	SW3050	BKG081	VANADIUM	28	=	32	=	0.14	21	mg/Kg	13%
SD	E200.7	SW3050	BKG081	ZINC	48	J	55	J	1	8.2	mg/Kg	14%
WG	E200.7	FLDFLT	BKG067	ALUMINUM, DISSOLVED	220	=	95	U	95	200	ug/L	200%
WG	E200.7	SW3050	BKG067	BARIUM	73	J	73	J	0.13	200	ug/L	0%
WG	E200.7	FLDFLT	BKG067	BARIUM, DISSOLVED	71	B	75	J	0.13	200	ug/L	5%
WG	E200.7	FLDFLT	BKG067	BERYLLIUM, DISSOLVED	0.33	J	0.33	U	0.33	5	ug/L	200%
WG	E200.7	SW3050	BKG067	CALCIUM	56000	=	58000	=	28	5000	ug/L	4%
WG	E200.7	FLDFLT	BKG067	CALCIUM, DISSOLVED	56000	=	59000	=	28	5000	ug/L	5%
WG	E200.7	SW3050	BKG067	IRON	3400	=	3500	J	25	100	ug/L	3%
WG	E200.7	FLDFLT	BKG067	IRON, DISSOLVED	2800	J	2900	J	25	100	ug/L	4%
WG	E200.7	SW3050	BKG067	MAGNESIUM	34000	J	35000	=	13	5000	ug/L	3%
WG	E200.7	FLDFLT	BKG067	MAGNESIUM, DISSOLVED	34000	=	36000	=	13	5000	ug/L	6%
WG	E200.7	SW3050	BKG067	MANGANESE	100	=	98	=	0.33	15	ug/L	2%
WG	E200.7	FLDFLT	BKG067	MANGANESE, DISSOLVED	94	=	98	=	0.33	15	ug/L	4%
WG	E200.7	SW3050	BKG067	NICKEL	1.8	J	1.9	J	0.93	40	ug/L	5%
WG	E200.7	FLDFLT	BKG067	NICKEL, DISSOLVED	1.9	J	2.1	J	0.93	40	ug/L	10%
WG	E200.7	SW3050	BKG067	POTASSIUM	2600	J	2500	J	30	5000	ug/L	4%
WG	E200.7	FLDFLT	BKG067	POTASSIUM, DISSOLVED	2500	J	2600	J	30	5000	ug/L	4%
WG	E200.7	SW3050	BKG067	SODIUM	140000	=	150000	=	200	5000	ug/L	7%
WG	E200.7	FLDFLT	BKG067	SODIUM, DISSOLVED	150000	=	150000	=	200	5000	ug/L	0%
WG	E200.7	SW3050	BKG067	THALLIUM	7.2	J	7.8	J	3.4	10	ug/L	8%
WG	E200.7	FLDFLT	BKG067	THALLIUM, DISSOLVED	6.3	J	8.6	J	3.4	10	ug/L	31%
WG	E200.7	SW3050	BKG067	VANADIUM	1.9	J	3.2	J	0.7	50	ug/L	51%

Appendix I-6 - Field Duplicate Precision

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Field Dup Lab Result	Field Dup Lab Qual	DL	RL	Units	RPD
WG	E200.7	FLDFLT	BKG067	VANADIUM, DISSOLVED	2.5	J	3	J	0.7	50	ug/L	18%
WG	E200.7	SW3050	BKG067	ZINC	8.4	J	9.9	J	5	20	ug/L	16%
WG	E200.7	FLDFLT	BKG067	ZINC, DISSOLVED	6.7	J	5.6	J	5	20	ug/L	18%
SS	E245.5	METHOD	BKG052	MERCURY	0.0037	J	0.0032	U	0.0028	0.04	mg/Kg	200%
SS	E200.7	SW3050	BKG052	ALUMINUM	8200	=	8600	=	11	45	mg/Kg	5%
SS	E200.7	SW3050	BKG052	ANTIMONY	0.66	J	0.71	J	0.27	14	mg/Kg	7%
SS	E200.7	SW3050	BKG052	ARSENIC	0.6	J	0.37	U	0.33	2.3	mg/Kg	200%
SS	E200.7	SW3050	BKG052	BARIUM	57	=	66	=	0.01	45	mg/Kg	15%
SS	E200.7	SW3050	BKG052	CALCIUM	3400	J	3700	J	3.2	1130	mg/Kg	8%
SS	E200.7	SW3050	BKG052	CHROMIUM, TOTAL	3.1	J	4	J	0.09	2.3	mg/Kg	25%
SS	E200.7	SW3050	BKG052	COBALT	6.9	J	8.2	J	0.04	11	mg/Kg	17%
SS	E200.7	SW3050	BKG052	COPPER	30	=	34	=	0.09	5.7	mg/Kg	13%
SS	E200.7	SW3050	BKG052	IRON	17000	J	21000	J	2.9	23	mg/Kg	21%
SS	E200.7	SW3050	BKG052	LEAD	1.1	=	1.2	=	0.18	0.68	mg/Kg	9%
SS	E200.7	SW3050	BKG052	MAGNESIUM	3000	J	3400	J	0.15	1130	mg/Kg	13%
SS	E200.7	SW3050	BKG052	MANGANESE	290	J	360	J	0.03	3.4	mg/Kg	22%
SS	E200.7	SW3050	BKG052	NICKEL	1.8	J	1.8	J	0.11	9.1	mg/Kg	0%
SS	E200.7	SW3050	BKG052	POTASSIUM	680	J	770	J	3.4	1130	mg/Kg	12%
SS	E200.7	SW3050	BKG052	SODIUM	93	J	79	J	23	1130	mg/Kg	16%
SS	E200.7	SW3050	BKG052	VANADIUM	50	=	63	=	0.07	11	mg/Kg	23%
SS	E200.7	SW3050	BKG052	ZINC	25	=	28	=	0.57	4.5	mg/Kg	11%
SS	E245.5	METHOD	BKG049	MERCURY	0.024	J	0.026	J	0.0028	0.04	mg/Kg	8%
SS	E200.7	SW3050	BKG049	ALUMINUM	18000	=	17000	=	11	45	mg/Kg	6%
SS	E200.7	SW3050	BKG049	ANTIMONY	1.2	J	1.2	J	0.27	14	mg/Kg	0%
SS	E200.7	SW3050	BKG049	ARSENIC	1.2	J	0.85	J	0.33	2.3	mg/Kg	34%
SS	E200.7	SW3050	BKG049	BARIUM	61	=	64	=	0.01	45	mg/Kg	5%
SS	E200.7	SW3050	BKG049	BERYLLIUM	0.17	J	0.17	J	0.03	1.1	mg/Kg	0%
SS	E200.7	SW3050	BKG049	CALCIUM	5100	J	4900	J	3.2	1140	mg/Kg	4%
SS	E200.7	SW3050	BKG049	CHROMIUM, TOTAL	41	J	36	J	0.09	2.3	mg/Kg	13%
SS	E200.7	SW3050	BKG049	COBALT	13	=	12	=	0.04	11	mg/Kg	8%
SS	E200.7	SW3050	BKG049	COPPER	30	=	27	=	0.09	5.7	mg/Kg	11%
SS	E200.7	SW3050	BKG049	IRON	26000	J	25000	J	2.9	23	mg/Kg	4%
SS	E200.7	SW3050	BKG049	LEAD	4.2	=	4	=	0.18	0.68	mg/Kg	5%
SS	E200.7	SW3050	BKG049	MAGNESIUM	4300	J	4200	J	0.15	1140	mg/Kg	2%
SS	E200.7	SW3050	BKG049	MANGANESE	640	=	640	J	0.03	3.4	mg/Kg	0%
SS	E200.7	SW3050	BKG049	NICKEL	13	=	12	=	0.11	9.1	mg/Kg	8%
SS	E200.7	SW3050	BKG049	POTASSIUM	1200	=	990	J	3.4	1140	mg/Kg	19%
SS	E200.7	SW3050	BKG049	SODIUM	130	J	170	J	23	1140	mg/Kg	27%
SS	E200.7	SW3050	BKG049	VANADIUM	74	=	69	=	0.07	11	mg/Kg	7%
SS	E200.7	SW3050	BKG049	ZINC	37	=	36	=	0.57	4.5	mg/Kg	3%
WG	E200.7	SW3050	BKG047DL1	SODIUM	1400000	=	1300000	R	4000	5000	ug/L	200%
WG	E200.7	SW3050	BKG047DL1	SODIUM	1400000	=	1500000	=	4000	5000	ug/L	7%
WG	E200.7	FLDFLT	BKG047DL1	SODIUM, DISSOLVED	1500000	=	1300000	R	4000	100000	ug/L	200%
WG	E200.7	FLDFLT	BKG047DL1	SODIUM, DISSOLVED	1500000	=	1500000	=	4000	100000	ug/L	0%
WG	E200.7	SW3050	BKG047	ALUMINUM	130	J	95	U	95	200	ug/L	200%
WG	E200.7	SW3050	BKG047	BARIUM	210	=	220	=	0.13	200	ug/L	5%
WG	E200.7	FLDFLT	BKG047	BARIUM, DISSOLVED	230	=	230	=	0.13	200	ug/L	0%
WG	E200.7	SW3050	BKG047	CALCIUM	320000	J	330000	J	28	5000	ug/L	3%
WG	E200.7	FLDFLT	BKG047	CALCIUM, DISSOLVED	330000	J	330000	J	28	5000	ug/L	0%
WG	E200.7	SW3050	BKG047	COBALT	0.43	U	1.2	J	0.43	50	ug/L	200%
WG	E200.7	SW3050	BKG047	IRON	480	J	440	J	25	100	ug/L	9%
WG	E200.7	FLDFLT	BKG047	IRON, DISSOLVED	420	J	420	J	25	100	ug/L	0%
WG	E200.7	SW3050	BKG047	MAGNESIUM	290000	=	310000	=	13	5000	ug/L	7%
WG	E200.7	FLDFLT	BKG047	MAGNESIUM, DISSOLVED	310000	=	310000	=	13	5000	ug/L	0%
WG	E200.7	SW3050	BKG047	MANGANESE	910	J	980	J	0.33	15	ug/L	7%
WG	E200.7	FLDFLT	BKG047	MANGANESE, DISSOLVED	1100	J	1000	J	0.33	15	ug/L	10%
WG	E200.7	SW3050	BKG047	NICKEL	3.1	J	2.8	J	0.93	40	ug/L	10%
WG	E200.7	FLDFLT	BKG047	NICKEL, DISSOLVED	2.4	J	2	J	0.93	40	ug/L	18%
WG	E200.7	SW3050	BKG047	POTASSIUM	56000	J	59000	J	30	5000	ug/L	5%
WG	E200.7	FLDFLT	BKG047	POTASSIUM, DISSOLVED	60000	J	60000	J	30	5000	ug/L	0%
WG	E200.7	SW3050	BKG047	SODIUM	1300000	R	1500000	=	200	5000	ug/L	200%
WG	E200.7	FLDFLT	BKG047	SODIUM, DISSOLVED	1300000	R	1500000	=	200	5000	ug/L	200%
WG	E200.7	SW3050	BKG047	THALLIUM	4.8	J	6	J	3.4	10	ug/L	22%
WG	E200.7	FLDFLT	BKG047	THALLIUM, DISSOLVED	7.1	J	6.4	J	3.4	10	ug/L	10%
WG	E200.7	SW3050	BKG047	VANADIUM	3.5	J	3.2	J	0.7	50	ug/L	9%
WG	E200.7	FLDFLT	BKG047	VANADIUM, DISSOLVED	2.8	J	2.6	J	0.7	50	ug/L	7%

Appendix I-6 - Field Duplicate Precision

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Field Dup Lab Result	Field Dup Lab Qual	DL	RL	Units	RPD
SS	E245.5	METHOD	BKG043	MERCURY	0.021	J	0.013	J	0.0031	0.04	mg/Kg	47%
SS	E200.7	SW3050	BKG043	ALUMINUM	6200	=	6500	=	12	49	mg/Kg	5%
SS	E200.7	SW3050	BKG043	ARSENIC	0.66	J	0.74	J	0.36	2.5	mg/Kg	11%
SS	E200.7	SW3050	BKG043	BARIUM	92	=	91	=	0.01	49	mg/Kg	1%
SS	E200.7	SW3050	BKG043	BERYLLIUM	0.33	J	0.34	J	0.04	1.2	mg/Kg	3%
SS	E200.7	SW3050	BKG043	CALCIUM	1900	=	1800	=	3.4	1230	mg/Kg	5%
SS	E200.7	SW3050	BKG043	CHROMIUM, TOTAL	4.5	=	4.8	=	0.11	2.5	mg/Kg	6%
SS	E200.7	SW3050	BKG043	COBALT	7.4	J	6.7	J	0.05	12	mg/Kg	10%
SS	E200.7	SW3050	BKG043	COPPER	9.1	=	9.8	=	0.09	6.2	mg/Kg	7%
SS	E200.7	SW3050	BKG043	IRON	14000	=	15000	=	3.1	25	mg/Kg	7%
SS	E200.7	SW3050	BKG043	LEAD	3.5	=	2.6	=	0.2	0.74	mg/Kg	30%
SS	E200.7	SW3050	BKG043	MAGNESIUM	1200	J	1300	=	0.16	1230	mg/Kg	8%
SS	E200.7	SW3050	BKG043	MANGANESE	1200	=	1100	=	0.04	3.7	mg/Kg	9%
SS	E200.7	SW3050	BKG043	NICKEL	2	J	2.4	J	0.11	9.8	mg/Kg	18%
SS	E200.7	SW3050	BKG043	POTASSIUM	660	J	610	J	3.7	1230	mg/Kg	8%
SS	E200.7	SW3050	BKG043	SELENIUM	0.82	J	1.1	J	0.57	1.2	mg/Kg	29%
SS	E200.7	SW3050	BKG043	SODIUM	94	J	100	J	25	1230	mg/Kg	6%
SS	E200.7	SW3050	BKG043	VANADIUM	34	=	37	=	0.08	12	mg/Kg	8%
SS	E200.7	SW3050	BKG043	ZINC	24	=	23	=	0.62	4.9	mg/Kg	4%
SB	E245.5	METHOD	BKG032	MERCURY	0.0084	J	0.01	J	0.0033	0.05	mg/Kg	17%
SB	E200.7	SW3050	BKG032	ALUMINUM	19000	J	16000	J	13	53	mg/Kg	17%
SB	E200.7	SW3050	BKG032	ANTIMONY	0.59	J	0.28	UJ	0.32	16	mg/Kg	200%
SB	E200.7	SW3050	BKG032	ARSENIC	0.71	J	0.34	U	0.39	2.7	mg/Kg	200%
SB	E200.7	SW3050	BKG032	BARIUM	320	J	230	J	0.01	53	mg/Kg	33%
SB	E200.7	SW3050	BKG032	BERYLLIUM	0.46	J	0.41	J	0.04	1.3	mg/Kg	11%
SB	E200.7	SW3050	BKG032	CALCIUM	32000	J	31000	J	3.7	1340	mg/Kg	3%
SB	E200.7	SW3050	BKG032	CHROMIUM, TOTAL	9.9	=	7.4	=	0.12	2.7	mg/Kg	29%
SB	E200.7	SW3050	BKG032	COBALT	16	=	14	=	0.05	13	mg/Kg	13%
SB	E200.7	SW3050	BKG032	COPPER	32	J	28	J	0.11	6.7	mg/Kg	13%
SB	E200.7	SW3050	BKG032	IRON	27000	J	24000	J	3.4	27	mg/Kg	12%
SB	E200.7	SW3050	BKG032	LEAD	4.8	=	3.8	=	0.21	0.8	mg/Kg	23%
SB	E200.7	SW3050	BKG032	MAGNESIUM	4000	J	3300	J	0.17	1340	mg/Kg	19%
SB	E200.7	SW3050	BKG032	MANGANESE	970	J	990	J	0.04	4	mg/Kg	2%
SB	E200.7	SW3050	BKG032	NICKEL	5.2	J	4.5	J	0.12	11	mg/Kg	14%
SB	E200.7	SW3050	BKG032	POTASSIUM	980	J	820	J	4	1340	mg/Kg	18%
SB	E200.7	SW3050	BKG032	SELENIUM	1.1	J	0.8	J	0.61	1.3	mg/Kg	32%
SB	E200.7	SW3050	BKG032	SODIUM	760	J	810	J	27	1340	mg/Kg	6%
SB	E200.7	SW3050	BKG032	VANADIUM	88	J	78	J	0.09	13	mg/Kg	12%
SB	E200.7	SW3050	BKG032	ZINC	29	=	25	=	0.67	5.3	mg/Kg	15%
SW	E200.7	SW3050	BKG022DL1	MAGNESIUM	1200000	=	1000000	=	130	5000	ug/L	18%
SW	E200.7	SW3050	BKG022DL1	MAGNESIUM	1200000	=	1100000	=	130	5000	ug/L	9%
SW	E200.7	SW3050	BKG022DL1	POTASSIUM	620000	J	570000	R	300	5000	ug/L	200%
SW	E200.7	SW3050	BKG022DL1	POTASSIUM	620000	J	580000	J	300	5000	ug/L	7%
SW	E200.7	SW3050	BKG022DL1	SODIUM	8600000	=	5000000	=	2000	5000	ug/L	53%
SW	E200.7	SW3050	BKG022DL1	SODIUM	8600000	=	8200000	=	2000	5000	ug/L	5%
SW	E200.7	SW3050	BKG022	ALUMINUM	5000	J	1500	J	95	200	ug/L	108%
SW	E200.7	SW3050	BKG022	ARSENIC	15	=	5.2	J	2.9	10	ug/L	97%
SW	E200.7	SW3050	BKG022	BARIUM	37	J	20	J	0.13	200	ug/L	60%
SW	E200.7	SW3050	BKG022	BERYLLIUM	1.1	J	1.2	J	0.33	5	ug/L	9%
SW	E200.7	SW3050	BKG022	CADMIUM	1.1	J	0.27	U	0.27	5	ug/L	200%
SW	E200.7	SW3050	BKG022	CALCIUM	390000	=	380000	=	28	5000	ug/L	3%
SW	E200.7	SW3050	BKG022	CHROMIUM, TOTAL	4.3	J	1.2	J	0.87	10	ug/L	113%
SW	E200.7	SW3050	BKG022	COBALT	2	J	1.1	J	0.43	50	ug/L	58%
SW	E200.7	SW3050	BKG022	COPPER	14	J	4.5	J	0.8	25	ug/L	103%
SW	E200.7	SW3050	BKG022	IRON	4900	=	1600	=	25	100	ug/L	102%
SW	E200.7	SW3050	BKG022	MAGNESIUM	1000000	J	1100000	=	13	5000	ug/L	10%
SW	E200.7	SW3050	BKG022	MAGNESIUM	1000000	J	1000000	=	13	5000	ug/L	0%
SW	E200.7	SW3050	BKG022	MANGANESE	85	=	46	=	0.33	15	ug/L	60%
SW	E200.7	SW3050	BKG022	NICKEL	5.2	J	3.3	J	0.93	40	ug/L	45%
SW	E200.7	SW3050	BKG022	POTASSIUM	610000	R	580000	J	30	5000	ug/L	200%
SW	E200.7	SW3050	BKG022	SODIUM	8900000	R	8200000	=	200	5000	ug/L	200%
SW	E200.7	SW3050	BKG022	SODIUM	8900000	R	5000000	=	200	5000	ug/L	200%
SW	E200.7	SW3050	BKG022	THALLIUM	9.7	J	7.5	J	3.4	10	ug/L	26%
SW	E200.7	SW3050	BKG022	VANADIUM	8.3	J	3	J	0.7	50	ug/L	94%
SD	E245.5	METHOD	BKG017	MERCURY	0.052	J	0.043	J	0.01	0.21	mg/Kg	19%
SD	E200.7	SW3050	BKG017	ALUMINUM	6400	=	7400	=	50	212	mg/Kg	14%

Appendix I-6 - Field Duplicate Precision

Matrix	Analytical Method	Prep Method	Sample ID	Parameter	Lab Result	Lab Qual	Field Dup Lab Result	Field Dup Lab Qual	DL	RL	Units	RPD
SD	E200.7	SW3050	BKG017	BARIUM	6.9	J	8.3	J	0.06	212	mg/Kg	18%
SD	E200.7	SW3050	BKG017	CALCIUM	8900	=	9200	=	15	5290	mg/Kg	3%
SD	E200.7	SW3050	BKG017	CHROMIUM, TOTAL	7.8	J	8.6	J	0.46	11	mg/Kg	10%
SD	E200.7	SW3050	BKG017	COBALT	2.3	J	2.6	J	0.23	53	mg/Kg	12%
SD	E200.7	SW3050	BKG017	COPPER	23	J	24	J	0.42	26	mg/Kg	4%
SD	E200.7	SW3050	BKG017	IRON	7300	=	7700	=	13	106	mg/Kg	5%
SD	E200.7	SW3050	BKG017	LEAD	6.4	=	6	=	0.85	3.2	mg/Kg	6%
SD	E200.7	SW3050	BKG017	MAGNESIUM	14000	=	14000	=	6.9	5290	mg/Kg	0%
SD	E200.7	SW3050	BKG017	MANGANESE	49	=	51	=	0.17	16	mg/Kg	4%
SD	E200.7	SW3050	BKG017	NICKEL	4.1	J	4.5	J	0.49	42	mg/Kg	9%
SD	E200.7	SW3050	BKG017	POTASSIUM	5200	J	5600	J	16	5290	mg/Kg	7%
SD	E200.7	SW3050	BKG017	SODIUM	67000	=	69000	=	110	5300	mg/Kg	3%
SD	E200.7	SW3050	BKG017	VANADIUM	29	J	24	J	0.37	53	mg/Kg	19%
SD	E200.7	SW3050	BKG017	ZINC	24	=	24	=	2.6	21	mg/Kg	0%
SB	E200.7	SW3050	BKG014	ALUMINUM	3200	=	3200	=	12	52	mg/Kg	0%
SB	E200.7	SW3050	BKG014	ARSENIC	1.1	J	0.37	U	0.38	2.6	mg/Kg	200%
SB	E200.7	SW3050	BKG014	BARIUM	6.6	J	6.7	J	0.01	52	mg/Kg	2%
SB	E200.7	SW3050	BKG014	CALCIUM	26000	=	24000	=	3.6	1300	mg/Kg	8%
SB	E200.7	SW3050	BKG014	CHROMIUM, TOTAL	3.6	=	3.7	=	0.11	2.6	mg/Kg	3%
SB	E200.7	SW3050	BKG014	COBALT	1.9	J	1.9	J	0.05	13	mg/Kg	0%
SB	E200.7	SW3050	BKG014	COPPER	4.7	J	4.4	J	0.1	6.5	mg/Kg	7%
SB	E200.7	SW3050	BKG014	IRON	4500	=	4100	=	3.3	26	mg/Kg	9%
SB	E200.7	SW3050	BKG014	LEAD	1.6	=	1.6	=	0.21	0.78	mg/Kg	0%
SB	E200.7	SW3050	BKG014	MAGNESIUM	1600	=	1600	=	1.7	1300	mg/Kg	0%
SB	E200.7	SW3050	BKG014	MANGANESE	55	=	57	=	0.04	3.9	mg/Kg	4%
SB	E200.7	SW3050	BKG014	NICKEL	1.2	J	1.2	J	0.12	10	mg/Kg	0%
SB	E200.7	SW3050	BKG014	POTASSIUM	830	J	840	J	3.9	1300	mg/Kg	1%
SB	E200.7	SW3050	BKG014	SODIUM	3600	=	3700	=	26	1300	mg/Kg	3%
SB	E200.7	SW3050	BKG014	VANADIUM	19	=	17	=	0.09	13	mg/Kg	11%
SB	E200.7	SW3050	BKG014	ZINC	5.8	=	5.2	=	0.65	5.2	mg/Kg	11%
SS	E245.5	METHOD	BKG006	MERCURY	0.011	J	0.013	J	0.0037	0.05	mg/Kg	17%
SS	E200.7	SW3050	BKG006	ALUMINUM	2200	=	2300	=	14	59	mg/Kg	4%
SS	E200.7	SW3050	BKG006	ARSENIC	1.2	J	1.3	J	0.42	2.9	mg/Kg	8%
SS	E200.7	SW3050	BKG006	BARIUM	12	J	12	J	0.01	59	mg/Kg	0%
SS	E200.7	SW3050	BKG006	BERYLLIUM	0.21	J	0.18	J	0.04	1.5	mg/Kg	15%
SS	E200.7	SW3050	BKG006	CALCIUM	45000	=	47000	=	4.1	1460	mg/Kg	4%
SS	E200.7	SW3050	BKG006	CHROMIUM, TOTAL	3.8	=	4.4	=	0.13	2.9	mg/Kg	15%
SS	E200.7	SW3050	BKG006	COBALT	1	J	1	J	0.06	15	mg/Kg	0%
SS	E200.7	SW3050	BKG006	COPPER	7.1	J	7.1	=	0.12	7.3	mg/Kg	0%
SS	E200.7	SW3050	BKG006	IRON	4200	=	4500	=	3.7	29	mg/Kg	7%
SS	E200.7	SW3050	BKG006	LEAD	6.9	=	6.8	=	0.23	0.88	mg/Kg	1%
SS	E200.7	SW3050	BKG006	MAGNESIUM	1600	=	1400	=	0.19	1460	mg/Kg	13%
SS	E200.7	SW3050	BKG006	MANGANESE	67	=	61	=	0.04	4.4	mg/Kg	9%
SS	E200.7	SW3050	BKG006	NICKEL	1.2	J	1.1	J	0.14	12	mg/Kg	9%
SS	E200.7	SW3050	BKG006	POTASSIUM	490	J	490	J	4.4	1460	mg/Kg	0%
SS	E200.7	SW3050	BKG006	SODIUM	470	J	550	J	29	1460	mg/Kg	16%
SS	E200.7	SW3050	BKG006	VANADIUM	12	J	12	J	0.1	15	mg/Kg	0%
SS	E200.7	SW3050	BKG006	ZINC	24	=	24	=	0.73	5.9	mg/Kg	0%

atrix	Analytical Method	Prep Method	Parameter	Number Analyzed	Number Detected	Min Detected	Max Detected	Min RL	Max RL	Min DL	Max DL	Units
RK	E200.7	SW3050	ALUMINUM	6	6	2000	5600	40	41	9.5	9.7	mg/Kg
RK	E200.7	SW3050	BARIUM	6	6	18	160	40	41	0.01	0.01	mg/Kg
RK	E200.7	SW3050	BERYLLIUM	6	2	0.16	0.2	1	1	0.03	0.03	mg/
RK	E200.7	SW3050	CALCIUM	6	6	2000	38000	1000	1020	2.8	2.9	mg/
RK	E200.7	SW3050	CHROMIUM, TOTAL	6	6	0.86	2.5	2	2	0.08	0.08	mg/Kg
RK	E200.7	SW3050	COBALT	6	6	2.2	6.9	10	10	0.04	0.04	mg/Kg
RK	E200.7	SW3050	COPPER	6	6	2.5	59	5	5.1	0.08	0.08	mg/Kg
RK	E200.7	SW3050	IRON	6	6	4800	10000	20	20	2.5	2.6	mg/Kg
RK	E200.7	SW3050	LEAD	6	5	0.96	3	0.6	0.61	0.16	0.16	mg/Kg
RK	E200.7	SW3050	MAGNESIUM	6	6	910	4300	1000	1020	0.13	0.13	mg/Kg
RK	E200.7	SW3050	MANGANESE	6	6	320	840	3	3.1	0.03	0.03	mg/Kg
RK	E200.7	SW3050	NICKEL	6	6	0.69	2.5	8	8.2	0.09	0.09	mg/Kg
RK	E200.7	SW3050	POTASSIUM	6	6	170	530	1000	1020	3	3.1	mg/Kg
RK	E200.7	SW3050	SODIUM	6	6	54	670	1000	1020	20	20	mg/Kg
RK	E200.7	SW3050	VANADIUM	6	6	7	24	10	10	0.07	0.07	mg/Kg
RK	E200.7	SW3050	ZINC	6	6	12	43	4	4.1	0.5	0.51	mg/Kg
RK	E245.5	METHOD	MERCURY	6	3	0.003	0.0063	0.04	0.04	0.0025	0.0026	mg/Kg
SB	E200.7	SW3050	ALUMINUM	13	13	1600	29000	43	58	10	14	mg/Kg
SB	E200.7	SW3050	ANTIMONY	13	9	0.48	1.4	13	17	0.26	0.35	mg/Kg
SB	E200.7	SW3050	ARSENIC	13	8	0.71	2.5	2.1	2.9	0.31	0.42	mg/Kg
SB	E200.7	SW3050	BARIUM	13	13	6.4	320	43	58	0.01	0.01	mg/Kg
SB	E200.7	SW3050	BERYLLIUM	13	11	0.13	0.46	1.1	1.4	0.03	0.04	mg/Kg
SB	E200.7	SW3050	CALCIUM	13	13	1700	200000	1070	14100	3	39	mg/Kg
SB	E200.7	SW3050	CHROMIUM, TOTAL	13	13	3.6	74	2.1	2.9	0.09	0.13	mg/Kg
SB	E200.7	SW3050	COBALT	13	13	1.2	25	11	14	0.04	0.06	mg/Kg
SB	E200.7	SW3050	COPPER	13	13	1.8	46	5.4	7.2	0.08	0.12	mg/Kg
SB	E200.7	SW3050	IRON	13	13	2500	39000	21	29	2.7	3.6	mg/Kg
SB	E200.7	SW3050	LEAD	13	13	0.3	5.9	0.64	0.86	0.17	0.23	mg/Kg
SB	E200.7	SW3050	MAGNESIUM	13	13	1300	8300	1070	1440	0.14	1.9	mg/Kg
SB	E200.7	SW3050	MANGANESE	13	13	55	990	3.2	4.3	0.03	0.04	mg/Kg
SB	E200.7	SW3050	NICKEL	13	13	0.77	40	8.6	12	0.1	0.13	mg/Kg
SB	E200.7	SW3050	POTASSIUM	13	13	500	1600	1070	1440	3.2	4.3	mg/Kg
SB	E200.7	SW3050	SELENIUM	13	4	0.68	1.1	1.1	1.4	0.49	0.66	mg/Kg
SB	E200.7	SW3050	SODIUM	13	13	81	6300	1070	1410	21	29	mg/
SB	E200.7	SW3050	VANADIUM	13	13	9.8	130	11	14	0.07	0.1	mg/
SB	E200.7	SW3050	ZINC	13	13	3.5	36	4.3	5.8	0.54	0.72	mg/Kg
SB	E245.5	METHOD	MERCURY	13	8	0.0048	0.025	0.04	0.05	0.0027	0.0036	mg/Kg
SD	E200.7	SW3050	ALUMINUM	8	8	2600	11000	60	212	14	50	mg/Kg
SD	E200.7	SW3050	ANTIMONY	8	1	0.59	0.59	18	63	0.36	1.3	mg/Kg
SD	E200.7	SW3050	BARIUM	8	8	6.9	69	60	212	0.02	0.06	mg/Kg
SD	E200.7	SW3050	BERYLLIUM	8	4	0.17	0.24	1.5	5.3	0.05	0.17	mg/Kg
SD	E200.7	SW3050	CALCIUM	8	8	8900	160000	1500	5290	4.2	15	mg/Kg
SD	E200.7	SW3050	CHROMIUM, TOTAL	8	8	2.3	8.6	3	11	0.13	0.46	mg/Kg
SD	E200.7	SW3050	COBALT	8	8	0.96	5.1	15	53	0.06	0.23	mg/Kg
SD	E200.7	SW3050	COPPER	8	8	3.3	29	7.5	26	0.12	0.42	mg/Kg
SD	E200.7	SW3050	IRON	8	8	2300	15000	30	106	3.8	13	mg/Kg
SD	E200.7	SW3050	LEAD	8	8	0.56	9.2	0.9	3.2	0.24	0.85	mg/Kg
SD	E200.7	SW3050	MAGNESIUM	8	8	2200	14000	1500	5290	2	6.9	mg/Kg
SD	E200.7	SW3050	MANGANESE	8	8	24	390	4.5	16	0.05	0.17	mg/Kg
SD	E200.7	SW3050	NICKEL	8	8	0.5	4.5	12	42	0.14	0.49	mg/Kg
SD	E200.7	SW3050	POTASSIUM	8	8	1300	5600	1500	5290	4.5	16	mg/Kg
SD	E200.7	SW3050	SELENIUM	8	3	0.78	1.1	1.5	5.3	0.69	2.4	mg/Kg
SD	E200.7	SW3050	SODIUM	8	8	7800	69000	1500	5300	30	110	mg/Kg
SD	E200.7	SW3050	VANADIUM	8	8	7.2	40	15	53	0.11	0.37	mg/Kg
SD	E200.7	SW3050	ZINC	8	8	4.9	55	6	21	0.75	2.6	mg/Kg
SD	E245.5	METHOD	MERCURY	8	4	0.013	0.052	0.06	0.21	0.0038	0.01	mg/Kg
SS	E200.7	SW3050	ALUMINUM	30	30	1900	24000	42	59	9.9	14	mg/Kg
SS	E200.7	SW3050	ANTIMONY	30	19	0.35	2.3	12	18	0.25	0.36	mg/Kg
SS	E200.7	SW3050	ARSENIC	30	24	0.57	2.2	2.1	3	0.3	0.43	mg/Kg
SS	E200.7	SW3050	BARIUM	30	30	6.7	190	42	59	0.01	0.01	mg/Kg
SS	E200.7	SW3050	BERYLLIUM	30	24	0.13	0.41	1	1.5	0.03	0.04	mg/Kg
SS	E200.7	SW3050	CALCIUM	30	30	1800	210000	1040	14800	2.9	41	mg/Kg
SS	E200.7	SW3050	CHROMIUM, TOTAL	30	30	2.2	57	2.1	3	0.09	0.13	mg/Kg
SS	E200.7	SW3050	COBALT	30	30	1	22	10	15	0.04	0.06	mg/Kg
SS	E200.7	SW3050	COPPER	30	30	2.6	68	5.2	7.4	0.08	0.12	mg/
SS	E200.7	SW3050	IRON	30	30	3000	38000	21	30	2.6	3.7	mg
SS	E200.7	SW3050	LEAD	30	30	1.1	13	0.62	0.89	0.17	0.24	mg/Kg
SS	E200.7	SW3050	MAGNESIUM	30	30	1200	16000	1040	1480	0.13	1.6	mg/Kg
SS	E200.7	SW3050	MANGANESE	30	30	48	1200	3.1	4.4	0.03	0.04	mg/Kg
SS	E200.7	SW3050	NICKEL	30	30	0.67	31	8.3	12	0.09	0.14	mg/Kg
SS	E200.7	SW3050	POTASSIUM	30	30	380	1700	1040	1480	3.1	4.4	mg/Kg

Matrix	Analytical Method	Prep Method	Parameter	Number Analyzed	Number Detected	Min Detected	Max Detected	Min RL	Max RL	Min DL	Max DL	Units
SS	E200.7	SW3050	SELENIUM	30	6	0.73	2	1	1.5	0.48	0.68	mg/Kg
SS	E200.7	SW3050	SODIUM	30	30	25	4000	1040	1480	21	30	mg/Kg
	E200.7	SW3050	THALLIUM	30	3	0.45	0.67	2.1	3	0.35	0.5	mg/Kg
	E200.7	SW3050	VANADIUM	30	30	9	120	10	15	0.07	0.1	mg/Kg
SS	E200.7	SW3050	ZINC	30	30	6	71	4.2	5.9	0.52	0.74	mg/Kg
SS	E245.5	METHOD	MERCURY	30	29	0.0037	0.031	0.04	0.05	0.0026	0.0037	mg/Kg
SW	E200.7	SW3050	ALUMINUM	3	3	530	5000	200	200	95	95	ug/L
SW	E200.7	SW3050	ANTIMONY	8	6	3.3	13	60	60	2.4	2.4	ug/L
SW	E200.7	SW3050	ARSENIC	8	7	5.2	19	10	10	2.9	2.9	ug/L
SW	E200.7	SW3050	BARIUM	8	8	17	1200	200	200	0.13	0.13	ug/L
SW	E200.7	SW3050	BERYLLIUM	8	8	1.1	11	5	5	0.33	0.33	ug/L
SW	E200.7	SW3050	CADMIUM	8	6	1.1	39	5	5	0.27	0.27	ug/L
SW	E200.7	SW3050	CALCIUM	8	8	380000	12000000	5000	5000	28	560	ug/L
SW	E200.7	SW3050	CHROMIUM, TOTAL	8	7	1.2	120	10	10	0.87	0.87	ug/L
SW	E200.7	SW3050	COBALT	8	7	1.1	120	50	50	0.43	0.43	ug/L
SW	E200.7	SW3050	COPPER	8	7	4.5	970	25	25	0.8	0.8	ug/L
SW	E200.7	SW3050	IRON	8	8	590	340000	100	100	25	25	ug/L
SW	E200.7	SW3050	LEAD	8	4	75	150	3	3	1.6	1.6	ug/L
SW	E200.7	SW3050	MAGNESIUM	10	10	1000000	14000000	5000	5000	13	260	ug/L
SW	E200.7	SW3050	MANGANESE	8	8	28	17000	15	15	0.33	0.33	ug/L
SW	E200.7	SW3050	NICKEL	8	8	3.1	61	40	40	0.93	0.93	ug/L
SW	E200.7	SW3050	POTASSIUM	8	8	580000	6300000	5000	5000	300	600	ug/L
SW	E200.7	SW3050	SILVER	8	3	1	2.4	10	10	0.57	0.57	ug/L
SW	E200.7	SW3050	SODIUM	9	9	5000000	65000000	5000	5000	200	4000	ug/L
SW	E200.7	SW3050	THALLIUM	8	4	3.4	9.7	10	13.6	3.4	13.6	ug/L
SW	E200.7	SW3050	VANADIUM	8	8	2.7	690	50	50	0.7	0.7	ug/L
SW	E200.7	SW3050	ZINC	8	4	470	1600	20	20	5	20	ug/L
WG	E200.7	FLDFLT	ALUMINUM, DISSOLVED	9	1	220	220	200	200	95	95	ug/L
WG	E200.7	FLDFLT	ANTIMONY, DISSOLVED	9	2	3.8	9.1	60	60	2.4	2.4	ug/L
WG	E200.7	FLDFLT	ARSENIC, DISSOLVED	9	1	5.5	5.5	10	10	2.9	2.9	ug/L
WG	E200.7	FLDFLT	BARIUM, DISSOLVED	9	8	15	870	200	200	0.13	0.13	ug/L
WG	E200.7	FLDFLT	BERYLLIUM, DISSOLVED	9	3	0.33	2.2	5	5	0.33	0.33	ug/L
WG	E200.7	FLDFLT	CADMIUM, DISSOLVED	9	1	1.1	1.1	5	5	0.27	0.27	ug/L
[illegible]	E200.7	FLDFLT	CALCIUM, DISSOLVED	9	9	19000	660000	5000	5000	28	28	ug/L
[illegible]	E200.7	FLDFLT	CHROMIUM, DISSOLVED	9	2	2.9	4.6	10	10	0.87	0.87	ug/L
WG	E200.7	FLDFLT	COBALT, DISSOLVED	9	3	5.5	11	50	50	0.43	0.43	ug/L
WG	E200.7	FLDFLT	IRON, DISSOLVED	9	8	410	14000	100	100	25	25	ug/L
WG	E200.7	FLDFLT	MAGNESIUM, DISSOLVED	9	9	12000	1700000	5000	5000	13	260	ug/L
WG	E200.7	FLDFLT	DISSOLVED	9	9	94	18000	15	15	0.33	0.33	ug/L
WG	E200.7	FLDFLT	NICKEL, DISSOLVED	9	9	1.8	12	40	40	0.93	0.93	ug/L
WG	E200.7	FLDFLT	POTASSIUM, DISSOLVED	9	9	2000	720000	5000	5000	30	30	ug/L
WG	E200.7	FLDFLT	SODIUM, DISSOLVED	9	9	130000	12000000	5000	100000	200	4000	ug/L
WG	E200.7	FLDFLT	THALLIUM, DISSOLVED	9	8	5.1	16	10	10	3.4	3.4	ug/L
WG	E200.7	FLDFLT	VANADIUM, DISSOLVED	9	8	1.9	32	50	50	0.7	0.7	ug/L
WG	E200.7	FLDFLT	ZINC, DISSOLVED	9	4	5.6	15	20	20	5	20	ug/L
WG	E200.7	SW3050	ALUMINUM	8	4	130	3500	200	200	95	95	ug/L
WG	E200.7	SW3050	ANTIMONY	9	2	5.1	5.2	60	60	2.4	2.4	ug/L
WG	E200.7	SW3050	BARIUM	9	9	15	960	200	200	0.13	0.13	ug/L
WG	E200.7	SW3050	BERYLLIUM	9	2	1.4	1.8	5	5	0.33	0.33	ug/L
WG	E200.7	SW3050	CADMIUM	9	1	1	1	5	5	0.27	0.27	ug/L
WG	E200.7	SW3050	CALCIUM	9	9	18000	660000	5000	5000	28	28	ug/L
WG	E200.7	SW3050	CHROMIUM, TOTAL	9	5	1.6	6.8	10	10	0.87	0.87	ug/L
WG	E200.7	SW3050	COBALT	9	5	1.2	20	50	50	0.43	0.43	ug/L
WG	E200.7	SW3050	COPPER	9	3	2.8	15	25	25	0.8	0.8	ug/L
WG	E200.7	SW3050	IRON	9	9	440	29000	100	100	25	25	ug/L
WG	E200.7	SW3050	LEAD	9	1	4.7	4.7	3	3	1.6	1.6	ug/L
WG	E200.7	SW3050	MAGNESIUM	9	9	13000	1600000	5000	5000	13	260	ug/L
WG	E200.7	SW3050	MANGANESE	9	9	98	17000	15	15	0.33	0.33	ug/L
WG	E200.7	SW3050	NICKEL	9	9	1.8	19	40	40	0.93	0.93	ug/L
WG	E200.7	SW3050	POTASSIUM	9	9	2000	700000	5000	5000	30	30	ug/L
WG	E200.7	SW3050	SODIUM	9	9	130000	12000000	5000	5000	200	4000	ug/L
WG	E200.7	SW3050	THALLIUM	9	8	4.8	18	10	10	3.4	3.4	ug/L
WG	E200.7	SW3050	VANADIUM	9	9	1.8	75	50	50	0.7	0.7	ug/L
WG	E200.7	SW3050	ZINC	9	5	8.4	1300	20	20	5	20	ug/L

appendix I-8 - Data Rejected through the Validation Process

Matrix	Sample ID	Sample Type	Parameter	Lab Result	Lab Qual	Final Qual	RL	DL	Units	Comments
SB	BKG004	N1	CALCIUM	150000	E	R	1290	3.6	mg/Kg	DL
SS	BKG003	N1	CALCIUM	150000	E	R	1480	4.1	mg/Kg	DL
SW	BKG085FD1	FD1	CALCIUM	1400000	E	R	5000	28	ug/L	DL
SW	BKG086	N1	CALCIUM	1200000	E	R	5000	28	ug/L	DL
SW	BKG087	N1	CALCIUM	1100000	E	R	5000	28	ug/L	DL
SW	BKG023	N1	MAGNESIUM	1300000	E	R	5000	13	ug/L	DL
SW	BKG083	N1	MAGNESIUM	1500000	E	R	5000	13	ug/L	DL
SW	BKG084	N1	MAGNESIUM	1400000	E	R	5000	13	ug/L	DL
SW	BKG085FD1	FD1	MAGNESIUM	1800000	E	R	5000	13	ug/L	DL
SW	BKG086	N1	MAGNESIUM	1800000	E	R	5000	13	ug/L	DL
SW	BKG087	N1	MAGNESIUM	1500000	E	R	5000	13	ug/L	DL
WG	BKG025	N1	MAGNESIUM	1200000	E	R	5000	13	ug/L	DL
WG	BKG026	N1	MAGNESIUM	1400000	E	R	5000	13	ug/L	DL
WG	BKG025	N1	MAGNESIUM, DISSOLVED	1100000	E	R	5000	13	ug/L	DL
WG	BKG026	N1	MAGNESIUM, DISSOLVED	1400000	E	R	5000	13	ug/L	DL
SW	BKG022	N1	POTASSIUM	610000	E	R	5000	30	ug/L	DL
SW	BKG023	N1	POTASSIUM	30	E	R	5000	30	ug/L	DL
SW	BKG024FD1	FD1	POTASSIUM	570000	=	R	5000	30	ug/L	DL
SW	BKG083	N1	POTASSIUM	30	U	R	5000	30	ug/L	DL
SW	BKG084	N1	POTASSIUM	30	U	R	5000	30	ug/L	DL
SW	BKG085FD1	FD1	POTASSIUM	30	U	R	5000	30	ug/L	DL
SW	BKG086	N1	POTASSIUM	30	U	R	5000	30	ug/L	DL
SW	BKG087	N1	POTASSIUM	30	U	R	5000	30	ug/L	DL
WG	BKG026	N1	POTASSIUM	30	U	R	5000	30	ug/L	DL
WG	BKG026	N1	POTASSIUM, DISSOLVED	30	U	R	5000	30	ug/L	DL
SW	BKG084	N1	SELENIUM	4.6	U	R	5	4.6	ug/L	DL
SW	BKG085FD1	FD1	SELENIUM	4.6	U	R	5	4.6	ug/L	DL
SW	BKG086	N1	SELENIUM	4.6	U	R	5	4.6	ug/L	DL
SW	BKG022	N1	SODIUM	8900000	E	R	5000	200	ug/L	DL
SW	BKG023	N1	SODIUM	6000000	E	R	5000	200	ug/L	DL
SW	BKG083	N1	SODIUM	7300000	E	R	5000	200	ug/L	DL
SW	BKG084	N1	SODIUM	6500000	E	R	5000	200	ug/L	DL
SW	BKG085FD1	FD1	SODIUM	7700000	E	R	5000	200	ug/L	DL
SW	BKG086	N1	SODIUM	8200000	E	R	5000	200	ug/L	DL
SW	BKG087	N1	SODIUM	6700000	E	R	5000	200	ug/L	DL
WG	BKG025	N1	SODIUM	11000000	E	R	5000	200	ug/L	DL
WG	BKG026	N1	SODIUM	6800000	E	R	5000	200	ug/L	DL
WG	BKG046FD1	FD1	SODIUM	1300000	E	R	5000	200	ug/L	DL
WG	BKG047	N1	SODIUM	1300000	E	R	5000	200	ug/L	DL
WG	BKG025	N1	SODIUM, DISSOLVED	5600000	E	R	5000	200	ug/L	DL
WG	BKG026	N1	SODIUM, DISSOLVED	7000000	E	R	5000	200	ug/L	DL
WG	BKG046FD1	FD1	SODIUM, DISSOLVED	1300000	E	R	5000	200	ug/L	DL
WG	BKG047	N1	SODIUM, DISSOLVED	1300000	E	R	5000	200	ug/L	DL
SW	BKG085FD1	FD1	THALLIUM	3.4	U	R	10	3.4	ug/L	DL
SW	BKG083	N1	ZINC	5	U	R	20	5	ug/L	DL
WG	BKG025	N1	ZINC	5	U	R	20	5	ug/L	DL
WG	BKG026	N1	ZINC	5	U	R	20	5	ug/L	DL
WG	BKG025	N1	ZINC, DISSOLVED	5	U	R	20	5	ug/L	DL
WG	BKG026	N1	ZINC, DISSOLVED	5	U	R	20	5	ug/L	DL

Appendix I-9 - Contrast Between Detections in Field Samples and Blanks in Common Elements

Matrix	Type	Analytical Method	Prep Method	Parameter	Number Analyzed	Number Detected	Min Detected	Max Detected	Min RL	Max RL	Min DL	Max DL	Units
WQ	EB1	E200.7	SW3050	BARIUM	4	1	1.7	1.7	200	200	0.13	0.13	ug/L
RK	N	E200.7	SW3050	BARIUM	6	6	18	160	40	41	0.01	0.01	mg/Kg
SB	N	E200.7	SW3050	BARIUM	13	13	6.4	320	43	58	0.01	0.01	mg/Kg
SD	N	E200.7	SW3050	BARIUM	8	8	6.9	69	60	212	0.02	0.06	mg/Kg
SS	N	E200.7	SW3050	BARIUM	30	30	6.7	190	42	59	0.01	0.01	mg/Kg
SW	N	E200.7	SW3050	BARIUM	8	8	17	1200	200	200	0.13	0.13	ug/L
WG	N	E200.7	SW3050	BARIUM	9	9	15	960	200	200	0.13	0.13	ug/L
WG	N	E200.7	FLDFLT	BARIUM, DISSOLVED	9	8	15	870	200	200	0.13	0.13	ug/L
WQ	EB1	E200.7	SW3050	CALCIUM	4	3	180	570	5000	5000	28	28	ug/L
SOIL	LB	E200.7	SW3050	CALCIUM	7	1	33	33	1000	1000	2.8	2.8	mg/Kg
WATER	LB	E200.7	SW3050	CALCIUM	4	2	134	292	5000	5000	28	28	ug/L
RK	N	E200.7	SW3050	CALCIUM	6	6	2000	38000	1000	1020	2.8	2.9	mg/Kg
SB	N	E200.7	SW3050	CALCIUM	13	13	1700	200000	1070	14100	3	39	mg/Kg
SD	N	E200.7	SW3050	CALCIUM	8	8	8900	160000	1500	5290	4.2	15	mg/Kg
SS	N	E200.7	SW3050	CALCIUM	30	30	1800	210000	1040	14800	2.9	41	mg/Kg
SW	N	E200.7	SW3050	CALCIUM	8	8	380000	12000000	5000	5000	28	560	ug/L
WG	N	E200.7	SW3050	CALCIUM	9	9	18000	660000	5000	5000	28	28	ug/L
WATER	LB	E200.7	FLDFLT	CALCIUM, DISSOLVED	3	1	292	292	5000	5000	28	28	ug/L
WG	N	E200.7	FLDFLT	CALCIUM, DISSOLVED	9	9	19000	660000	5000	5000	28	28	ug/L
WG	N	E200.7	FLDFLT	CHROMIUM, DISSOLVED	9	2	2.9	4.6	10	10	0.87	0.87	ug/L
WQ	AB1	E200.7	SW3050	CHROMIUM, TOTAL	1	1	7.8	7.8	10	10	0.87	0.87	ug/L
WQ	EB1	E200.7	SW3050	CHROMIUM, TOTAL	4	1	3.2	3.2	10	10	0.87	0.87	ug/L
RK	N	E200.7	SW3050	CHROMIUM, TOTAL	6	6	0.86	2.5	2	2	0.08	0.08	mg/Kg
SB	N	E200.7	SW3050	CHROMIUM, TOTAL	13	13	3.6	74	2.1	2.9	0.09	0.13	mg/Kg
SD	N	E200.7	SW3050	CHROMIUM, TOTAL	8	8	2.3	8.6	3	11	0.13	0.46	mg/Kg
SS	N	E200.7	SW3050	CHROMIUM, TOTAL	30	30	2.2	57	2.1	3	0.09	0.13	mg/Kg
SW	N	E200.7	SW3050	CHROMIUM, TOTAL	8	7	1.2	120	10	10	0.87	0.87	ug/L
WG	N	E200.7	SW3050	CHROMIUM, TOTAL	9	5	1.6	6.8	10	10	0.87	0.87	ug/L
WQ	EB1	E200.7	SW3050	COPPER	4	1	3.3	3.3	25	25	0.8	0.8	ug/L
RK	N	E200.7	SW3050	COPPER	6	6	2.5	59	5	5.1	0.08	0.08	mg/Kg
SB	N	E200.7	SW3050	COPPER	13	13	1.8	46	5.4	7.2	0.08	0.12	mg/Kg
SD	N	E200.7	SW3050	COPPER	8	8	3.3	29	7.5	26	0.12	0.42	mg/Kg
SS	N	E200.7	SW3050	COPPER	30	30	2.6	68	5.2	7.4	0.08	0.12	mg/Kg
SW	N	E200.7	SW3050	COPPER	8	7	4.5	970	25	25	0.8	0.8	ug/L
WG	N	E200.7	SW3050	COPPER	9	3	2.8	15	25	25	0.8	0.8	ug/L
WQ	EB1	E200.7	SW3050	IRON	4	1	220	220	100	100	25	25	ug/L
WATER	LB	E200.7	SW3050	IRON	4	1	70	70	100	100	25	25	ug/L
RK	N	E200.7	SW3050	IRON	6	6	4800	10000	20	20	2.5	2.6	mg/Kg
SB	N	E200.7	SW3050	IRON	13	13	2500	39000	21	29	2.7	3.6	mg/Kg
SD	N	E200.7	SW3050	IRON	8	8	2300	15000	30	106	3.8	13	mg/Kg
SS	N	E200.7	SW3050	IRON	30	30	3000	38000	21	30	2.6	3.7	mg/Kg
SW	N	E200.7	SW3050	IRON	8	8	590	340000	100	100	25	25	ug/L
WG	N	E200.7	SW3050	IRON	9	9	440	29000	100	100	25	25	ug/L
WG	N	E200.7	FLDFLT	IRON, DISSOLVED	9	8	410	14000	100	100	25	25	ug/L
WQ	EB1	E200.7	SW3050	MAGNESIUM	4	2	49	550	5000	5000	13	13	ug/L
SOIL	LB	E200.7	SW3050	MAGNESIUM	7	2	11	11	1000	1000	0.13	1.3	mg/Kg
WATER	LB	E200.7	SW3050	MAGNESIUM	4	1	468	468	5000	5000	13	13	ug/L
RK	N	E200.7	SW3050	MAGNESIUM	6	6	910	4300	1000	1020	0.13	0.13	mg/Kg
SB	N	E200.7	SW3050	MAGNESIUM	13	13	1300	8300	1070	1440	0.14	1.9	mg/Kg
SD	N	E200.7	SW3050	MAGNESIUM	8	8	2200	14000	1500	5290	2	6.9	mg/Kg

Appendix I-9 - Contrast Between Detections in Field Samples and Blanks in Common Elements

Matrix	Type	Analytical Method	Prep Method	Parameter	Number Analyzed	Number Detected	Min Detected	Max Detected	Min RL	Max RL	Min DL	Max DL	Units
SS	N	E200.7	SW3050	MAGNESIUM	30	30	1200	16000	1040	1480	0.13	1.6	mg/Kg
SW	N	E200.7	SW3050	MAGNESIUM	10	10	1000000	14000000	5000	5000	13	260	ug/L
WG	N	E200.7	SW3050	MAGNESIUM	9	9	13000	1600000	5000	5000	13	260	ug/L
WATER	LB	E200.7	FLDFLT	MAGNESIUM, DISSOLVED	3	2	108	468	5000	5000	13	13	ug/L
WG	N	E200.7	FLDFLT	MAGNESIUM, DISSOLVED	9	9	12000	1700000	5000	5000	13	260	ug/L
WQ	EB1	E200.7	SW3050	MANGANESE	4	2	3.3	4.5	15	15	0.33	0.33	ug/L
WATER	LB	E200.7	SW3050	MANGANESE	4	1	7.69	7.69	15	15	0.33	0.33	ug/L
RK	N	E200.7	SW3050	MANGANESE	6	6	320	840	3	3.1	0.03	0.03	mg/Kg
SB	N	E200.7	SW3050	MANGANESE	13	13	55	990	3.2	4.3	0.03	0.04	mg/Kg
SD	N	E200.7	SW3050	MANGANESE	8	8	24	390	4.5	16	0.05	0.17	mg/Kg
SS	N	E200.7	SW3050	MANGANESE	30	30	48	1200	3.1	4.4	0.03	0.04	mg/Kg
SW	N	E200.7	SW3050	MANGANESE	8	8	28	17000	15	15	0.33	0.33	ug/L
WG	N	E200.7	SW3050	MANGANESE	9	9	98	17000	15	15	0.33	0.33	ug/L
WATER	LB	E200.7	FLDFLT	MANGANESE, DISSOLVED	3	1	7.69	7.69	15	15	0.33	0.33	ug/L
WG	N	E200.7	FLDFLT	MANGANESE, DISSOLVED	9	9	94	18000	15	15	0.33	0.33	ug/L
WQ	EB1	E200.7	SW3050	NICKEL	4	2	1.6	2	40	40	0.93	0.93	ug/L
RK	N	E200.7	SW3050	NICKEL	6	6	0.69	2.5	8	8.2	0.09	0.09	mg/Kg
SB	N	E200.7	SW3050	NICKEL	13	13	0.77	40	8.6	12	0.1	0.13	mg/Kg
SD	N	E200.7	SW3050	NICKEL	8	8	0.5	4.5	12	42	0.14	0.49	mg/Kg
SS	N	E200.7	SW3050	NICKEL	30	30	0.67	31	8.3	12	0.09	0.14	mg/Kg
SW	N	E200.7	SW3050	NICKEL	8	8	3.1	61	40	40	0.93	0.93	ug/L
WG	N	E200.7	SW3050	NICKEL	9	9	1.8	19	40	40	0.93	0.93	ug/L
WG	N	E200.7	FLDFLT	NICKEL, DISSOLVED	9	9	1.8	12	40	40	0.93	0.93	ug/L
WQ	EB1	E200.7	SW3050	POTASSIUM	4	2	170	230	5000	5000	30	30	ug/L
WATER	LB	E200.7	SW3050	POTASSIUM	4	1	144	144	5000	5000	30	30	ug/L
RK	N	E200.7	SW3050	POTASSIUM	6	6	170	530	1000	1020	3	3.1	mg/Kg
SB	N	E200.7	SW3050	POTASSIUM	13	13	500	1600	1070	1440	3.2	4.3	mg/Kg
SD	N	E200.7	SW3050	POTASSIUM	8	8	1300	5600	1500	5290	4.5	16	mg/Kg
SS	N	E200.7	SW3050	POTASSIUM	30	30	380	1700	1040	1480	3.1	4.4	mg/Kg
SW	N	E200.7	SW3050	POTASSIUM	8	8	580000	6300000	5000	5000	300	600	ug/L
WG	N	E200.7	SW3050	POTASSIUM	9	9	2000	700000	5000	5000	30	30	ug/L
WATER	LB	E200.7	FLDFLT	POTASSIUM, DISSOLVED	3	1	144	144	5000	5000	30	30	ug/L
WG	N	E200.7	FLDFLT	POTASSIUM, DISSOLVED	9	9	2000	720000	5000	5000	30	30	ug/L
WQ	EB1	E200.7	SW3050	SODIUM	4	2	310	5100	5000	5000	200	200	ug/L
SOIL	LB	E200.7	SW3050	SODIUM	7	2	108	108	1000	1000	20	20	mg/Kg
WATER	LB	E200.7	SW3050	SODIUM	4	1	4240	4240	5000	5000	200	200	ug/L
RK	N	E200.7	SW3050	SODIUM	6	6	54	670	1000	1020	20	20	mg/Kg
SB	N	E200.7	SW3050	SODIUM	13	13	81	6300	1070	1410	21	29	mg/Kg
SD	N	E200.7	SW3050	SODIUM	8	8	7800	69000	1500	5300	30	110	mg/Kg
SS	N	E200.7	SW3050	SODIUM	30	30	25	4000	1040	1480	21	30	mg/Kg
SW	N	E200.7	SW3050	SODIUM	9	9	5000000	65000000	5000	5000	200	4000	ug/L
WG	N	E200.7	SW3050	SODIUM	9	9	130000	12000000	5000	5000	200	4000	ug/L
WATER	LB	E200.7	FLDFLT	SODIUM, DISSOLVED	3	2	761	4240	5000	5000	200	200	ug/L
WG	N	E200.7	FLDFLT	SODIUM, DISSOLVED	9	9	130000	12000000	5000	100000	200	4000	ug/L
WQ	AB1	E200.7	SW3050	THALLIUM	1	1	7.7	7.7	10	10	3.4	3.4	ug/L
WQ	EB1	E200.7	SW3050	THALLIUM	4	2	5.6	6.2	10	10	3.4	3.4	ug/L
WATER	LB	E200.7	SW3050	THALLIUM	4	3	6.74	7.4	10	10	3.4	3.4	ug/L
SS	N	E200.7	SW3050	THALLIUM	30	3	0.45	0.67	2.1	3	0.35	0.5	mg/Kg
SW	N	E200.7	SW3050	THALLIUM	8	4	3.4	9.7	10	13.6	3.4	13.6	ug/L
WG	N	E200.7	SW3050	THALLIUM	9	8	4.8	18	10	10	3.4	3.4	ug/L

Appendix I-9 - Contrast Between Detections in Field Samples and Blanks in Common Elements

Matrix	Type	Analytical Method	Prep Method	Parameter	Number Analyzed	Number Detected	Min Detected	Max Detected	Min RL	Max RL	Min DL	Max DL	Units
WATER	LB	E200.7	FLDFLT	THALLIUM, DISSOLVED	3	1	6.74	6.74	10	10	3.4	3.4	ug/L
WG	N	E200.7	FLDFLT	THALLIUM, DISSOLVED	9	8	5.1	16	10	10	3.4	3.4	ug/L
WQ	AB1	E200.7	SW3050	ZINC	1	1	24	24	20	20	5	5	ug/L
WQ	EB1	E200.7	SW3050	ZINC	4	2	11	79	20	20	5	5	ug/L
SOIL	LB	E200.7	SW3050	ZINC	7	1	1.6	1.6	4	4	0.5	0.5	mg/Kg
RK	N	E200.7	SW3050	ZINC	6	6	12	43	4	4.1	0.5	0.51	mg/Kg
SB	N	E200.7	SW3050	ZINC	13	13	3.5	36	4.3	5.8	0.54	0.72	mg/Kg
SD	N	E200.7	SW3050	ZINC	8	8	4.9	55	6	21	0.75	2.6	mg/Kg
SS	N	E200.7	SW3050	ZINC	30	30	6	71	4.2	5.9	0.52	0.74	mg/Kg
SW	N	E200.7	SW3050	ZINC	8	4	470	1600	20	20	5	20	ug/L
WG	N	E200.7	SW3050	ZINC	9	5	8.4	1300	20	20	5	20	ug/L
WG	N	E200.7	FLDFLT	ZINC, DISSOLVED	9	4	5.6	15	20	20	5	20	ug/L

Table 1 - Number of Samples Collected by Matrix, Method, and Type

Matrix	Analytical Method	Preparation Method	N	FD	AB	EB
WG	E200.7	FLDFLT	7	2		
RK	E200.7	SW3050	6			
SB	E200.7	SW3050	11	2		
SD	E200.7	SW3050	6	2		
SS	E200.7	SW3050	26	4		
SW	E200.7	SW3050	6	2		
WG	E200.7	SW3050	7	2	1	4
WG	E245.2	FLDFLT	7	2		
SW	E245.2	METHOD	6	2		
WG	E245.2	METHOD	7	2	1	4
RK	E245.5	METHOD	6			
SB	E245.5	METHOD	11	2		
SD	E245.5	METHOD	6	2		
SS	E245.5	METHOD	26	4		

Table 2 - Frequency of L ,ction in Blank Samples

Matrix	Type	Analytical Method	Prep Method	Parameter	Number Analyzed	Number Detected	Min Detected	Max Detected	Min RL	Max RL	Min DL	Max DL	Units
WQ	EB1	E200.7	SW3050	BARIUM	4	1	1.7	1.7	200	200	0.13	0.13	ug/L
SOIL	LB	E200.7	SW3050	CALCIUM	7	1	33	33	1000	1000	2.8	2.8	mg/Kg
WATER	LB	E200.7	SW3050	CALCIUM	4	2	134	292	5000	5000	28	28	ug/L
WQ	EB1	E200.7	SW3050	CALCIUM	4	3	180	570	5000	5000	28	28	ug/L
WATER	LB	E200.7	FLDFLT	CALCIUM, DISSOLVED	3	1	292	292	5000	5000	28	28	ug/L
WQ	AB1	E200.7	SW3050	CHROMIUM, TOTAL	1	1	7.8	7.8	10	10	0.87	0.87	ug/L
WQ	EB1	E200.7	SW3050	CHROMIUM, TOTAL	4	1	3.2	3.2	10	10	0.87	0.87	ug/L
WQ	EB1	E200.7	SW3050	COPPER	4	1	3.3	3.3	25	25	0.8	0.8	ug/L
WATER	LB	E200.7	SW3050	IRON	4	1	70	70	100	100	25	25	ug/L
WQ	EB1	E200.7	SW3050	IRON	4	1	220	220	100	100	25	25	ug/L
SOIL	LB	E200.7	SW3050	MAGNESIUM	7	2	11	11	1000	1000	0.13	1.3	mg/Kg
WATER	LB	E200.7	SW3050	MAGNESIUM	4	1	468	468	5000	5000	13	13	ug/L
WQ	EB1	E200.7	SW3050	MAGNESIUM	4	2	49	550	5000	5000	13	13	ug/L
WATER	LB	E200.7	FLDFLT	MAGNESIUM, DISSOLVED	3	2	108	468	5000	5000	13	13	ug/L
WATER	LB	E200.7	SW3050	MANGANESE	4	1	7.69	7.69	15	15	0.33	0.33	ug/L
WQ	EB1	E200.7	SW3050	MANGANESE	4	2	3.3	4.5	15	15	0.33	0.33	ug/L
WATER	LB	E200.7	FLDFLT	MANGANESE, DISSOLVED	3	1	7.69	7.69	15	15	0.33	0.33	ug/L
WQ	EB1	E200.7	SW3050	NICKEL	4	2	1.6	2	40	40	0.93	0.93	ug/L
WATER	LB	E200.7	SW3050	POTASSIUM	4	1	144	144	5000	5000	30	30	ug/L
WQ	EB1	E200.7	SW3050	POTASSIUM	4	2	170	230	5000	5000	30	30	ug/L
WATER	LB	E200.7	FLDFLT	POTASSIUM, DISSOLVED	3	1	144	144	5000	5000	30	30	ug/L
SOIL	LB	E200.7	SW3050	SODIUM	7	2	108	108	1000	1000	20	20	mg/Kg
WATER	LB	E200.7	SW3050	SODIUM	4	1	4240	4240	5000	5000	200	200	ug/L
WQ	EB1	E200.7	SW3050	SODIUM	4	2	310	5100	5000	5000	200	200	ug/L
WATER	LB	E200.7	FLDFLT	SODIUM, DISSOLVED	3	2	761	4240	5000	5000	200	200	ug/L
WATER	LB	E200.7	SW3050	THALLIUM	4	3	6.74	7.4	10	10	3.4	3.4	ug/L
WQ	AB1	E200.7	SW3050	THALLIUM	1	1	7.7	7.7	10	10	3.4	3.4	ug/L
WQ	EB1	E200.7	SW3050	THALLIUM	4	2	5.6	6.2	10	10	3.4	3.4	ug/L
WATER	LB	E200.7	FLDFLT	THALLIUM, DISSOLVED	3	1	6.74	6.74	10	10	3.4	3.4	ug/L
SOIL	LB	E200.7	SW3050	ZINC	7	1	1.6	1.6	4	4	0.5	0.5	mg/Kg
WQ	AB1	E200.7	SW3050	ZINC	1	1	24	24	20	20	5	5	ug/L
WQ	EB1	E200.7	SW3050	ZINC	4	2	11	79	20	20	5	5	ug/L

Table 3

Code and Definition

Code	Definition
TN	Tune
BS	Blank Spike/LCS
IS	Internal Standard
MS	Matrix Spike and/or Matrix Spike Duplicate Recovery
MD	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source
SD	Serial Dilution
SS	Spiked Surrogate
LR	Analyte present above linear (or calibration) range
IC	Initial Calibration
CC	Continuing Calibration Verification
PD	Pesticide Degradation
LD	Lab Duplicate
2C	Second Column (Confirmation)
HT	Holding Time
PS	Post Spike
BL	Blank
RE	Re-extraction
DL	Dilution
IB	In Between
FD	Field Duplicate
OT	Other

Summary of Conference Call on Resolving Background Report Comments

PREPARED FOR: CERCLA Technical Committee (CTC)

PREPARED BY: Vijaya Mylavarapu/CH2M HILL

COPIES: Yarissa Martínez/PREQB, Marian Olsen/EPA, Region II, Ted Henry/TAPP, Dale Weiss/TRC

DATE:

A conference call was held on May 28, 2002, to discuss comments made regarding the *Draft Soil, Groundwater, Surface Water and Sediment Background Investigation Report* (herein referred to as "Background Report"), dated June 2001. This Technical Memorandum (TM) serves to summarize the discussions held during the conference call, and to present the action items that were proposed by the Background Technical Subcommittee. The purpose of this TM is also to inform the CERCLA Technical Committee (CTC) of the solutions proposed by the various agencies to enable closure of the Background Report. These proposed solutions are identified as the action items below.

The anticipated purpose/outcome of the discussions held during the conference call is for the CTC to be able to determine the feasibility and applicability of the action items proposed by the Background Technical Subcommittee for the closure of the Background Report, and to arrive at a final decision and recommendation for the most appropriate "path forward."

In attendance during the conference call were:

Dale Weiss/TRC Inc.
Tracy Kauffman/TRC Inc.
Vijaya Mylavarapu/CH2M HILL
Marty Clasen/CH2M HILL
Ted Henry/TAPP
Aimee Houghton/CPEO
Marian Olsen/EPA, Region II
Yarissa Martínez/PREQB

The call took place on May 28th, from 8:30 AM to 12:00 PM. The format for the comment discussion was decided based on consensus among the group of participants. It was decided that individual set of comments would be discussed by the team. The following summary reflects the order in which each set of comments was discussed. The action items that were identified during the call are listed below, as well as comments by various agency representatives and responses to the comments that were addressed during the call. An attachment is provided at the end of this TM which serves as the summary of responses from the CTC regarding the action items identified by the Technical Subcommittee during the conference call.

Action Items Identified During the Call

1) A visit to the site by agency representatives was suggested by the Background Technical Subcommittee.

2) The review team (primarily TRC and TAPP) expressed the potential need for additional sampling and organic chemicals analysis of selected background soil sample locations following the site visit, if any of the previously collected sample locations are identified as having been impacted by Navy operations.

3) It was suggested that better figures are provided prior to the site visit, and to use aerial study photos for better scale/resolution and overlay Preliminary Assessment/Site Investigation (PA/SI) sites areas with background sampling locations. It was also suggested that these be inserted as an appendix to the revised report.

4) The 95-percent UTL (UTL_{95}) values should be replaced with updated values that default to the maximum concentration if the estimated value is greater than the maximum. It was also suggested that a set of UCL_{95} values be added to these tables.

5) The Background Report should be revised accordingly to address the responses submitted to EPA, as well as the to incorporate changes to address all other comments resulting from discussions with the technical subcommittee team, as presented during the conference call.

6) An appendix will be added to the Background Report that will include a complete set of all comments and response to the comments.

PREQB Comments from TRC Inc. (Forwarded by Mr. Don Elliott)

First Set of TRC Inc. Comments:

1) The first PREQB comment from TRC that was forwarded by Mr. Don Elliott proposed the collection of filtered surface water samples for use in ecological risk assessments. It was stated that the purpose of the collection of background surface water samples was meant for general purposes (i.e., to be used for comparison against site characterization samples in order to determine if the inorganic chemicals detected in total analysis of surface water are part of the background or are due to site activities).

   It was also clarified that, based on site-specific sampling needs, additional samples will be collected for ecological evaluations at a future time, when such need is identified for a surface water body. A filtered sample set is not proposed at this time as part of this existing report. Any additional background sampling needs that are identified at a future time will be addressed and decisions regarding background levels will be evaluated as appropriate on a site-specific basis. Thus, the background values that are proposed in the Background Report are general representatives of the background conditions around the NASD area of Vieques.

   As part of the comments regarding sampling locations, the team indicated that Lagoona Kiani must be closely evaluated before accepting the data as representative of background levels. This is because Solid Waste Management Unit (SWMU) 6 is in close proximity to the two samples that are included in the background. CH2M HILL

indicated that there were errors in the current Figure 2-1 contained in the Background Report. The two sediment and surface water samples within Lagoon Kiani, close to SWMU 6, were not included as part of the background data set in the report. This error will be corrected during revision of the Background Report.

2) The second comment from TRC indicated that it was unclear to the reviewer what background values will actually be used for comparison against the site data. CH2M HILL responded that UTL_{95} estimates would be used as the representative background values. The text in the Background Report will be edited to more clearly state what background values will be used for comparison.

3) The third comment from TRC indicated that because organic chemicals were not analyzed at each of the background soil samples, it is difficult to determine if they represent unimpacted soils. The uncertainty about the location of the samples was reaffirmed by TAPP in its comments as well as during the conference call. The concern about locations included the possibility of human access to these remote sample locations and the collection of samples from roadways impacted by traffic and Navy activities. During the conference call, CH2M HILL clarified that samples were collected in locations away from any human activity areas or roadways. It was reaffirmed by EPA that several of the original proposed sampling locations in the work plan were moved by EPA in order to be farther away from any roadways; EPA also used historical aerial survey results in determining the areas for sampling. It was discussed by the team that a site visit by agency representatives will provide a better feel for sampling locations, raise the comfort level, and provide a chance to observe the conditions of the lagoons sampled for background. TAPP and TRC also proposed the use of better photographs to clarify background sampling locations for the reviewer and visits to the sites in order to gain a better feel for the area and the vegetative cover described by CH2M HILL.

4) The last comment by TRC, which questioned the detection limits of metals compared to the Preliminary Remediation Goals (PRGs), was determined to be a non-issue by TRC as well as the team, since the analytical procedures followed are according to existing protocols recommended by the EPA.

Second Set of TRC Comments:

1) The first comment was resolved during the meeting held in Puerto Rico during May, as rock samples were not combined with soil samples in the background data analysis.

2) The second comment addressed the issue of the UTL_{95} value exceeding the maximum concentration in the tables. During the discussion, CH2M HILL proposed using the maximum concentration as the UTL_{95}value if the estimated UTL_{95}value is greater than maximum detected concentration. The tables in the Background Report will be revised accordingly.

   Some of the UTL_{95}values are based on half of the detection limit value of non-detects, which are included in the event that the detection limits are altered. The team agreed to keep them as they are. TAPP wanted clarification on the variability in the number of samples between surface soil and subsurface soil samples. The rationale that was presented by CH2M HILL was that subsurface soil is typically less impacted than surface soil, and thus fewer subsurface soil samples will be collected from sites for

comparison. Also, when statistical differences between surface and subsurface soils are not present, the data are typically pooled, as is the case for this set of background data. EPA clarified that their hydrogeologist reviewed the number of samples proposed, and felt that number of proposed samples for background soils was appropriate.

3) The third comment questioned that dissolved metals concentrations were greater than total metals concentrations. The results could be analytical artifacts. The text in the report will be edited to acknowledge that dissolved metals were sometimes higher than total metals levels in the groundwater samples.

4) The fourth comment addressed the concern that the number of surface water, sediment, and groundwater samples was much lower than the number of soil samples. It was clarified that this is not uncommon. There are very few surface water bodies within the NASD area of the island suitable for background sampling. The two lagoons identified were sampled. Groundwater was sampled from four existing wells, and from two new wells installed in each type of geological unit, resulting in a total of eight wells. Depending on the need identified during site-specific investigations, additional data may be collected. No changes will be made to the Background Report data at this time.

5) TRC decided not to discuss comments 5 through 10, as they were not considered relevant to the decision on hand that was to be made regarding the Background Report. However, a general response to these comments will be included in the Background Report.

EPA Comments

1) The responses to EPA's comments were submitted to the team, and TAPP indicated that their representatives had reviewed the comment responses. EPA indicated that it had also reviewed the responses to comments and will provide a formal response to the submitted comment responses.

2) As agreed to in the responses to comments, the revised Background Report will include a set of UCL_{95} values in the tables. In addition, and as recommended by EPA in their comments, additional statistical tests will be conducted during site data comparisons with background as per the guidance from EPA as needed during site data comparisons. This text will be clarified in the revised report. The TAPP representative requested that the UCL_{95} values be distributed, as they become available, prior to formal report finalization.

3) The flowchart has been corrected and the correct flowchart was submitted to EPA with comment responses, which will be included in the revised Background Report.

4) EPA's comment on possible outlier presence in background lead concentration data at a maximum of 13 milligram per kilogram (mg/kg) is well below any health-based concentrations or ecological criteria for soils, and it is not a significant concentration. The sample where this maximum lead is detected is from a remote sampling area, no other elevated metals were detected in this sample, thus lead is not very significant, and possibly represents internal concentration variability in solid media, i.e. soils. CH2M HILL proposed to retain this detection lead, though it is statistically identified as a potential outlier, because the actual value at the detected concentration is not indicative

of significant contamination, and it is not at levels that are a human health or ecological exposure concern.

TAPP Comments

November 2001 Comments

1) Several of the general comments from TAPP were addressed during the above discussions of TRC and EPA comments.

2) During the call, CH2M HILL discussed a general grouping based on the nature of the comments. There were approximately 16 comments (not numbered by the reviewer) and 7 to 8 of them questioned whether the sampling locations represented unimpacted background. TAPP would like to see aerial photographs overlain with sample locations to aid in determining whether background locations are truly representative of unimpacted areas. A site walk-through is suggested to raise the comfort level regarding the background sampling locations representing unimpacted conditions.

3) It was stated that the TAPP recognizes the need for Navy to proceed with the ongoing reports, such as those addressing the 10 sites that are being evaluated for No Further Action (NFA) status. The report that is being prepared and is scheduled to be sent out at the end of July was discussed, and it was indicated that this report utilizes the existing background data. TAPP and the team realized that the work will progress using the background data presented in this Background Report.

4) Comment 1 from the set of the November 2001comments from TAPP indicates the need for clearer figures. As discussed in other comments from TRC that are presented above, additional figures are suggested by TAPP and TRC to be added as an appendix with aerial survey photos overlain with sample locations.

5) TAPP representatives inquired as to who the reviewers for the background sampling work plan were. It was mentioned by CH2M HILL that a copy of the work plan was provided to all agencies involved at the time, including EQB and EPA. Only EPA provided feedback on the work plan. Thus, EPA participated in meetings looking at sampling locations, and selecting sample numbers etc, prior to finalization of the work plan for background study.

6) The U.S. Geological Survey (USGS) data were provided to TAPP and the rest of the technical team for review prior to the call, to confirm that it had high detection limits and groundwater data collected by USGS are unusable with the current groundwater well data. On the call TAPP and the team agreed that to be the case.

7) TAPP requested more information regarding groundwater flow, and CH2M HILL explained that groundwater at the NASD follows general topographic features, flowing from higher geographic elevations to lower elevations, and ultimately to the ocean. TAPP requested more discussions be held on groundwater hydrology.

8) TAPP expressed concern about possible impacts from vehicle emissions resulting in elevated lead concentrations in soil along the roadways. It was clarified that vehicle exhaust emissions tend to uniformly elevate lead concentrations, due to air-borne dispersion/deposition, whereas only one soil data point had isolated lead detection at a

maximum of 13 mg/kg, which is sporadic and limited to one sample. Additionally, the remote roads near the sampled areas do not have routine or heavy traffic. Thus, such a scenario is not applicable to the observed lead concentration. Ch2M HILL proposed to keep this detection, because it could be representative of internal variability in the solid media (e.g., soil)

9) TAPP and Mr. Cruz-Pérez requested that the team look at the background data from other islands near Vieques as possible representative background values. The Technical Subcommittee has been provided with a table containing background data from Puerto Rico and the eastern U.S., which was reproduced from the Agency for Toxic Substances and Disease Registry (ATSDR) public health assessment document, prior to the call. During the conference call, EPA indicated that for Superfund sites they recommend sampling from the same base from unimpacted areas. TRC said off-island samples may reflect different hydrogeological conditions and may not be applicable as background values for Vieques. TAPP felt based on experience at other bases, it is sometimes not appropriate to collect samples from the same base. EQB proposed a tour of the site to be able to use existing background data. CH2M HILL concluded that from available background data from ATSDR, all other sources indicate higher levels of background inorganic concentrations in soil. Therefore, the team will not be actively looking for other off-island background data. However, if it is provided by any member of the team at a future time, it will be considered for its applicability to Vieques. The team agreed to the suggested path forward.

10) TAPP expressed concern regarding maximum detected copper in the surface water and how it will be used for decision-making. It was proposed by CH2M HILL that the Background Report text be edited to indicate that some of the copper detections were high in the background surface water samples, and site-specific detections of copper in surface water should be carefully evaluated, prior to disregarding it as a true contamination.

April 2002 Comments

1) The tiered approach was discussed by TAPP at the May meeting in Puerto Rico, and was included in this set of comments discussed on the call. TAPP suggested using the current data from the background report as the first phase of investigation. Additional phases included obtaining data from other islands and collecting additional background data as Phase II. During the call it was discussed and decided by the team to not look for background data from off-island locations. Additional background samples may be collected as needed for soils, groundwater, surface water, and sediments. A formal step-by-step tiered approach was not adapted for this project.

2) Sampling locations were questioned, and it was proposed that aerial photos be looked at that are part of an EBS report (preferably on CD-ROM). CH2M HILL indicated that the report is available on the website. TAPP would like a site walk-through to ensure that the sampling locations represent unimpacted background conditions. When vegetation and access limitations were described by CH2M HILL, TAPP and TRC indicated they would like to have a walk-through to determine whether background samples truly reflect unimpacted areas. If such visit were to take place, it was requested that the team

pick a couple of sample locations for site visits, however TAPP prefers to visit all of the sample locations.

3) CPEO indicated that EQB had special concerns about the sampling locations and number of samples. CH2M HILL indicated that if CPEO was referring to the comments made by the commissioner's representative, Mr. Cruz-Pérez, they were discussed and resolved with him during the May CTC meeting.

4) TAPP commented on the variation in the sample depths from sample to sample. CH2M HILL clarified that the depths varied depending where rock is encountered in the subsurface, and thus sampling depth varied slightly from location to location, differing slightly from what was proposed in the work plan. TAPP recommended adding such information in a footnote to the table.

5) TAPP had concerns regarding two of the sediment samples. These two sediment samples, which are included in Figure 2-1 as near SWMU 6, were not included in the background data set, and the figure will be corrected in the revised report.

6) CPEO indicated that the community might be concerned about the levels of inorganic chemicals in groundwater. The question was asked of what should the community be told? CH2M HILL suggested clarifying to the community that metals are naturally occurring in all environmental media, including soil, groundwater, surface water, and sediments. With few exceptions such as copper in surface water, the levels of inorganic chemicals in media collected at Vieques are lower than those reported for media from Puerto Rico or the U.S.

7) TAPP indicated that other specific comment discussion was not necessary based on the information discussed thus far on the call.

Comments by the Commissioner's Office (Mr. Rafael Cruz-Pérez)

Comments from the Commisioner's office by Mr. Rafael Cruz-Perez were briefly discussed. Mr. Cruz-Perez indicated during the May CTC meeting that if we remove the word *natural* in reference to "background" from the report, he indicated that all of his comments would be resolved. CH2M HILL proposed to Mr. Cruz-Perez that during revision of the report we would ensure that none of the background discussions would refer to the background as *natural* background.

The team requested that a response to comments be prepared and added to the revised report.

Miscellaneous Topics for Technical Committee Discussion

1) Aimee Houghton suggested the use of clearer maps presented in larger size at TRC meetings in order to help community members relate to the site better.

2) TAPP requested additional groundwater discussions be held to enable a better understanding of the hydrogeology at NASD. TAPP was provided with Marty Clasen as the point of contact for any specific questions on the subject.

3) TAPP and TRC felt that a future risk assessment approach committee should be identified, and the approach to risk assessment be discussed in the near future, perhaps in a similar committee format.

4) EQB requested information on the background training workshop that was attended by CH2M HILL last August.

Background Investigation at NASD - Comment Review and Resolution Task Committee

PREPARED FOR: Technical Committee – Background Investigation Report, NASD, Vieques

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Bob Wing/EPA

DATE: May 15, 2002

This memorandum is prepared to provide an introduction to the purpose and mission of the task committee and propose a conference call to discuss technical issues included in comments from various agencies/interested parties. The task committee was identified at May 2002 NASD TAC team meeting. The purpose of the technical committee is to resolve background report related comments and propose a path forward to the NASD TAC Team. The outcome of the committee discussion will be prepared as a recommendations memorandum to the NASD TAC team. The scheduled deadline for this recommendations memorandum is June 14, 2002.

Mission statement for the Committee:

Technical experts representing the stakeholders (i.e., Navy, EQB, EPA and the TRC Community) will resolve issues and make recommendations to core team regarding the established background levels in accordance with applicable EPA guidance for the former NASD. The subgroup will use the current background investigation as the frame work. The work of the subgroup will be equally distributed among the membership. They will produce a brief report of their recommendation to the core team, by June 15, 2002.

The committee members *(listed according to alphabetical order of last names):*
Ted Henry, TAPP Consultant, - Technical Representative of the TRC Community
Yarissa Martinez, EQB-PR – Technical Overseer of EQB
Vijaya Mylavarapu, CH2M HILL – Technical Representative of Navy – *(also, Coordinator for this task team)*
Marianne Olsen, US EPA Region II – Technical Representative of EPA
Dale Weiss, TRC – Technical Representative of EQB

Committee Purpose, Project History and Summary

As stated above, the main purpose of this sub-committee is to resolve the comments from various interested parties on the background document and propose a path-forward to the NASD TAC team, in a memorandum. The team needs to review the comments listed below, attached in separate files, and discuss among the memebers, so we can propose a resolution. Based on the outcome, the Background Investigation document may be revised, as needed.

The *draft Soil, Groundwater, Surface water, and Sediment Background Investigation Report*, U.S. Naval Ammunition Support Detachment (NASD), Vieques Island, Puerto Rico, June 2001, was submitted to various parties for review. The approach taken for sampling, and proposed sampling locations were discussed with the project team in a meeting (included agencies and other parties) as part of Work Plan rview session, prior to conducting field work and preparation of this report.

The purpose of the background document was to establish background levels to support IR program. Specifically, the background levels established through this sampling and investigation report will be used for comparisons with site concentrations - to determine on a site-specific basis, if site related sample results for chemicals are from releases at the site due to current or historical activities involving hazardous waste materials. The background sampling, analysis and statistical methods followed are in accordance with existing EPA guidance. Section 4 included tables with background values (Tables 4-2 through 4-6) with background statistical estimates (UTL95%) for point comparisons. As and when needed, (e.g., if a point estimnate for background exceeded site concentration) a full statistical (population) comparison tests will be conducted according to EPA guidance, and as recommended in the EPA review comments received, to determine if a site chemical concentration is significantly different from background levels. Please review comments with this purpose as the primary goal for the background investigation report.

Comments List

Navy has received comments on the background investigation reprot from various parties, and some agencies have 2 sets of comments as listed below. The comments included for our discussion are:

1) EPA comments reviewed by Dr. Singh for Region 4 (includes responses submitted to EPA)
2) EQB: 2a) – from Mr. Don Elliott – EQB attorney and 2b) from TRC – EQB consultants
3) TAPP: Two sets from Mr. Ted Henry 3a) Dated November 2001, and 3b) Dated January 2002
4) Commissioner's office – by Mr. Rafael Cruz Perez – Consultant to Commissioner

Thus, there are a total of 6 sets of comments. Of these the last set above (from Mr. Cruz-Perez) have been discussed and resolved with the author during this month's team meeting in Puerto Rico, and may not require extensive discussions. They are provided for your files, however, a formal response will be prepared by Navy for these comments.

Schedule(s)

Conference Call 8:30 to 12:30 AM on May 28th (Tuesday), 2002

Follow-up Conference call – As needed

Memorandum Summary - June 14th, 2002

Final Observation/Comment

As we all know, administratively this is a very complex project, and the TAC team decided that this technical team and such future teams may provide a means of resolving technical issues. This is a test case to find out if this can work, and **we are the pioneers**. I feel it is our challenge to make this work, so the TAC team can rely on similar approach for resolution of future technical impasse items by similar means. I am looking forward to working with each of you to provide a successful outcome of meeting set goals for this team.

Response To EPA Comments on Draft Soil, Groundwater, Surface Water and Sediment Background Investigation Report

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EPA Comment 1

Overall, the statistical methodologies (e.g., normality/lognormality tests, Analysis of Variance tests, UTL computation methods) used by the Navy to determine background level constituent concentrations at the NASD facility appear to be adequate and comply with the procedures described in EPA guidance documents.

It is noted that Navy has proposed the use of tolerance interval approach to determine background level contaminant concentrations. Use of 95% upper tolerance limits (UTLs) has been proposed to compute the background level contaminant concentrations in groundwater. However, in this approach, even a single exceedance of background UTL by onsite (e.g., monitoring well) data is considered as an indication of contamination due to site activities (EPA 1989, page 5-22). It is desirable that Navy uses this approach consistently. On page 4-15 of the NASD draft report, it is stated that, "these additional comparisons should be used for future analysis when a 95% UTL based background value is exceeded for a specific site." Once a background 95% UTL is exceeded by onsite data, it should be considered as evidence of contamination due to site activities. This may be verified by taking additional onsite samples from locations exhibiting concentrations in exceedence of background upper tolerance limits.

Response Comment 1:

Comment noted. The site versus background data evaluations will be consistent with the existing EPA guidance for background evaluations.

The referenced text from the RCRA Groundwater Monitoring Guidance for RCRA Facilities indicates that once a tolerance interval is established for background groundwater, any site concentrations falling outside this upper-bound percentile range can be considered site related. Also, note that the RCRA facility monitoring guidance has strict guidelines as to where to place the wells and how often data should be collected (multiple rounds of sampling). When evaluating background it is more difficult to match natural conditions between all sites with one set of background soil data, and groundwater data with one round of sampling may not be representative of groundwater concentration trends. These are just practical limitations in applying a statistical guidance as a strict rule. As previously mentioned, all the data analysis will follow the most current statistical evaluation guidance. The need for additional sampling will be determined on a case specific basis, depending on how high the elevated concentration is, whether other statistical test procedures indicate significant different between site and background data, and whether the exceedance indicates human health or ecological impacts etc.. Any additional sampling will not be based only on an evaluation of statistical upper tolerance limits, as suggested by the comment. This approach will be consistent for all the media, and sites across the base.

EPA Comment 2:

In Section 4 (page 4-1), five criteria are listed to determine the similarity (not defined) between the background and onsite data distributions. It should be noted that the number of data points in the background dataset and the onsite data set need not be similar to test the similarity (or equality) of distributions (e.g., in terms of general shape, mean, standard deviation, median etc.) of two or more datasets. Also for this type of data distribution, comparison, the frequency of non-detects need not be the same for the two datasets.

Response Comment 2:

The Navy agrees with the comment in principle. However, the point refers to - if the background data set is much smaller (e.g., n=10) than site data (e.g., n>50), population comparisons become irrelevant. If the distributions are similar it may not matter (e.g., both are normally distributed). However, if one data set for a parameter indicates a lognormal distribution and the other parameters indicates a non-parametric distribution, it could be due to the large variation in the number of samples between the two data sets. Thus high variance in number of samples between data sets do matter in the data comparisons between background and site data.

EPA Comment 3:

Furthermore, depending upon data distributions other more powerful procedures such as the t-test, Mann-Whitney test, and the ANOVA Kruskal and Wallis test should also be used to test the similarity (equality) of the distributions of two (background versus onsite) or more data sets.

Response Comment 3:

The Navy agrees with this comment. Following newer background guidance, populations will be compared using one or more of the listed tests, as appropriate, based on the chemical concentrations and their distributions, to determine if site concentrations are different from background in identifying contaminated areas.

EPA Comment 4:

Other measures (as mentioned in Section 4.3, page 4-15) such as a 95% upper confidence limit (UCL) of the mean concentration should be included in the list (given on page 4-1) to test the similarity between background and onsite data distributions. If the UCL of onsite data exceeds the UCL of background distribution, there is evidence that onsite contaminant mean concentration is higher than that of the background distribution.

Response Comment 4:

Page 4-1 has been revised to include the 95% upper confidence limit (UCL) of the mean concentration.

EPA Comment 5:

In the flow chart given in Figure 4-1, it is stated that lognormality test would be performed on normally distributed data sets. Test of normality should precede the lognormality test. If a data set passes the normality test, then UTL and all other statistics should be computed

using a normal distribution. Whenever possible, for interpretation purposes, it is desirable to compute relevant statistics using untransformed data.

Response Comment 5*:*

The error has been corrected in the flow chart to indicate that normally distributed data will proceed to the UTL calculation directly.

EPA Comment 6:

Box plot represents a good qualitative exploratory tool to compare two or more data distributions, and also to identify outliers. In general, no apparent outlying observations can be seen in the box plots as given in Appendix F of the NASD report. However, there are a few graphs where some observations can be considered as outlying (e.g., Pb in surface soil - soil type QA, and Mg in surface soil - type QS). Since, the background sampling locations have been selected from across the NASD facility, it should be verified that those elevated concentrations indeed represent the site background and are not influenced by site activities.

Response Comment 6:

The sampling locations (as indicted on Figure 2-1, QASS/SB05) are verified prior to inclusion in the data set to ensure no NASD operations have historically occurred at these sites. The nearest site is to the west about 500 to 600 feet, (an old power plant building) and had no known source of lead. The highest detected lead concentration at 13 mg/kg is well below any levels of concern or typically what is associated with source contributions (e.g., lead based paint or lead from ordnance) and may be indicative of natural internal variability for the soils on this island.

EPA Comment 6:

Appendix E2 (as mentioned on page 4 of appendix E) is missing. Also, it is stated in Appendix E (page 4) that the normality/lognormality test results are summarized in Appendix G, but the test results (e.g., p-values, W-statistics) of normality/lognormality tests for soils, rocks, sediments, and water are not given in any of the appendices. Also, appendix H does not have the distribution test results for rock and groundwater data as mentioned on page 7 of Appendix E.

Response Comment 6:

The references in the text have been corrected. The test results for distribution testing are very cumbersome and not usually presented. Only the procedure followed is listed in Appendix G, and results of the tests are indicted in the tables listed in Appendix E3 through E10. The text has been revised for clarification.

EPA Comment 7: (from Amelia Jackson on 7/20/01)

The data tables provided in Appendix I should be specifically referred to throughout Section 5 as nine different tables exist. It would clarify the information presented in the text to the correlating table.

Response Comment 7:

The DQE does refer to the Tables and Attachments in Appendix I repeatedly in the text in order to give the reader (user) a complete picture of the discussion. The draft Appendix I did not include all of the tables and attachments. Appendix I has been revised.

EPA Comment 8:

It is stated that Attachment A contains a list of the changes in data qualifiers that occurred due to the validation process. As this attachment was not provided, verify that Attachment A is consistent with the qualifier definitions provided in the text on page 5-3 and in Table 5-2.

Response Comment 8:

The DQE does refer to the Tables and Attachments in Appendix I repeatedly in the text in order to give the reader (user) a complete picture of the discussion. The draft Appendix I did not include all of the tables and attachments. Appendix I has been revised.

EPA Comment 9:

Appendix I-5 contains information regarding the Relative Percent Difference calculated between the original and duplicate sample concentrations. The matrix listed as "WS" on this table must be defined. In addition, verify that the RPD values associated to the samples designated as WS are correct as errors have been discovered during recalculation. This will also affect the precision of the overall data set as the prior RPD values reported as 200% were not included in the precision statements.

Response Comment 9:

The laboratory duplicate precision Table does not contain any WS matrix types. SW is surface water.
The standard RPD calculation was applied: ((ABS(X-Y))/((X+Y)/2)). The "200"is a default calculated number similar to that used in the CLP SOW which is used when one value is a non-detect and the duplicate is detected. The "200" is also used in the database for a pair of results where one or more value was rejected as it is unusable.
The text here should discuss the resultant qualifiers that are placed on data that have exceeded established RPD limits, In addition, the effect on data usability should also be provided.
From the DQE text:
"As Attachments D and E indicate, the majority of the accuracy and precision results for the combined background and NASD II main efforts were well within established criteria. Only 44 of 546 (8%) matrix spike measurements were outside criteria. Precision data indicate that 25 of 580 results were outside control limits. Attachment A lists data which were qualified for accuracy (MS) or precision (LD) deficiencies. These data indicate that the specific sample matrix did not greatly influence the overall analytical process or the final numerical sample result."
Additionally, as per Functional Guidelines, data outside precision criteria must be qualified as "estimated" (J/UJ). There is no other flagging option.

EPA Comment 10:

The text presented in this section which discusses the "Completeness" assessment of the data set should be revised as it currently provides information for acrolein. This sampling and analysis effort did not include organic compounds. As per the Introductory Section 5.1, metals were the only analytes of interest.

Response Comment 10:

Agreed. The following sentence has been deleted:

"Other than the 34 non-detected acrolein results rejected for poor continuing calibration statistics as previously mentioned, no other data were rejected."

EPA Comment 11:

If comparability between past and current data sets is desired, then the text presented in this section discussing "Comparability" should be amended to include information on the specific types of analytical methods, applied QA/QC and assessment tools previously used for data acquisition. It is insufficient to state that comparability is attained because "only EPA methods were used to analyze the sample and EPA Level III QC data are available to support the quality of the data."

Response Comment 11:

From the DQE memo:
"Comparability--is another qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix type, and analytical method. Comparability is limited by the other PARCC parameters because data sets can be compared with confidence only when precision and accuracy are known."….
A sub-section of the comparability is presented above. Sample collection and handling techniques were performed by the same project team as other Vieques NASD sites. The data supports that sampling handling techniques were sufficient as blank contamination in the field was at a minimum. The sample matrices were similar to the other NASD sites. And lastly, the lab was the same, the analytical methodologies were the same and were EPA approved methodologies. Analytical precision and accuracy and field duplicate precision very acceptable for all the NASD projects. This would seem to say that makes the data comparable to other data collected at the site.

Comments from EQB: 2a – from Don Elliott – attorney consultant for EQB

DRAFT

DRAFT SOIL, GROUNDWATER, SURFACE WATER, AND SEDIMENT BACKGROUND INVESTIGATION REPORT, FORMER U.S. NAVAL AMMUNITION SUPPORT DETACHMENT, VIEQUES ISLAND, PUERTO RICO, DATED JUNE 15, 2001

EQB request that the Navy take the following actions which are discussed in the more detailed comments below

- *In order to conduct ecological risk assessment, filtered surface water samples must be collected and analyzed as part of the Background Investigation.*
- *To provide a text summary of the conclusions, the actual background values for each media need to be presented.*
- *In the absence of non-organic data for the background samples, sample location information must be provided.*
- *Risk Assessment studies must incorporate those concentrations below background level but above applicable Preliminary Remediation Goals.*

MAJOR COMMENTS

1) Surface water samples for inorganic parameters do not appear to have been taken in compliance with EPA requirements because they were not filtered. The surface water background inorganic samples were not filtered in accordance with EPA 822-Z-99-001, April 1999, National Recommended Water Quality Criteria Correction. Thus, background concentrations developed for surface water are not usable for establishing background screening levels for ecological risk purposes. Moreover, the background values that were determined using total metal concentrations exceed established criteria (based on dissolved concentrations) used to evaluate toxic effects of aquatic wildlife.

   We recommend that new background surface water samples be collected and filtered to establish a dissolved background concentration and that all future surface water samples to be tested for inorganic parameters be filtered.

ADDITIONAL COMMENTS

2) The report does not identify actual background concentrations. The report contains a statistical analyses of all of the background sample contaminant concentrations and summary tables, but there is no summary of which values are intended to be used for determining "background" concentrations. Although Appendix E includes a rationale for how background values will be selected, the actual background concentrations are not identified in the report. Including the background concentrations determined by the investigation is important for clear understanding of what the baseline is.

   We recommend that the report be revised to include the actual background concentrations.

3) We could not determine whether representative samples were taken because the report does not provide sample location information or sample analysis for non-inorganic parameters. No detailed information was presented (e.g. maps, physical description of location, photos, etc.) regarding any of the background sampling locations to establish whether or not the areas sampled were contaminated. Furthermore, none of the samples were analyzed for non-inorganic parameters, making it impossible to determine whether or not the background samples were collected from uncontaminated areas. If the samples were not collected in remote areas, but rather from road sides and other areas impacted by site operations, they might not be truly representative of background conditions.

We recommend that the Navy confirm that representative samples were taken, and to revise

the report to including sample location information or sample analysis for non-inorganic parameters.

5) We could not determine if inorganic chemicals are present at unacceptable risk levels. Several of the soil background values exceed the Region IX Residential and or Industrial Preliminary Remediation Goals (PRG). PRGs are used to help identify contaminants of concern for a risk assessment; therefore, any concentrations above the PRG must be included in the Risk Assessment. The following background concentrations must be included in the Risk Assessment: surface soil background concentrations for aluminum, iron, manganese, thallium and vanadium that exceeded the residential PRG, surface soil background concentrations for aluminum and iron that exceeded the industrial PRG; subsurface soil background concentrations for aluminum, arsenic, iron, manganese and vanadium that exceeded the residential PRG; the subsurface soil background concentrations for aluminum and iron that exceeded the industrial PRG and the ground water background concentrations for antimony, barium, iron, manganese, thallium, vanadium and zinc that exceeded the PRG.

   The Risk Assessment must also note that the maximum reporting limits for antimony, arsenic, and thallium for soil and antimony for ground water exceeded the Region IX PRGs. Based on the elevated reporting limits for these constituents in the respective media, it is not possible to determine if these constituents are present at concentrations that might result in unacceptable risk levels.

   We recommend that inorganic chemicals present at concentrations below the associated background concentration but above the Preliminary Remediation Goals be included in the Risk Assessment.

Comments from EQB: 2b – from TRC – EQB Technical consultants

Background Investigation

1) The pooled standards appear to be what is used as background standards for comparison at the field sites but the pooled standards include bedrock samples. Bedrock samples are not meant for comparison to site soils based on the report's own description [page 6-1].
2) The 95% upper confidence levels are greater than 2 times background in some cases (e.g., vanadium and zinc in surface water). These values seem excessive and probably reflect too few samples being collected on which to base background.
3) The groundwater 95% upper confidence level for some dissolved metals exceeds the level for total metals, please explain (e.g., sodium, and arsenic). The dissolved groundwater 95% upper confidence levels are all based on samples with nondetect yet the 95% UCLs are well above detection levels, please explain.
4) How was the number of samples collected to represent background determined? There were far fewer groundwater, sediment and surface water samples collected than were used to represent pooled soil confidence levels.
5) How were samples preserved in the field? Were samples acidified? What type of sample containers were used?
6) Could the type of sampling equipment used impact the results (e.g., steel spoons, stainless split spoons, metal cased wells), please describe?
7) What was the condition of surface water bodies during sampling? Was the water flowing? When was the last rain event and amount of precipitation?
8) No deep soil samples were collected (>5 ft bgs). How will soils greater that 5 feet in depth be compared to background standards?
9) Elevations for deep wells could not be +0.01 feet as indicated in the report using GPS techniques. GPS techniques are not that accurate.
10) Some sample log sheets are not clearly documented examples include QS-MW-01, 02 and Navy–7 where the odor type was not clearly identified.

Soil, Groundwater, Surface Water and Sediment Background Investigation Report

Document Comments Prepared By:

Theodore J. Henry Consulting

For:

NASD Technical Review Committee (TRC)
Vieques, Puerto Rico

November 2001

Sponsored by:

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Soil, Groundwater, Surface Water and Sediment Background Investigation Report

By Theodore J Henry Consulting
November 2001

Purpose: This investigation was conducted to determine to what extent elevated metals reported previously can be attributed to either site conditions or background conditions associated with naturally occurring constituents.

General Finding: In short, as discussed in more detail below, it is highly questionable that the background samples collected in this study truly reflect background concentrations, because the background samples were collected within NASD boundaries and apparently biased toward areas where human access was most probable.

Efforts to assess background concentrations of contaminants, or at least those levels not resulting from military activities, have included off-site sampling at at least a few high visibility current and former military sites. At least some assessment of the feasibility of this approach for NASD should be considered.

Evaluation of the results that were provided through this investigation was difficult given the lack of clarity and detail in the site history, maps provided, etc.

Section I - Introduction

Note that with the 2001 transfer of 8,000 acres, several entities now own various portions of this land. In turn, any environmental sampling, characterization and remediation under one owner/land manager will need to be coordinated with the other properties since past and possibly current activities in one location can impact the long-term environmental remediation and land-use needs on another portion of the transferred property.

This exact concern is reinforced in the *Site Description* section where the document indicates that the majority of the site is undeveloped and heavily vegetated. Such undeveloped areas, particularly those with nearby road access, may contain unmanaged and even undocumented dumping and disposal.

The mapping provided in the *Introduction* section is inadequate to understand the basics of the where facilities and activities took place. While the document indicates that much of the 8,000 acres was leased to ranchers for cattle grazing, no effort is made to delineate these areas within the document.

Section II – Technical Approach and Investigation Procedures

Technical Approach and Investigation Procedures section describes the technical approach based on the approved Background Investigation Work Plan; however, there is no discussion of the entities/parties involved in the development and approval of this plan.

The document does indicate that aerial photos were reviewed to ensure samples were collected from non-impacted areas and that sampling locations were inspected prior to sampling to verify that no apparent signs of past activities were present. This approach generates a variety of concerns given that a) the photos used in the analysis skip up to 2 decades temporally, b) the undeveloped nature of the site suggests that overgrowth could easily cover signs of past activities and c) there is no discussion how past activities and the types of contaminants in question could possible impact adjacent land where there is no visual evidence of environmental concerns.

This section mentions the consideration of USGS wells but indicates the wells are unusable for the background study because of different reporting limits. Instead, existing water supply wells were used in the background study. It should be noted that all available data should be provided publicly to assess its usefulness in either background and/or characterization.

Groundwater sample locations are provided in figure 2-1 but groundwater contour data are not provided. In turn, many questions remain unanswered regarding if the groundwater samples truly reflect non-impacted groundwater. This concern is confirmed in section III where background and up-gradient wells are described but no evidence is provided to explain why these well descriptions are appropriate. The directional flow of the groundwater in relation to the locations and types of past activities is critical to not only background determination of constituents but characterization as well.

With regard to soil samples collected, it appears that most samples were taken from accessible areas along roads or paths. This may significantly bias the background data results through the use of vehicles and subsequent emissions, tendency for areas adjacent to roads to be used for dumping, etc.

Section III – Field Background Sampling Investigations

This section only briefly describes the samples collected. Besides noting the lack of information regarding determination of the terms up-gradient and background, this section also notes that samples collected from Laguana Kiani during the PA/SI investigation in May 2000 were also used for the background study.

First, knowing the disposal tendencies of the Department of Defense, it is illogical to assume that such Lagunas have not been used as disposal sites; thus, data results from these areas may not represent background concentrations. In this case, at a minimum, analyte concentrations from such samples would need to be compared with data from other islands with similar lagunas to confirm the results are reasonable and expected.

Second, some concern exists regarding the investigative methodology for using data from the PA/SI for the subsequent background study. The focus of the preliminary assessment should have been to take the current environmental pulse of the site and determine if contamination may be present, while the background investigation truly has a different purpose. In turn, without clear logical discussion and justification as to why data from Laguana Kiani is useable for the background study, it is inappropriate to make such use of these PA/SI data. [Note that Section V indicates that these data in question were collected to identify up-gradient conditions. While it is good to know that these samples were initially collected to be representative of up-gradient conditions, no information is provided in Section V to show these sample locations are, in fact, up-gradient of all past NASD activities.]

Section IV – Background Values Estimation and Sampling Results

Initial review of surface data compared to subsurface results show moderate consistency, suggesting that these reported levels may well be representative of background for the area. Nonetheless, background data from similar tropical locations should be pursued. Furthermore a comparison of these data with risk-based concentrations or soil screening levels should be conducted.

It is interesting to note that the maximum detection of lead in the surface soil is twice that of the maximum concentration found in the subsurface. The possibility of these higher levels being the result of motor vehicles used on the paths adjacent to the sampling locations is a distinct possibility and reinforces the concerns stated previously about the potential bias of the background investigation. Whether or not the detected levels are cause for concern to ecological (aquatic or terrestrial) or human receptors is a separate subject.

Other data analysis between media should be discussed to ensure the results appear logical. Additionally, the levels reported for a given media should generally coincide with data from other sources for the region. For instance, is 610 parts per billion of copper in surface water for this region expected? Such questions need to be answered if the background data set is to be widely accepted.

The need to ensure the background data are representative of the site without any impacts from military activities is critical. As stated in the Section 4.3, "The background concentrations will be used for comparisons with sample specific

data from the site investigations at the NASD facility." Site specific data will be compared with these background data and when these site specific data do not exceed the identified 95% upper tolerance limit for a compound, that analyte will not be considered a contaminant of concern, even if that analyte poses a risk to a receptor.

Section VI – Background Investigation Summary and Conclusions

Note that this section indicates that "If inorganic constituents exceed the background concentrations for a specific site, and other site-specific information indicates contamination is not likely to be site operations related, then additional statistical comparisons should be made." While this may be justified in specific instances, transparency becomes critical in how such data analysis is carried out. Shortcoming in other aspects of the site investigation and characterization process, such as lacking historical document review, must be given equal consideration as extensive statistical analysis when determining which contaminants are carried through the risk assessment process and possibly remediated.

Comments from TAPP: 3b) Dated April 2002

Technical Assistance for Public Participation (TAPP) Comments

Draft Soil, Groundwater, Surface Water and Sediment Background Investigation Report

Former U.S. Naval Ammunition Support Detachment (NASD)Vieques Island, Puerto Rico

Prepared For:

NASD Technical Review Committee

Prepared By:

Theodore J. Henry Consulting
April 18, 2002

THEODORE J. HENRY CONSULTING

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Under the Technical Assistance for Public Participation (TAPP) Program for Vieques, Puerto Rico, Theodore J. Henry Consulting reviewed the *Draft Soil, Groundwater, Surface Water and Sediment Background Investigation Report* (June 2001). Comments based on this review are provided below.

It should be noted that comments were also generated on this document by Theodore J Henry Consulting previously, which were funded by the Center for Public Environmental Oversight (CPEO) and submitted to the TRC in November, 2001. While a few of the issues from those previous comments may be raised within this current review for emphasis, please note that the CPEO comments are being submitted again as an attachment to this document, since those comments have not yet been resolved and will be one aspect of the technical discussions scheduled for May, 2002.

Recommendation for Multi-tiered Background Determination

The background study is a reasonable effort from a technical perspective based on the assumption that contamination resulting from NASD activities is limited and localized. While there are some points that support the technical merits of this background study, there are also considerations that refute the assumptions that underlie the background sampling plan. Given this reality and the importance of background determination in the cleanup of Vieques, the only way to ensure a successful cleanup a decade from now is to start a strong collaborative effort in determining background. Every effort should be made to reach consensus among the TRC members on this issue.

The TRC and the project team should explore a multi-tiered approach for determining background. The willingness to pursue this approach was evident at the last TRC meeting where U.S. background levels were discussed. Consideration of these data were a good start in looking at the adequacy of the background study and will be a good starting off point for the background discussion that will occur in the technical TRC meeting scheduled for May, 2002. In turn, it would be useful to have a copy of that TRC presentation in preparation for the meeting.

As the technical meetings on this issue progress, additional facets of a comprehensive background study to explore include:

- Focused assessment of specific background sampling sites already sampled;
- Transect-based field inspection and additional sampling of western-end territory farther from the NASD sites already designated for investigation;
- Consideration of sampling data from other Caribbean islands;
- Literature searches for media composition data that may be relevant.

Some of these aspects are touched upon or otherwise supported in the comments to follow. Such a multi-tiered approach to determining background would provide the Navy with a strong base for future cleanup actions on Vieques. At the same time, it would best address community concerns that past and current military activities are contributing to elevated background levels. It would also provide the best possible chance for the final cleanup of Vieques to meet the diverse stakeholder interests of protecting current and future human health and the environment and ensuring economic viability of Vieques.

Section 1 - Introduction

Resolving Background – Determination of background will impact all future remedial efforts on Vieques. In turn, it is imperative that all stakeholders are involved in the determination of background. Unresolved issues in this arena can impact both future technical efforts on Vieques as well as the long-term working relationship between the community, U.S. Navy and other stakeholders.

Both known and unknown historical activities can impact the accurate determination of background. In turn, it is important for the project team to seek out anecdotal information not only from the TRC members but from the larger community. An example of such effort was visible at the March TRC tour where one community TRC member discussed several issues regarding storage and disposal. Such opportunities for more comprehensive site assessment should be followed-up.

Site Overview - In providing technical support to the TRC, please note that Theodore J Henry Consulting will need a more detailed site tour than the one conducted on the first visit to Vieques in March. Included in this tour should be a visit to the areas where background samples were collected. Also, in support of better understanding the locations of the background samples, it is important for the best available maps and schematics are available during the TRC technical meeting in May.

Vegetative Barrier – The TRC team should explore ways to minimize the hindrance the vegetation places on site characterization. The need to do so was quite evident on the March site tour when a significant discussion took place regarding what disposal may have taken place just on the other side of the fence from one of the sites of concern, where visibility was minimal. Specifically, the project partners should explore ways to implement checks or verification of the areas identified as not requiring investigation. This is an important aspect of verifying some of the assumptions made regarding background sampling locations.

For instance, transects could be walked starting from the areas of known activity into the areas believe to be unaffected by past military activities. Such a visual inspection would either a) confirm some of the conclusions drawn about past activity and appropriate background sampling locations, or b) uncover additional sites needing investigation. Either outcome would benefit the cleanup process. If the former was the result of the effort, the community and other stakeholders would be far more confident of the characterization and remediation. If additional sites were discovered, it certainly would be far more cost-effective for the Navy's mission for such sites to be discovered and addressed now rather than having to return to the site after cleanup completion following later accidental discoveries. It should be noted that such discoveries are not uncommon regarding past military activities.

It is equally important to note that such an *on the ground* confirmation of conclusions drawn from available records would also provide the opportunity to collect background samples farther from historically accessed areas, an issue raised in the CPEO comments submitted previously on this background document.

Soil Types – In Section 1.4, *Local Geology and Hydrogeology*, a 1977 soil survey by the Soil Conservation Service is referenced. It indicated that there were four general categories of soil on the western end of Vieques. With regard to these categories, can the Navy please address whether any data may exist on the natural metal content of these different types of soil (i.e. do alluvial deposits tend to be higher in specific metals than other categories of soil identified)? Such broad data from the field of geology would be useful in the assessment of the background data obtain in this specific effort.

Groundwater Issues – While noted in previous comments, it is worth stressing the need for much better aquifer characterization and graphical presentation of the data, including contour data. Along with adequate characterization of background, groundwater is the other most important technical issue the TRC will face. It is a major exposure pathway people face on Vieques and it certainly could impact future land use and economic growth on the island. To assist in a clear discussion on groundwater issues in the future, efforts will be made to bring examples of groundwater graphics from other military sites to the May technical meeting in order to address future data needs of the TRC.

Section 2 – Technical Approach and Investigation Procedures

Historical Aerial Photos – The assessment of aerial photos to identify past military activities is an active topic of discussion in various state environmental agencies across the country. While providing copies of such photos may be too expensive, would it be possible to make a cross-section of these referenced photos available at the TRC technical meeting in May and at the next regular TRC meeting later this summer? Additionally, please provide information on the entity and individuals that conducted this aerial photo analysis and their respective qualifications, as these skills are not particularly common and directly relevant to selecting areas considered unaffected by NASD activities.

While this single document cannot present the extent to which aerial photos were utilized to recreate NASD historical activities, the nuance of how aerial photos should be used can be addressed. Historical records can be sketchy and aerial photo interpretation is certainly part art. Thus, photo analysis can be used to focus or concentrate characterization efforts and dollars, but it should not be the sole factor used to rule out areas for investigation. Empirical information, namely field inspections and some sampling, should be used to confirm that areas not identified as an impacted areas through photos are, in fact, unaffected.

USGS Data – As discussed in Section 2.1 of this document and mentioned in the previous CPEO comments, the USGS groundwater data deemed unusable needs clarification. While the reporting limits were higher for the USGS data, the data only becomes truly unusable if the concentrations of the metals under consideration in this project all fell below those reporting limits (and were thus non-detects). The information provided in this background document does not address this clearly. In turn, it would be useful to have these data available at the technical meeting in May.

Wells for Background Study – The locations and grouping of various groundwater wells need further discussion. For instance, Navy wells 06 and 07 are very close to each other and it is not clear what the value is of using both wells in this study. It is really assessing the same area of aquifer twice. As for several other wells located near the shoreline, the document should address

if seawater infiltration can influence the metals data from those wells. Additionally, MW-3 proximity to an area of several SWMUs and AOCs is a concern, since the current groundwater information available is very limited.

Section 2.1 describes wells being placed in the water table aquifer. While it is assumed that the previously mentioned Resolucion Valley aquifer is the water table aquifer, the text leaves some question. Please clarify.

On a grammatical note, please delete the last sentence of the middle paragraph on page 2-2 as it is a duplicate of the one previous.

Soil Data Comparisons – In the soil and rock samples discussion, it is noted that surface soil samples were taken from the first 6 inches below ground surface (bls) and that the subsurface samples were collected from 4 – 5 ft bls. Please clarify why some subsurface data from Appendix D were taken from 2 – 4 ft. Additionally, in the assessment discussion of background data, it will be useful to further discuss/compare the surface to the subsurface concentrations, as this will be another level of determining if the background concentrations are truly reflective of background.

Section 3 – Field Background Sampling Investigations

Laguna Dumping – Section 3.1.1 and figure 2-1 indicate that sediment, soil, surface water and groundwater samples were collected in, adjacent to or beneath Laguna Kiani and Laguna Playa Grande. While this issue was raised in the CPEO comments, it is worthy of additional discussion here. Past dumping activities of by both military and civilian entities involved a great deal of marsh-type disposal in the continental United States. Additionally, ocean dumping was common practice and there is some evidence of this around Vieques. Given these facts, it is possible and even likely that past dumping took place in the lagunas on the western end of Vieques.

In conjunction with the aerial photo analysis discussion above, except for SWMU – 06, it does not appear that such dumping has been documented in the lagunas. It is important to address what other characterization of these lagunas has been conducted or what other evidence beyond aerial photos was used to rule them out from additional characterization. Without such clear discussion, it is not clear that the lagunas provide background water/sediment quality references discussed in Section 3.1.3.

Subsurface Soil Samples – Please provide the basis for only collecting subsurface soil samples at 50% of the proposed soil background locations.

Section 4 – Background Values Estimation and Sampling Results

Groundwater Data – Table 4-1(a) presents the groundwater sampling results for the background study. Some metals expectedly were found in 100% of the eight samples collected, while another set of metals were only found in a fraction of the samples. It would be highly useful for both the technical discussions and in broader TRC meetings to present data in graphical form to show where individual metals were detected and at what concentrations. This allows stakeholders to better see patterns regarding distribution and increases the likelihood that connections between specific detections of different metals will be caught in the data evaluation process.

For instance, beryllium was only found in the groundwater below the swamp marsh deposits (Qs), which appear to be located near SWMU-4 and Laguna Kiani (note that figure 2-1 has two QA-MW02 wells and no QS-MW02 so the exact location of the second beryllium well could not be determined at the time of review). It is possible that the detection of beryllium may be the result of the geology in those areas, but it may also be possible that this metal is present due to past activities – no opinion on this issue has been made from the TAPP perspective at this time. The point here is that this type of assessment should be explored to the extent possible, particularly for beryllium since the EPA Region III risk based concentration for this metal is 0.016 ppb while the detected levels were 100 times higher.

As far as patterns between metals, it should be noted that dissolved chromium was found in the same two wells as the beryllium, as was antimony. Arsenic and cadmium were found only in one of the eight wells sampled, noting both were in the same well and this well was one of the QS wells where the beryllium, chromium and antimony were also detected.

On a text/grammar level, please note that that table 4-1(a) does not necessarily match Appendix D where the groundwater data per well are presented. For instance, in the appendix, total chromium is reported above detection on 5 of the 9 wells (noting well QA-MW02 is reported twice), but the table from Section 4 indicates total chromium was found in 75% of the wells. Also, with regard to Appendix D, please note that for some data a "=" is noted in the qualifier column (also present in other Appendix D media results) but no explanation of this designation is present. Please confirm that this symbol is just a space marker and that the use of a "=" reflects that no data qualifier was assigned to that respective data point.

Surface Water Data – Focusing on the metals not found in 100% of the locations, a great deal of variation can be seen between the minimum and maximum detected levels for certain metals. For instance, the range of arsenic detected is from 5 – 19 ppb, but the detected copper concentration range from 5 – 610 ppb, which is more than 100-fold difference. Assessing these numbers via the Appendix D table for surface water, the higher concentrations of several metals, including copper, chromium, nickel, vanadium and zinc were all found in the beach and dune (Qb) surface water samples taken from Laguna Playa Grande (QB-SW02, QB-SW03 and QB-SW04). In resolving background findings, it is important for the project team to provide the TRC with the logic behind why these significantly different levels found in Laguna Playa Grande are attributable to background versus anthropogenic sources.

Why such clarification is so important can be seen in the data for lead at the above referenced sample locations. In the Qs surface water samples and even in QB-SW01 lead was reported as undetected (below 1.6 ppb). However, at the three Qb sample locations under discussion, lead concentrations ranged from 75 to 150 ppb, while chronic marine effects for flora and fauna begin to be a concern at one-tenth these concentrations. While it is possible that the lead detected my not be the result of past military activity, this issue must be looked at carefully for any metal that may have human health or ecological effects and is being attributed to background.

Note that surface water data (and sediment data) from SW/SED06 and SW/SED07 were not included in the Appendix D. Note that while these locations were sampled to obtain background data associated with SWMU-06, they were still associated with SWMU-06. In turn, looking at these data in comparison to the other background data is particularly important in assessing the quality of the background data from these locations. Review of such sites sampled outside the

background study but used within the background results should be conducted at the technical TRC meeting scheduled for May.

Soil Data – Many of the soil data appear unremarkable; nonetheless, it is important to review the data looking for suggestion that a sampling location may not be reflective of background. For instance, QS-SS04 is elevated for several metals compared to other data, even within the same soil type. Such readings may be natural variation in both environmental distribution and/or laboratory analysis. However, it is also possible that elevated metals may be indicative of past activities nearby (e.g. waste burial/ disposal). A closer look at individual background sampling sites should be considered in order to resolve points of concern, which may need to include more detailed site inspection and/or additional sampling.

In the Appendix D subsurface data, please note that surface data are included in this table, specifically QS-SB05. Please clarify the depth at which this sample was collected.

Sediment Data – Basic concerns or questions exist regarding 10-fold detection ranges for certain metals, use of the 95th UTL, use or non-use of SED06 and SED07 data, etc. Response to similar comments on other media and the working meeting will begin to address these issues. Thus, there is no need to provide more specific sediment comments at this time.

Section 5 – Data Quality Evaluation

Laboratory/Field Contamination – Section 5.2 indicates systemic chromium and thallium contamination of samples either from the laboratory or the field. The text then indicates that "all of the thallium and many of the chromium sample detections would normally have been qualified as non-detects when utilizing *EPA's Functional Guidelines* 'five times rule'." It is important for the project team to discuss this issue during the May technical TRC meeting to address how this data quality issue was handled and why it was addressed the way it was.

The use of these data is particularly important for chromium given its toxicity, the fact that the mean is much higher than the median for various media (suggesting localized elevated detections), and given that soil screening levels for chromium VI for transfer to groundwater is only19 ppm (EPA Region III draft number; should be confirmed through other criteria).

Section 6 – Background Investigation Summary and Conclusions

Metal Concentration for Future Comparison – Background comparison concentrations for the different metals were determined via the calculation of upper tolerance limits (UTLs). As defined in Section 4 of the background document, the 95th UTL is the 95% upper confidence bound of the 95 percentile. Please provide the regulatory and logical justification for use of the UTL.

It is questionable that the determination of background concentration, which will be used for assessing contaminated areas on Vieques, should be done using the UTL. For example, in Table 4-2 entitled *Soil Sample Background Estimates*, the UTL is greater than the maximum detected concentration for nine of the metals listed based on the pooled data from the various soil types. In some cases the UTL is considerably higher, noting that in the Qs data set, the maximum barium concentration reported is 24 ppm where the calculated 95th UTL is 34 ppm, a difference

of greater than 40%. In Table 4-4 entitled *Groundwater Sample Background Estimates*, the 95th UTL for chromium is 11 ppb while the maximum detection is only 6.8.

This approach for calculating background is particularly troubling given the other language in Section 6 indicating that even exceedances of this UTL should be explored further using available information and statistical analyses before accepting an exceedance as truly above background.

Future Use of Background Data – Also regarding Table 4-2, it is noted that 95th UTLs were calculated for each soil type. While it is assumed that soil sampling of different soils in the future would be compared to the specific background soil subset (i.e. Qs area of concern data would be compared to Qs background data), the process for how the background data will be used in the future is not clearly set forth in this document. This should be addressed since there are some significant differences between the different soil subsets and the pooled data.

On a similar note using antimony as an example from groundwater (Table 4-4), the 95th UTL for total antimony is 5.2 ppb while the dissolved antimony 95th UTL is 9.1 ppb. What UTL (dissolved or total) would be used in future data assessments? Also, in reviewing this table, please explain why the minimum and maximum detected levels for all of the dissolved metals data are listed as non-detects. Again, it is important that the TRC collaboratively address the future use of the background data before the background development process is completed.

4. Comments from Commissioner's office – by Eng. Rafael Cruz Perez, P.E. – Consultant to the Commissioner

(This is an excerpt from a complete set of comments)

Background Samples

As indicated on the background determination report, the purpose of the investigation was to provide site-specific soil analytical data to be used to provide background data for the remediation activities. It was indicated by CH2M HILL and US Navy representatives that surface samples were taken at the initial zero (0) to six (6) inches below the ground level.

It is our professional opinion that based on the standard methodology utilized by geotechnical investigators and the scientific community on conducting this type of study, and due to a poor selection of sampling methodologies, lack of target concentration and the amount and area distribution of samples, there are not sufficient sampling points to establish a statistically significant values with the analytical precision and the required type, to establish a valid profile and potential representation of contamination level of the area evaluated nor of background conditions. The methodology used for the selection of sampling points did not follow accepted methodology and was subject to extreme bias in the selection, and thus, there is no relationship with the stated purpose and objective of the study.

For a soil contamination study for an area this size, in order to establish a representative profile of the background, accepted practice in the geotechnical field indicates that at least three soil samples are required per one hundred acres. The sampling points must be selected utilizing a random system that will eliminate all bias from the process. It is also necessary that, the professional conducting the study evaluate the subsurface physical conditions, soil permeability, potential direction of movement for pollutants and others. The type or types of activities conducted in the area must also be evaluated to establish potential paths of movement in the difference medias for the contaminants. It is not evidenced from the report if any of the above-indicated methodologies were used in the project.

The most unusual aspect of the collected data is that it is indicated that the soil samples were taken at depths ranging from zero (0) to six (6) inches. Samples at this depth are classified as surface samples. This situation presents a major and significant technical error, resulting in a suspect methodology biased to favor obtaining results lower than what should be found in the area. We have to be aware that over a year had elapsed between the last exercise and the sampling period. Due to that delay, no sampling was required to determine that no explosive compounds were present, since only the most persistent compounds would remain on the surface of the soil after such an extended period of time, due to the effect of weathering, leaching and particle transport. Without a need for any sampling, a person with minimal experience in the field could have predicted that no residues of the explosive compounds would be present on the surface layers of the soil. As to the food chain, it must be noted that only a few grasses and very small plants will have their root system in the initial six (6) inches of the soil profile, thus, whether there were explosive residues or not on that surface stratum is totally irrelevant to the food chain system of the area.

The behavior of soil contaminants in soils is very simple and well known by the scientific community, and any type of sampling must be strictly conducted using a series of some basic principles, well-established on the USEPA and ASTM soil sampling standard methodologies. Contaminants in the soil are rapidly transported from the surface to deeper stratums by different mechanisms, and this transport is highly dependant on the degree of fracture,

permeability and porosity of the underlying soil. Thus, in order to establish the purpose, objective and scope of work indicated in this study, a complete profile of the soil must be made, analyzing samples at several depths, down to the lowest area that can be perturbed by the activities taking place in the area of the survey, the bedrock surface or the water table, whichever is deeper. In this particular case, it must be noted that the perturbed area resulting from a military explosive device can reach several meters in depth, even down to the bedrock in some cases, depending on the explosive used, velocity of the projectile at the point of impact, angle of impact and the soil conditions at the point of impact. When all of these factors are considered together, it is mandatory that samples must be taken at a multiplicity of points at different depths.

We are very much aware of the extreme hazards present in the studied area to a soil sampling team taking samples of the lower stratums due to the unexploded ammunition that could be found in the underlying layers, however under such limitations, any responsible and competent professional should clearly indicate in his report the presence of this limitation, and adjust, if possible, the results obtained within that limitation using acceptable modeling methodologies.

Thus, and based on all of the limitations listed above, the results of this background determination should be classified under the most liberal interpretation of accepted scientific and regulatory methods, as suspect and useless. The study is not able to prove or demonstrate valid analytical data that could be used for a background determination. Nor it is able to demonstrate that the surface area contains or do not contain explosive compounds.

It must be noted that in studies conducted by the US Navy on or about 1978 [1][2][3][4][5][6], it was clearly determined that movement of explosive residues in Vieques are distributed through the whole surface area of the island. It is strongly recommended that a testing protocol for background determination be discussed with the PREQB and USEPA prior to a next round of testing.

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[1] Defendants answers to the first portion of the first set of interrogatories submitted by the DON plaintiffs-intervenors. Carlos Romero Barcelo, Governor of Puerto Rico vs. Harold Brown, Secretary of Defense et. al.

[2] Demilitarization of Conventional Munitions; State of the art study, by N.I. Shapira, J. Patterson, J. Brown, K. Noll, American Defense Preparedness Association (undated)

[3] Environmental Dispersion of the Products of Explosions of Conventional Ordnance at Vieques Island; George A. Young, 1978, Explosives Chemistry Branch, Naval Surface Weapons Center.

[4] Vieques Litigation Support: Explosives Analysis of Water and Soil Samples Taken on Vieques Island, Puerto Rico. May 11 through May 16, 1978; by John C. Hoffsomer and Donald J. Glover, Explosives Chemistry Branch, Naval Surface Weapons Center.

[5] Water Quality Survey, Navy, Puerto Rico, 77-021-001. File #USNP 1; C. L. Strattor, May 31, 1978

[6] Explosion Products Content of Water and Soil Samples Taken on Vieques Island, Puerto Rico, May 11 through May 16, 1978, by Ming G. Lal, Explosives Chemistry Branch, Naval Surface Weapon Center.

Table 1

Ranges and Averages of the Chemicals Detected in Soil on Vieques
Sediments on Mainland Puerto Rico, and Soil in the United States

Metals	Lowest Screening Criteria	NASD Vieques		Puerto Rico[1]		United States[1]	
		Range	Average	Range	Average	Range	Average
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Aluminum	7641(R)	1,600-29,000	9,573	NS	NS	700–>100,000	72,000
Antimony*	3.1(R)	0.35-2.3	0.67	1-4.1	1.4	<1-8.8	0.66
Arsenic*	0.39(R)	0.57-2.5	0.93	1-22	2.95	<0.1-97	7.2
Barium	538(R)	6.4-320	65	20-5,000	617	10-5,000	580
Beryllium	15.4(R)	0.13-0.46	0.21	1	1	<1-15	0.92
Cadmium*	3.7(R)	ND	ND	0.05-0.95	0.139	NS	NS
Chromium	38(L)	2.2-74	16	10-5,000	681	1-2,000	54
Cobalt	469(R)	1.0-25	8.2	5-1,500	31.4	<3-70	9.1
Copper	291(R)	1.8-68	23	10-7,000	80	<1-700	25
Iron	2346(R)	2,500-39,000	16,884	7,000-200,000	55,500	100–>100,000	26,000
Lead	40(R)	0.30-13	3.5	10-1,000	20.9	<10-700	19
Magnesium	NA	1,200-16,000	4,116	500-100,000	12,700	50–>100,000	9,000
Manganese*	176(R)	48-1,200	478	70-5,000	1,040	<2-7,000	550
Mercury	2.4(R)	0.0037-0.031	0.013	NS	NS	<0.01-4.6	0.09
Nickel	130(L)	0.67-40	7.2	5-5,000	97.7	<5-700	19
Potassium	NA	380-1,700	1650	NS	NS	50-63,000	15,000
Selenium	5(L)	0.68-2.0	0.66	NS	NS	<0.1-4.3	0.39
Silver*	34(L)	ND	ND	0.1-30	0.903	NS	NS
Sodium	NA	113-411	220	2,000-50,000	14,900	<500-100,000	12,000
Thallium	NA	0.45-0.67	0.42	NS	NS	NS	NS
Vanadium	55(R)	9.0-130	50	30-1,500	250	<7-500	80
Zinc	2346(R)	3.5-71	29	6-700	113	<5-2,900	60

+Average concentrations were calculated using detected values only.
*Averages are significantly different between Vieques and Puerto Rico, $p<0.05$.
ND = not detected
NS = not sampled
R= Residential Risk-Based Screening Criteria
L= Leachability Screening Criteria
1 - ATSDR - Focuseed Petitioned PublicHealth Assessment, Soil Pathway Evaluation, Isla De Vieques Bombing Range, Vieques, P.R.

Table 1 (continued)
Ranges and Averages of the Chemicals Detected in Soil on Vieques
Sediments on the Mainland of Puerto Rico, and Soil in the United States

	Vieques		Puerto Rico		United States	
Metals	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Selenium	0.52-2.1	1.23	NS	NS	<0.1-4.3	0.39
Silver*	0.5-1.5	0.742	0.1-30	0.903	NS	NS
Strontium*	100-700	254	100-5,000	238	<5-3,000	240
Thallium	ND	ND	NS	NS	NS	NS
Thorium	ND	ND	ND	ND	2.2-31	9.4
Tin	4.6-30	12.6	10-300	27.1	<0.1-10	1.3
Titanium	200-15,000	3,740	500-30,000	4,660	70-20,000	2,900
Tungsten	50	50	ND	ND	NS	NS
Vanadium	3.6-500	162	30-1,500	250	<7-500	80
Yttrium*	10-50	23	10-70	21	<10-200	25
Zinc	2.4-3,000	78.5	6-700	113	<5-2,900	60
Zirconium	10-300	85.3	10-1,000	83.8	<20-2,000	230
Inorganics						
Ammonia	0.37-3	1.49	NS	NS	NS	NS
Ammonium perchlorate	0.123	0.123	NS	NS	NS	NS
Calcium*	500-200,000	26,400	500-200,000	15,200	100-320,000	24,000
Cyanide	0.06-0.1	0.075	NS	NS	NS	NS
Magnesium	1,000-30,000	11,700	500-100,000	12,700	50–>100,000	9,000
Nitrate and nitrite	0.04-10.6	2.63	NS	NS	NS	NS
Potassium	426-3,700	1650	NS	NS	50-63,000	15,000
Sodium	113-411	220	2,000-50,000	14,900	<500-100,000	12,000
Organic Compounds			NS	NS	NS	NS
Acetone	0.04-0.091	0.068	NS	NS	NS	NS
Benzene	0.0007	0.0007	NS	NS	NS	NS
2-Butanone	0.014-0.032	0.025	NS	NS	NS	NS
Carbazole	0.0011	0.0011	NS	NS	NS	NS
Carbon disulfide	0.0014	0.0014	NS	NS	NS	NS
Methylenen chloride	0.0012-0.0023	0.0019	NS	NS	NS	NS
Toluene	0.0006-0.0007	0.00067	NS	NS	NS	NS
Xylene	0.0007-0.0015	0.00097	NS	NS	NS	NS
Explosives						
Cyclotetramethylene tetranitramine (HMX)	0.35-0.42[a]	0.385[a]	NS	NS	NS	NS
Cyclotrimethylene tetranitramine (RDX)	0.003-2.8[b]	0.411[b]	NS	NS	NS	NS
2-amino-4,6-Dinitrotoluene	0.62[a]	0.62[a]	NS	NS	NS	NS
Nitroglycerin	1.6-19[c]	8.1[c]	NS	NS	NS	NS
2,4,6-Trintrotolucne (TNT)	0.0004-13[d]	2.85[d]	NS	NS	NS	NS

a-HMX and 2-amino-4,6 Dinitrotoluene were only detected on the LIA.
b-RDX was detected on the LIA, near Bahia de la Chiva, and near Bahia Tapon.
c-Nitroglycerin was detected on the LIA and in the North Coast Conservation Zone.
d-TNT was detected on the LIA and near Bahia de la Chiva.

Sources:
CH2MHILL 2000 Lai 1978Learned, Grove, and Boissen 1973 PMC 1998
Hoffsommer and Glover 1978 Marsh 1992 Shacklette and Boerngen 1984

+Average concentrations were calculated using detected values only.
*Averages are significantly different between Vieques and Puerto Rico, $p<0.05$.
ND = not detected
NS = not sampled

Table 1 (continued)
Ranges and Averages of the Chemicals Detected in Soil on Vieques,
Sediments on the Mainland of Puerto Rico, and Soil on the United States (continued)

	Vieques		Puerto Rico		United States	
Metals	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Organic Compounds			NS	NS	NS	NS
Acetone	0.04-0.091	0.068	NS	NS	NS	NS
Benzene	0.0007	0.0007	NS	NS	NS	NS
2-Butanone	0.014-0.032	0.025	NS	NS	NS	NS
Carbazole	0.0011	0.0011	NS	NS	NS	NS
Carbon disulfide	0.0014	0.0014	NS	NS	NS	NS
Methylenen chloride	0.0012-0.0023	0.0019	NS	NS	NS	NS
Toluene	0.0006-0.0007	0.00067	NS	NS	NS	NS
Xylene	0.0007-0.0015	0.00097	NS	NS	NS	NS
Explosives						
Cyclotetramethylene tetranitramine (HMX)	0.35-0.42[a]	0.385[a]	NS	NS	NS	NS
Cyclotrimethylene tetranitramine (RDX)	0.003-2.8[b]	0.411[b]	NS	NS	NS	NS
2-amino-4,6-Dinitrotoluene	0.62[a]	0.62[a]	NS	NS	NS	NS
Nitroglycerin	1.6-19[c]	8.1[c]	NS	NS	NS	NS
2,4,6-Trintrotolucne (TNT)	0.0004-13[d]	2.85[d]	NS	NS	NS	NS

a-HMX and 2-amino-4,6 Dinitrotoluene were only detected on the LIA.
b-RDX was detected on the LIA, near Bahia de la Chiva, and near Bahia Tapon.
c-Nitroglycerin was detected on the LIA and in the North Coast Conservation Zone.
d-TNT was detected on the LIA and near Bahia de la Chiva.

United States Department of the Interior

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ENV ENG DIV

March 3, 1997

Mr. Winston Martinez, Land Use Manager
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FPO AA 34051-3001

Dear Mr. Martinez:

Please find enclosed the final report from Quanterra Environmental Services for the ground-water samples taken during the rehabilitation of the U.S. Navy wells located in the Naval Ammunition Support Department (NASD), Vieques, Puerto Rico. Also enclosed, I have included tables and figures which summarize the findings from the initial survey conducted by the U.S. Geological Survey (USGS) in October and the subsequent sampling in November, 1996. The purpose of the October visit was to rehabilitate the existing wells using compressed air and chemical treatment to enhance ground-water flow into the casing.

A total of fourteen wells were inventoried in the NASD area by USGS personnel. The depth and depth to water were measured and the coordinates obtained through use of Global Positioning System (GPS) equipment. The findings were compared to existing data from previous studies in the USGS Ground-water Site Inventory (GWSI) database. Eight wells were matched based upon available information with the remaining wells to be added to the database. All wells were assigned a number according to the sequence of well rehabilitation or proximity of nearby wells. Four wells were found to be plugged with soil or debris, one destroyed, one with a bent casing, and another was plugged with a beehive inside the casing (see table 1).

A total of six wells were rehabilitated using compressed air to remove accumulated sediments and chemically treated (sulfamic acid) to dissolve mineral buildup in well screens. The treated wells are identified in table 1 with the USGS well rehab designation. Sulfamic acid was added to remove any calcium carbonate encrustation in the well screens at least 12 hours prior to development with air. The air development was conducted for a minimum of three hours and generally produced 1 to 4 gallons per minute from each well. After the redevelopment was completed, concentrated chlorine was added as a disinfectant.

Ground-water sampling of five wells located within the NASD, Vieques, Puerto Rico (figure 1) was conducted on November 19 and 20, 1996, with each well pumped for a period of time prior to sampling to acquire a representative ground water from the aquifer. Analytical results given in table 2. General sampling protocol requires extracting a minimum of 3 well volumes from each well to be sampled. Due to the chlorination process used following well redevelopment, a minimum of 4.7 (U.S. Navy 11) and maximum of 87 (U.S. Navy 17) well volumes were pumped from the respective wells. Samples were processed and preserved in the field using standard USGS water-quality techniques and sent to Quanterra Environmental Services at Arvada, Colorado, for analyses. The specific conductance and pH were monitored during the pumping of each well. Dissolved solids and the Sodium Adsorption Ratio (SAR) were calculated from the laboratory results. The calculated dissolved solids in the water samples range from about 450 to about 730 mg/L. The calculated Sodium Adsorption Ratios (SAR) values were used to classify the ground water for agricultural use by comparing the SAR values with the specific conductance of each well. All except the well U.S. Navy 10 has an SAR considered to have hazard levels high in salinity and low in sodium (alkali) in use as an irrigation water source (see diagram). The value for well U.S. Navy 10 fell into the range for medium sodium hazard.

All the wells sampled showed high concentrations of iron and manganese which exceeded the secondary drinking water maximum contaminant level (SMCL) established by the Environmental Protection Agency (EPA). The concentrations of iron ranged from 0.8 to 6.1 mg/L, which exceeds the established SMCL for iron of 0.3 mg/L. The concentrations of manganese ranged from 0.18 to 0.54 mg/L, which exceeds the established SMCL for manganese of 0.05 mg/L. A detailed description of the geology of Vieques by Meyerhoff in 1927 eludes to the granitoid intrusives exposed over the western half of the island. Volcanic rocks are a common source for iron and manganese. A report published in 1996 on the Yabucoa valley by Troester attributes high dissolved iron and manganese found in numerous wells to the volcanic source material within the drainage basin.

The three wells sampled for Volatile Organic Compounds (VOCs) indicated the presence of chloroform in the range of 0.74 to 6.2 µg/L. The Maximum Contaminant Level (MCL) set by EPA for the combination of trihalomethanes (chloroform, bromoform, bromodichloromethane, dibromochloromethane) is 100 µg/L. The trihalomethanes are usually present as a byproduct of direct chlorination or disinfection, thus it cannot be inferred that these contaminants are present in ground water at the site since chlorine disinfection was conducted at the well.

The analyses for organochlorine pesticides and PCBs tentatively identified heptachlor epoxide (0.38 µg/L) in well U.S. Navy 17. This compound was not confirmed in the second column analysis therefore, it was not reported as present. Siloxane was also detected in the range of 1.1 to 1.9 µg/L in wells U.S. Navy 17 and Well rehab 2. The laboratory reports that siloxanes are common laboratory and field artifacts but may also be present in silicone or lubricating oils with siloxane additives.

A total of 6 wells were surveyed for elevation using the benchmark on the south side of highway 994, 0.4 mile east of Laguna Kiani, as the starting point. A reference mark near the entrance road to the Navy Facility was used to survey the elevation for the well U.S. Navy 17. The elevations of reference marks (RM's) established at the surveyed wells within the Resolución valley ranged from 26.4 to 48.5 feet above mean sea level and well U.S. Navy 17 near the Navy Facility, was surveyed at 57.4 feet above mean sea level. The water levels taken in the wells located in the Resolución valley indicate the altitude of the water table ranges from 0.57 feet (U.S. Navy - USGS Well Rehab 2), nearest the shoreline to 2.62 feet above mean sea level (U.S. Navy - USGS 3B) inland-most wells. Two wells surveyed and subsequent water levels indicate the altitide of the water table is below mean sea level in the area of U.S. Navy 10 and 11 wells.

The preliminary findings of this study indicate that previous estimates for the aquifer ground-water development potential in the Resolución valley could be high. It is highly recommended that aquifer tests be conducted to delineate the transmissivity, specific yield, and the potential for saltwater encroachment into the well fields. This work was included in our original proposal for the second year: We are willing to meet with you at your convenience to discuss this possibility. If you have any questions regarding the results, feel free to call Gregory S. Cherry at (787) 749-4346.

Sincerely,

Rafael W. Rodríguez

Rafael W. Rodríguez
District Chief

Enclosures

Table 1. Description of wells located on NASD, Vieques Island, Puerto Rico
[--, indicates data not available; MSL, mean sea level]

Well number on figure 2	Well name	USGS Site ID	Lat/Long GPS unit	Year constructed	Measured depth of well (feet)	Casing diameter (inches)	Type of well finish and finish interval (feet)	Land surface altitude of well (feet)	Depth to water below land surface datum (feet)	Water level altitude, in ft above MSL	Date water level measured (month-day-year)
			Y X								
1	U.S. Navy (USGS Well Rehab 2)	180658065325900	180658, 655259	--	75.0	10	--	26.37 Surveyed	25.80	0.57	11-21-96
2	U.S. Navy 8 (USGS 2A)	180659065325900	180658 653259	--	46.3	8	--	23 Topo map	25.00	--	10-30-96
3	U.S. Navy 7 (USGS 2B)	180657065325700	180657 653259	1941	Destroyed	8	--	--	--	--	
4	U.S. Navy 6 (USGS Well Rehab 3)	180654065325900	180651 653256	--	60.0	21	--	36.65 Surveyed	36.10	0.55	11-21-96
5	U.S. Navy 5 (USGS 3A)	180644065325400	180647 653254	--	16.5	6	--	33 Topo map	Plugged		
6	U.S. Navy (USGS 3B)	--	180640 653254	--	58.1	6	--	48.53 Surveyed	45.91	2.62	11-21-96
7	U.S. Navy 10 (USGS Well Rehab 4)	180637065331000	180639 653311	--	58.0	6	--	33.77 Surveyed	34.35	-0.58	11-21-96
8	U.S. Navy 9 (USGS 4B)	180640065330700	180639 653309	--	35.0	8	--	33 Topo map	Plugged		
9	U.S. Navy 11 (USGS Well Rehab 5)	180637065330700	180638 653308	1941	48.5	18	0-65 Perforated	35.74 Surveyed	36.08	-0.34	11-21-96
10	U.S. Navy (USGS 6)	--	180637 653254	--	28.0	6	--	49	Plugged		
11	U.S. Navy 17 (USGS Well Rehab 1)	180727065312600	180728 653128	--	69.0	8	--	57.41 Surveyed	53.46	3.95	11-21-96
12	U.S. Navy (USGS 3C)	--	180647 653254	--	45.5	6	--	40.19 Surveyed	38.95	1.24	10-31-96
13	U.S. Navy (USGS 3D)	--	180644 653255	--	42.7	6	--	--	Plugged		
14	U.S. Navy (USGS 4C)	--	180637 653308	--	Well casing plugged with beehive						

AOC K
Perf casing

Table 2.--Summary of Physical and chemical characteristics of ground water at selected wells within the Resolución alluvial aquifer, Isla de Vieques, Puerto Rico.

[---, indicates data not available; µS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; SAR, sodium adsorption ratio; ND, not detected]

Well number and name	well number on figure	Date of Sample	Time of pumpage (min.)	Pump rate (gal per min)	Total drawdown in feet	Specific conductance (µS/cm) (Field)	pH (standard units) (Field)	Nitrate as N dissolved (mg/L as N)	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)
1 U.S. Navy 17	11	11-19-96	175	20	2.66	1,275	---	1.2	64	45	168
2 Well Rehab 2	1	11-19-96	122	22	15.16	950	---	1.4	47	30	147
3 U.S. Navy 11	9	11-19-96	40	18-22	4.31	1,300	---	1.4	23	18	139
4 U.S. Navy 6	4	11-20-96	134	21	12.55	900	6.6	1.6	46	23	133
5 U.S. Navy 10	7	11-20-96	60	22	3.94	750	6.6	1.7	14	12	156

Well number and name	Sulfate, dissolved (mg/L)	Chloride, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Zinc dissolved (mg/L)	Iron dissolved (mg/L)	Manganese dissolved (mg/L)	Alkalinity (mg/L as CaCO3) (Lab)	Sodium Adsorption Ratio (SAR)
1 U.S. Navy 17	38	178	< 1.0	< 0.01	0.8	0.21	369	3.9
2 Well Rehab 2	26	104	< 1.0	0.02	1.9	0.18	348	4.1
3 U.S. Navy 11	17	79	< 1.0	< 0.01	6.1	0.39	254	5.3
4 U.S. Navy 6	19	90	< 1.0	0.01	5.0	0.54	309	4.0
5 U.S. Navy 10	15	76	< 1.0	0.03	2.0	0.33	261	7.4

Summary of detected Volatile Organic Compounds (VOCs) and Organochlorine Pesticides

Well number and name	Chloroform (µg/L)	Siloxane (µg/L)	Heptachlor epoxide (µg/L)
1 U.S. Navy 17	0.74	1.1	ND
2 Well Rehab 2	1.1	1.9	ND
3 U.S. Navy 11	6.2	ND	ND

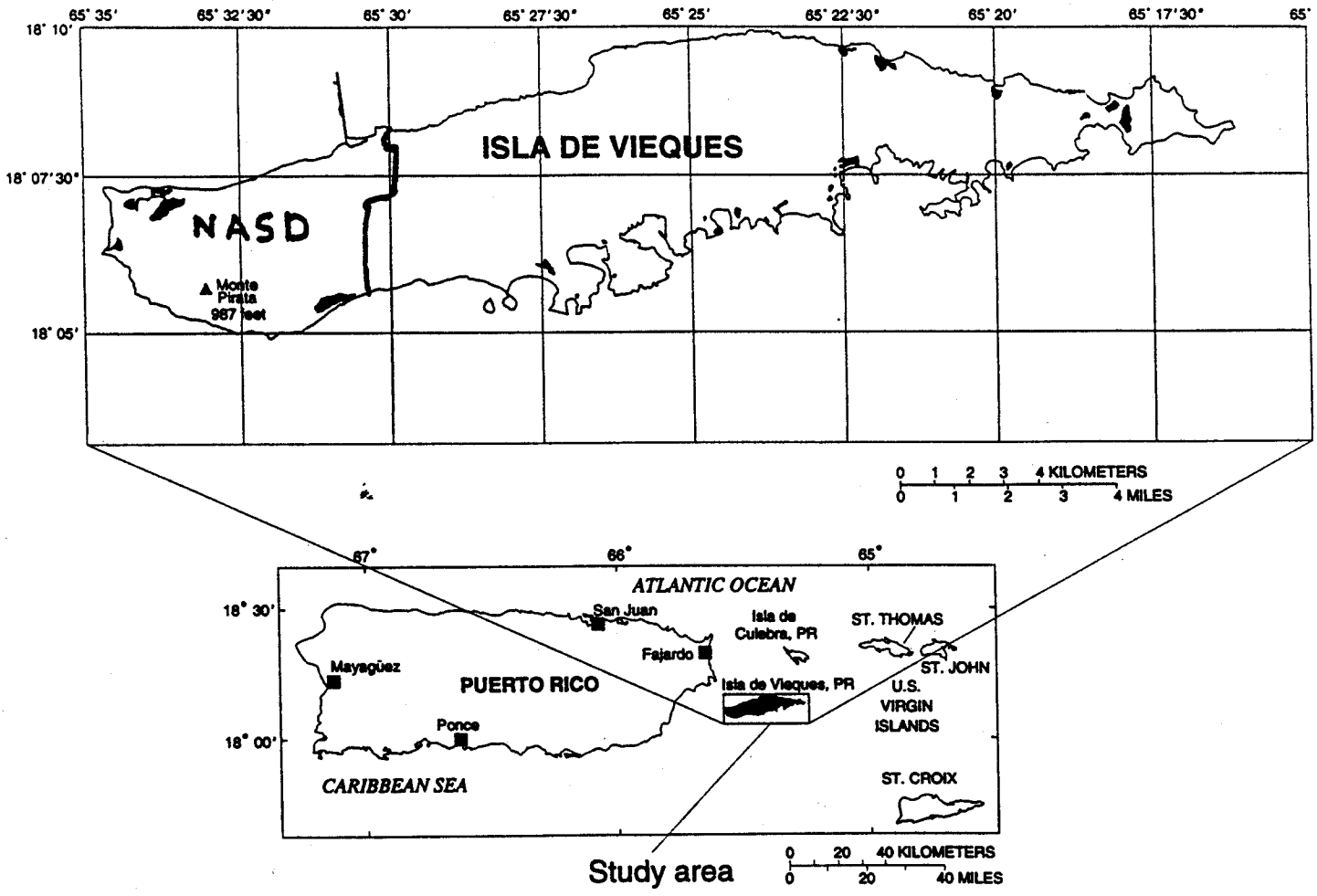


Figure 1. Location of Isla de Vieques, Puerto Rico, and Naval Ammunition Support Department (NASD).

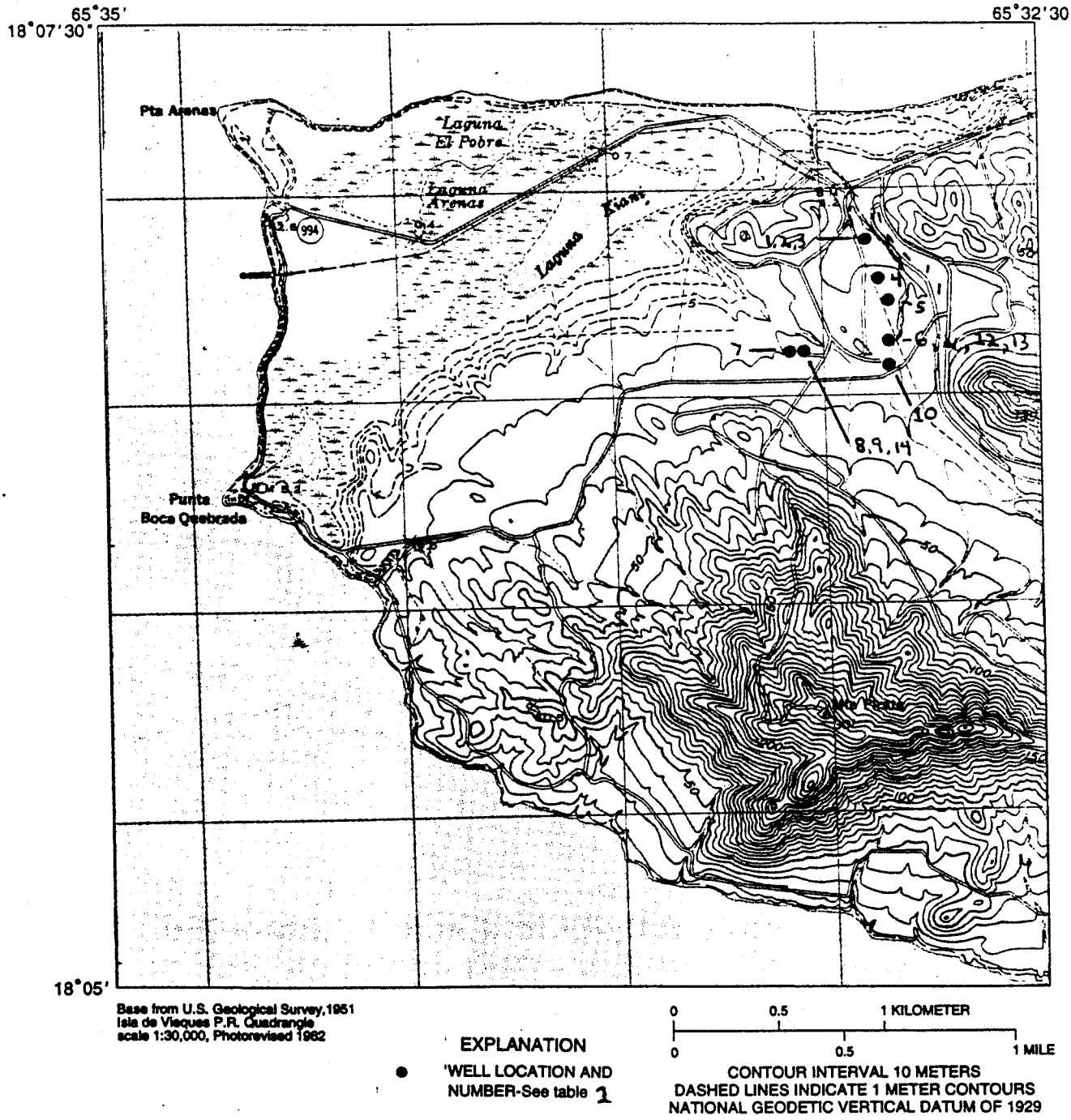


Figure 2a Location of reconnaissance study area, Isla de Vieques, Puerto Rico.

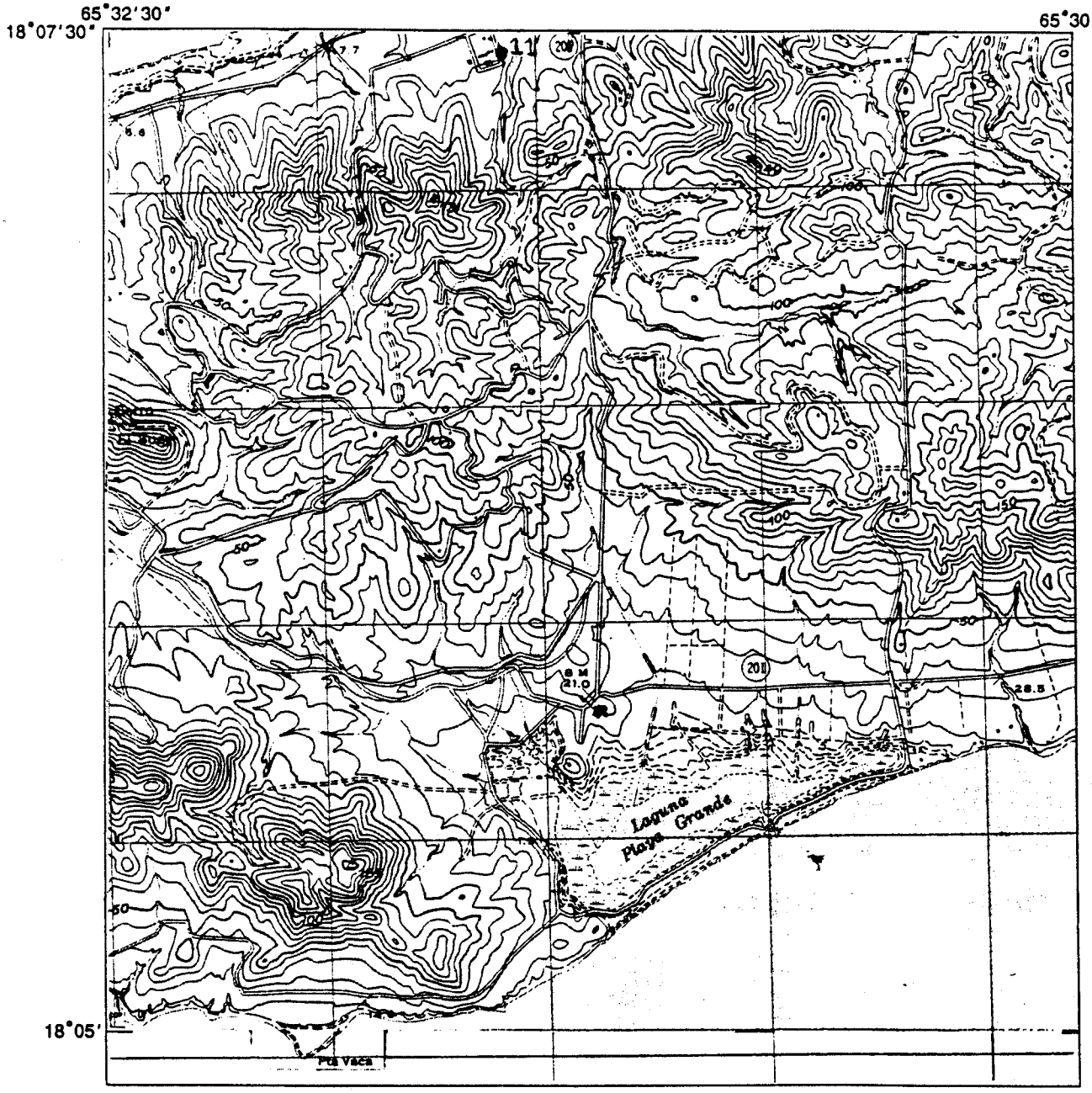
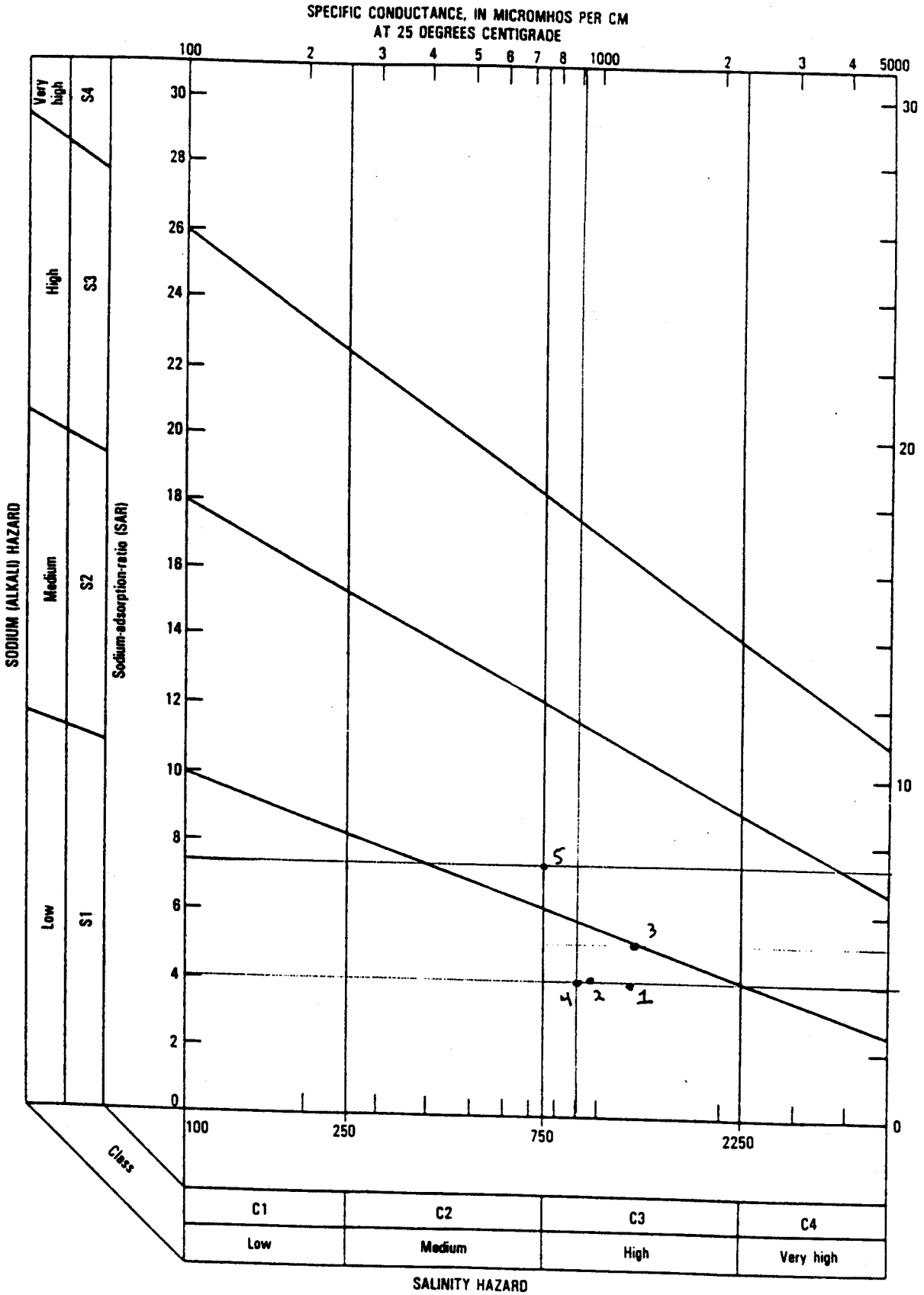


Figure 2 b Location of reconnaissance study area, Isla de Vieques, Puerto Rico.



. Diagram for use in interpreting the analysis of irrigation water. Adapted from U.S. Salinity Laboratory staff (1954). [Numbers in graph correspond to wells as given in Table 1]

Metals
Total Metals

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180727065312600 (U.S. Navy 17)
Lab ID: 052686-0001-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Prepared: See Below

Received: 21 NOV 96
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
luminum	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
ntimony	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
rsenic	ND		1.0	0.30	mg/L	6010	25 NOV 96	25 NOV 96
arium	0.13		1.0	0.10	mg/L	6010	25 NOV 96	25 NOV 96
eryllium	ND		1.0	0.0020	mg/L	6010	25 NOV 96	25 NOV 96
admium	ND		1.0	0.0050	mg/L	6010	25 NOV 96	25 NOV 96
alcium	63.7		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
hromium	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
obalt	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
opper	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
ron	0.80		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
ead	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
agnesium	44.7		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
anganese	0.21		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
olybdenum	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
ickel	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
otassium	ND		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
elenium	ND		1.0	0.40	mg/L	6010	25 NOV 96	25 NOV 96
lver	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
odium	168		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
allium	ND		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
nadium	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
nc	ND		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
senic	ND		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
ad	ND	G	1.0	0.0034	mg/L	6010	25 NOV 96	25 NOV 96
lenium	ND		1.0	0.0050	mg/L	6010	25 NOV 96	25 NOV 96
allium	ND		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96

- Reporting limit raised due to the matrix of the sample.
- Not Detected

orted By: Mark Woolley

Approved By: Richard Persichitte

DRAFT

General Inorganics

Client Name: U.S. Geological Survey
Client ID: 180727065312600 (U.S. Navy 17)
Lab ID: 0[redacted]A
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Prepared: See Below

Received: 21 NOV 96
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
lkalinity, Total as CaCO3 at pH 4.5	369		1.0	5.0	mg/L	310.1	NA	25 NOV 96
kalinity, Bicarb. as CaCO3 at pH 4.5	369		1.0	5.0	mg/L	310.1	NA	25 NOV 96
lkalinity, Carb. as CaCO3 at pH 8.3	ND		1.0	5.0	mg/L	310.1	NA	25 NOV 96
kalinity, Hydrox. as CaCO3	ND		1.0	5.0	mg/L	310.1	NA	25 NOV 96
luoride	ND	G	2.0	1.0	mg/L	300.0	NA	21 NOV 96
hloride	178	t	2.0	1.0	mg/L	300.0	NA	21 NOV 96
itrate as N	1.2		1.0	0.50	mg/L	300.0	NA	21 NOV 96
rthophosphate as P	ND		1.0	0.50	mg/L	300.0	NA	21 NOV 96
ulfate	38.5		1.0	0.50	mg/L	300.0	NA	21 NOV 96

- Reporting limit raised due to the matrix of the sample.
- Sample diluted due to the concentration of target compounds.
- Not Detected

orted By: Mark Woolley

Approved By: Richard Persichitte

Purgeable Volatile Organics
Method 8260

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180727065312600 (U.S. Navy 17)
Lab ID: 052686-0001-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 25 NOV 96
Analyzed: 02 DEC 96

Parameter	Result	Units	Reporting Limit
Acetone	ND	ug/L	10
Benzene	ND	ug/L	1.0
Bromodichloromethane	ND	ug/L	1.0
Bromoform	ND	ug/L	1.0
Bromomethane	ND	ug/L	1.0
2-Butanone (MEK)	ND	ug/L	10
Carbon disulfide	ND	ug/L	1.0
Carbon tetrachloride	ND	ug/L	1.0
Chlorobenzene	ND	ug/L	1.0
Chloroethane	ND	ug/L	1.0
2-Chloroethyl vinyl ether	ND	ug/L	1.0
Chloroform	0.74	ug/L	0.50
Chloromethane	ND	ug/L	1.0
Dibromochloromethane	ND	ug/L	1.0
1,2-Dichlorobenzene	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	1.0
1,4-Dichlorobenzene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,2-Dichloroethene (total)	ND	ug/L	1.0
1,1-Dichloroethene	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	1.0
Ethylbenzene	ND	ug/L	1.0
2-Hexanone	ND	ug/L	10
Methylene chloride	ND	ug/L	1.0
4-Methyl-2-pentanone (MIBK)	ND	ug/L	10
Styrene	ND	ug/L	1.0
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	1.0
Toluene	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	1.0
1,1,2-Trichloroethane	ND	ug/L	1.0
Trichloroethene	ND	ug/L	1.0
Trichlorofluoromethane	ND	ug/L	1.0
1,2,3-Trichloropropane	ND	ug/L	1.0
Vinyl acetate	ND	ug/L	10
Vinyl chloride	ND	ug/L	1.0
Xylenes (total)	ND	ug/L	1.0

Dilution factor is 1.0.

All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Sandra Jones

Approved By: Audrey Cornell

Purgeable Volatile Organics
Method 8260

DRAFT (cont.)

Client Name: U.S. Geological Survey
Client ID: 180727065312600 (U.S. Navy 17)
Lab ID: 052686-0001-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 25 NOV 96
Analyzed: 02 DEC 96

Parameter	Result	Units	Reporting Limit
Surrogate	Recovery		Limits
1,2-Dichloroethane-d4	100	%	70-130
Toluene-d8	102	%	70-130
4-Bromofluorobenzene	98	%	70-130

Dilution factor is 1.0. All results and limits are corrected for dilution.

Reported By: Sandra Jones

Approved By: Audrey Cornell

Volatiles Library Search (20 Compound TIID)
Method 8260

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180727065312600 (U.S. Navy 17)
Lab ID: [redacted]
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: NA
Analyzed: 02 DEC 96

Parameter	Result	Units	Reporting Limit	
Siloxane	1.1	ug/L		J

Dilution factor is 1.0. All results and limits are corrected for dilution.

J - Result is detected below the reporting limit or is an estimated concentration.

Reported By: Sandra Jones

Approved By: Audrey Cornell

DRAFT

Organochlorine Pesticides/PCB's
Method 8080A

Client Name: U.S. Geological Survey
Client ID: 180727085312600 (U.S. Navy 17)
Lab ID: 052686-0001-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 25 NOV 96
Analyzed: 05 DEC 96

Parameter	Result	Units	Reporting Limit	
alpha-BHC	ND	ug/L	0.050	T
beta-BHC	ND	ug/L	0.050	
delta-BHC	ND	ug/L	0.050	
gamma-BHC (Lindane)	ND	ug/L	0.050	
Toxaphene	ND	ug/L	1.0	
Heptachlor	ND	ug/L	0.020	
Aldrin	ND	ug/L	0.050	
Heptachlor epoxide	0.38	ug/L	0.050	
gamma-Chlordane	ND	ug/L	0.050	
Endosulfan I	ND	ug/L	0.050	
alpha-Chlordane	ND	ug/L	0.050	
Dieldrin	ND	ug/L	0.020	
4,4'-DDE	ND	ug/L	0.10	
Endrin	ND	ug/L	0.061	
Endosulfan II	ND	ug/L	0.10	
4,4'-DDD	ND	ug/L	0.10	
Endosulfan sulfate	ND	ug/L	0.10	
4,4'-DDT	ND	ug/L	0.10	
Endrin aldehyde	ND	ug/L	0.10	
Aroclor 1016	ND	ug/L	0.50	
Aroclor 1221	ND	ug/L	0.50	
Aroclor 1232	ND	ug/L	0.50	
Aroclor 1242	ND	ug/L	0.50	
Aroclor 1248	ND	ug/L	0.50	
Aroclor 1254	ND	ug/L	1.0	
Aroclor 1260	ND	ug/L	1.0	
Methoxychlor	ND	ug/L	0.50	

Surrogate	Recovery		Limits
Tetrachloro-m-xylene	86	%	54-106
Dibutyl chlorendate	103	%	56-138
Decachlorobiphenyl	111	%	65-145

Dilution factor is 1.0. All results and limits are corrected for dilution.

T - Preferred values unless footnoted on secondary column test.
ND - Not Detected

Reported By: Dianna Link

Approved By: Kristin Shadowlight

Organochlorine Pesticides/PCB's 2nd Column Data
Method 8080A

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180727065312600 (U.S. Navy 17)
Lab ID: 052886-0001-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 25 NOV 96
Analyzed: 05 DEC 96

Parameter	Result	Units	Reporting Limit	
alpha-BHC	ND	ug/L	0.050	
beta-BHC	ND	ug/L	0.050	
delta-BHC	ND	ug/L	0.050	
gamma-BHC (Lindane)	ND	ug/L	0.050	
Toxaphene	ND	ug/L	1.0	
Heptachlor	ND	ug/L	0.020	
Aldrin	ND	ug/L	0.050	
Heptachlor epoxide	ND	ug/L	0.050	V
gamma-Chlordane	ND	ug/L	0.050	
Endosulfan I	ND	ug/L	0.050	
alpha-Chlordane	ND	ug/L	0.050	
Dieldrin	ND	ug/L	0.020	
4,4'-DDE	ND	ug/L	0.10	
Endrin	ND	ug/L	0.061	
Endosulfan II	ND	ug/L	0.10	
4,4'-DDD	ND	ug/L	0.10	
Endosulfan sulfate	ND	ug/L	0.10	
4,4'-DDT	ND	ug/L	0.10	
Endrin aldehyde	ND	ug/L	0.10	
Aroclor 1016	ND	ug/L	0.50	
Aroclor 1221	ND	ug/L	0.50	
Aroclor 1232	ND	ug/L	0.50	
Aroclor 1242	ND	ug/L	0.50	
Aroclor 1248	ND	ug/L	0.50	
Aroclor 1254	ND	ug/L	1.0	
Aroclor 1260	ND	ug/L	1.0	
Methoxychlor	ND	ug/L	0.50	

Surrogate	Recovery		Limits
Tetrachloro-m-xylene	90	%	54-106
Dibutyl chlorendate	109	%	56-138
Decachlorobiphenyl	110	%	65-145

Dilution factor is 1.0. All results and limits are corrected for dilution.

V = Secondary column result is the preferred value.
ND = Not Detected

Reported By: Dianna Link

Approved By: Kristin Shadowlight

Chlorinated Herbicides
SW-846 List
Method 8150

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180727065312600 (U.S. Navy 17)
Lab ID: 052686-0001-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 26 NOV 96
Analyzed: 04 DEC 96

Parameter	Result	Units	Reporting Limit
2,4-D	ND	ug/L	2.0
2,4-DB	ND	ug/L	5.1
2,4,5-T	ND	ug/L	0.51
2,4,5-TP (Silvex)	ND	ug/L	0.51
Dalapon	ND	ug/L	5.1
Dicamba	ND	ug/L	0.51
Dichlorprop	ND	ug/L	1.0
Dinoseb	ND	ug/L	1.0
MCPA	ND	ug/L	250
MCPP	ND	ug/L	250

Surrogate	Recovery		Limits
DCAA	73	%	45-123

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Joseph Aten

Approved By: Lynn S. Calvin

DRAFT

Metals
Total Metals

Client Name: U.S. Geological Survey
Client ID: 180658065325900 (Well Rehab 2)
Lab ID: 052686-0002-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Prepared: See Below

Received: 21 NOV 96
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
luminum	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
ntimony	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
rsenic	ND		1.0	0.30	mg/L	6010	25 NOV 96	25 NOV 96
arium	ND		1.0	0.10	mg/L	6010	25 NOV 96	25 NOV 96
eryllium	ND		1.0	0.0020	mg/L	6010	25 NOV 96	25 NOV 96
admium	ND		1.0	0.0050	mg/L	6010	25 NOV 96	25 NOV 96
alcium	47.1		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
hromium	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
obalt	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
opper	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
ron	1.9		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
ead	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
agnesium	30.2		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
anganese	0.18		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
olybdenum	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
ickel	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
otassium	ND		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
elenium	ND		1.0	0.40	mg/L	6010	25 NOV 96	25 NOV 96
ilver	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
odium	147		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
hallium	ND		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
anadium	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
inc	0.022		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
senic	ND		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
ad	ND	G	1.0	0.0049	mg/L	6010	25 NOV 96	25 NOV 96
lenium	ND		1.0	0.0050	mg/L	6010	25 NOV 96	25 NOV 96
allium	ND		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96

= Reporting limit raised due to the matrix of the sample.
Not Detected

orted By: Mark Woolley

Approved By: Richard Persichitte

DRAFT

General Inorganics

Client Name: U.S. Geological Survey
Client ID: 180658065325900 (well Rehab 2)
Lab ID: 052686-0002-SA
Matrix: A[redacted]
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Prepared: See Below

Received: 21 NOV 96
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Alkalinity, Total as CaCO3 at pH 4.5	348		1.0	5.0	mg/L	310.1	NA	25 NOV 96
Alkalinity, Bicarb as CaCO3 at pH 4.5	348		1.0	5.0	mg/L	310.1	NA	25 NOV 96
Alkalinity, Carb. as CaCO3 at pH 8.3	ND		1.0	5.0	mg/L	310.1	NA	25 NOV 96
Alkalinity, Hydrox as CaCO3	ND		1.0	5.0	mg/L	310.1	NA	25 NOV 96
Chloride	ND	G	2.0	1.0	mg/L	300.0	NA	21 NOV 96
Fluoride	104	t	2.0	1.0	mg/L	300.0	NA	21 NOV 96
Nitrate as N	1.4		1.0	0.50	mg/L	300.0	NA	21 NOV 96
Orthophosphate as P	ND		1.0	0.50	mg/L	300.0	NA	21 NOV 96
Sulfate	25.7		1.0	0.50	mg/L	300.0	NA	21 NOV 96

G - Reporting limit raised due to the matrix of the sample.
t - Sample diluted due to the concentration of target compounds.
ND - Not Detected

Reported By: Mark Woolley

Approved By: Richard Persichitte

Purgeable Volatile Organics
Method 8260

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180658065325900 (well rehab 2)
Lab ID: 052686-0002-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 25 NOV 96
Analyzed: 02 DEC 96

Parameter	Result	Units	Reporting Limit
Acetone	ND	ug/L	10
Benzene	ND	ug/L	1.0
Bromodichloromethane	ND	ug/L	1.0
Bromoform	ND	ug/L	1.0
Bromomethane	ND	ug/L	1.0
2-Butanone (MEK)	ND	ug/L	10
Carbon disulfide	ND	ug/L	1.0
Carbon tetrachloride	ND	ug/L	1.0
Chlorobenzene	ND	ug/L	1.0
Chloroethane	ND	ug/L	1.0
2-Chloroethyl vinyl ether	ND	ug/L	1.0
Chloroform	1.1	ug/L	0.50
Chloromethane	ND	ug/L	1.0
Dibromochloromethane	ND	ug/L	1.0
1,2-Dichlorobenzene	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	1.0
1,4-Dichlorobenzene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,2-Dichloroethene (total)	ND	ug/L	1.0
1,1-Dichloroethene	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	1.0
Ethylbenzene	ND	ug/L	1.0
2-Hexanone	ND	ug/L	10
Methylene chloride	ND	ug/L	1.0
4-Methyl-2-pentanone (MIBK)	ND	ug/L	10
Styrene	ND	ug/L	1.0
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	1.0
Toluene	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	1.0
1,1,2-Trichloroethane	ND	ug/L	1.0
Trichloroethene	ND	ug/L	1.0
Trichlorofluoromethane	ND	ug/L	1.0
1,2,3-Trichloropropane	ND	ug/L	1.0
Vinyl acetate	ND	ug/L	10
Vinyl chloride	ND	ug/L	1.0
Xylenes (total)	ND	ug/L	1.0

Dilution factor is 1.0.

All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Sandra Jones

Approved By: Audrey Cornell

Purgeable Volatile Organics
Method 8260

DRAFT (cont.

Client Name: U.S. Geological Survey
Client ID: 180658066325900 (well rehab 2)
Lab ID: 052686-0002-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 25 NOV 96
Analyzed: 02 DEC 96

Parameter	Result	Units	Reporting Limit
Surrogate	Recovery		Limits
1,2-Dichloroethane-d4	101	%	70-130
Toluene-d8	101	%	70-130
4-Bromofluorobenzene	100	%	70-130

Dilution factor is 1.0. All results and limits are corrected for dilution.

Reported By: Sandra Jones

Approved By: Audrey Cornell

Volatiles Library Search (20 Compound TID)
Method 8260

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180658065325900 (well rehab 2)
Lab ID: 052[redacted]-0002-SA
Matrix AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: NA
Analyzed: 02 DEC 96

Parameter	Result	Units	Reporting Limit	
None Detected	ND	ug/L		
Siloxane	1.9	ug/L		J
Siloxane	14	ug/L		J

Dilution factor is 1.0. All results and limits are corrected for dilution.

J = Result is detected below the reporting limit or is an estimated concentration.
ND = Not Detected

Reported By: Sandra Jones

Approved By: Audrey Cornell

Organochlorine Pesticides/PCB's
Method 8080A

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180658006326900 (Well Rehab 2)
Lab ID: 052886-0002-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 25 NOV 96
Analyzed: 05 DEC 96

Parameter	Result	Units	Reporting Limit	
alpha-BHC	ND	ug/L	0.050	T
beta-BHC	ND	ug/L	0.050	
delta-BHC	ND	ug/L	0.050	
gamma-BHC (Lindane)	ND	ug/L	0.050	
Toxaphene	ND	ug/L	1.0	
Heptachlor	ND	ug/L	0.020	
Aldrin	ND	ug/L	0.050	
Heptachlor epoxide	ND	ug/L	0.050	
gamma-Chlordane	ND	ug/L	0.050	
Endosulfan I	ND	ug/L	0.050	
alpha-Chlordane	ND	ug/L	0.050	
Dieldrin	ND	ug/L	0.020	
4,4'-DDE	ND	ug/L	0.10	
Endrin	ND	ug/L	0.001	
Endosulfan II	ND	ug/L	0.10	
4,4'-DDD	ND	ug/L	0.10	
Endosulfan sulfate	ND	ug/L	0.10	
4,4'-DDT	ND	ug/L	0.10	
Endrin aldehyde	ND	ug/L	0.10	
Aroclor 1016	ND	ug/L	0.10	
Aroclor 1221	ND	ug/L	0.50	
Aroclor 1232	ND	ug/L	0.50	
Aroclor 1242	ND	ug/L	0.50	
Aroclor 1248	ND	ug/L	0.50	
Aroclor 1254	ND	ug/L	0.50	
Aroclor 1260	ND	ug/L	1.0	
Methoxychlor	ND	ug/L	1.0	
			0.50	

Surrogate	Recovery		Limits
Tetrachloro-m-xylene	82	%	54-106
Dibutyl chlorendate	101	%	56-138
Decachlorobiphenyl	105	%	65-145

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Dianna Link

Approved By: Kristin Shadowlight

DRAFT

Metals
Total Metals

Client Name: U.S. Geological Survey
Client ID: 180654065325900 (U.S. Navy 6)
Lab ID: 052686-0003-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 20 NOV 96
Prepared: See Below

Received: 21 NOV 96
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Aluminum	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
Antimony	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
Arsenic	ND		1.0	0.30	mg/L	6010	25 NOV 96	25 NOV 96
Barium	0.10		1.0	0.10	mg/L	6010	25 NOV 96	25 NOV 96
Beryllium	ND		1.0	0.0020	mg/L	6010	25 NOV 96	25 NOV 96
[illegible]mium	ND		1.0	0.0050	mg/L	6010	25 NOV 96	25 NOV 96
alcium	46.0		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
hromium	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
obalt	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
opper	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
ron	5.0		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
ead	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
agnesium	22.8		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
anganese	0.54		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
olybdenum	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
ickel	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
otassium	ND		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
elenium	ND		1.0	0.40	mg/L	6010	25 NOV 96	25 NOV 96
ilver	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
odium	133		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
hallium	ND		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
anadium	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
inc	0.010		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
rsenic	ND		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
ead	ND		1.0	0.0030	mg/L	6010	25 NOV 96	25 NOV 96
lenium	ND		1.0	0.0050	mg/L	6010	25 NOV 96	25 NOV 96
allium	ND		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96

= Not Detected

orted By: Mark Woolley

Approved By: Richard Persichitte

DRAFT

General Inorganics

Client Name: U.S. Geological Survey
Client ID: 180654065325900 (U.S. Navy 6)
Lab ID: 052686-0003-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 20 NOV 96
Prepared: See Below

Received: 21 NOV 96
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Alkalinity, Total as CaCO3 at pH 4.5	309		1.0	5.0	mg/L	310.1	NA	25 NOV 96
Alkalinity, Bicarb. as CaCO3 at pH 4.5	309		1.0	5.0	mg/L	310.1	NA	25 NOV 96
Alkalinity, Carb. as CaCO3 at pH 8.3	ND		1.0	5.0	mg/L	310.1	NA	25 NOV 96
Alkalinity, Hydrox. as CaCO3	ND		1.0	5.0	mg/L	310.1	NA	25 NOV 96
luoride	ND	G	2.0	1.0	mg/L	300.0	NA	21 NOV 96
hloride	89.7		1.0	0.50	mg/L	300.0	NA	21 NOV 96
itrate as N	1.6		1.0	0.50	mg/L	300.0	NA	21 NOV 96
~~orthophosphate as P~~	~~ND~~		1.0	0.50	mg/L	300.0	NA	21 NOV 96
ulfate	19.4		1.0	0.50	mg/L	300.0	NA	21 NOV 96

~~Reporting limit raised due~~ to the matrix of the sample.
= Not Detected

orted By: Mark Woolley

Approved By: Richard Persichitte

Gasoline Range Organics and Selected Components
Method API GRO

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180654065325900 (U.S. Navy 6)
Lab ID: 052686-0003-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 20 NOV 96
Received: 21 NOV 96

Prepared: NA
Analyzed: 25 NOV 96

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	ND	ug/L	0.50
Gasoline Range Organics	ND	ug/L	10

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	100	%	75-125

Dilution factor is 1.0.

All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Kenneth Aten

Approved By: Audrey Cornell

Chlorinated Herbicides
SW-846 List
Method 8150

DRAFT

Client Name: U.S. Geological Survey
Client ID: 180658065325900 (U.S. Navy 6)
Lab ID: 052686-0002-SA
Matrix: AQUEOUS
Authorized: 21 NOV 96

Sampled: 19 NOV 96
Received: 21 NOV 96

Prepared: 26 NOV 96
Analyzed: 04 DEC 96

Parameter	Result	Units	Reporting Limit
2,4-D	ND	ug/L	2.1
2,4-DB	ND	ug/L	5.1
2,4,5-T	ND	ug/L	0.51
2,4,5-TP (Silvex)	ND	ug/L	0.51
Dalapon	ND	ug/L	5.1
Dicamba	ND	ug/L	0.51
Dichlorprop	ND	ug/L	1.0
Dinoseb	ND	ug/L	1.0
MCPA	ND	ug/L	260
MCPP	ND	ug/L	260

Surrogate	Recovery		Limits
DCAA	82	%	45-123

Dilution factor is 1.0.

ND = Not Detected

Reported By: Joseph Aten

All results and limits are corrected for dilution.

Approved By: Lynn S. Calvin

DRAFT

Metals
Total Metals

:lient Name: U.S. Geological Survey
:lient ID: 180637065331000 (U.S. Navy 10)
.ab ID: 052686-0005-SA
latrix: AQUEOUS
uthorized: 21 NOV 96

Sampled: 20 NOV 96
Prepared: See Below

Received: 21 NOV 96
Analyzed: See Below

'arameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
luminum	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
ntimony	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
rsenic	ND		1.0	0.30	mg/L	6010	25 NOV 96	25 NOV 96
arium	ND		1.0	0.10	mg/L	6010	25 NOV 96	25 NOV 96
eryllium	ND		1.0	0.0020	mg/L	6010	25 NOV 96	25 NOV 96
admium	ND		1.0	0.0050	mg/L	6010	25 NOV 96	25 NOV 96
alcium	14.5		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
hromium	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
obalt	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
opper	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
ron	2.0		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
ead	ND		1.0	0.20	mg/L	6010	25 NOV 96	25 NOV 96
agnesium	12.2		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
anganese	0.33		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96
olybdenum	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
ickel	ND		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
otassium	ND		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
elenium	ND		1.0	0.40	mg/L	6010	25 NOV 96	25 NOV 96
ilver	ND		1.0	0.030	mg/L	6010	25 NOV 96	25 NOV 96
odium	156		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
hallium	ND		1.0	5.0	mg/L	6010	25 NOV 96	25 NOV 96
[redacted]	[redacted]		1.0	0.040	mg/L	6010	25 NOV 96	25 NOV 96
inc	0.031		1.0	0.010	mg/L	6010	25 NOV 96	25 NOV 96

RECEIVE STOP

KTD-SS01

KTD-SS03

KTD-SS08

QA-SS01

QA-SS03

QA-SS04

QA-SS06

QB-SW04

QB-SW02

QB-SW03

QS-SS01

QS-SS04

QS-SS05

QS-SS06

Table 1
Naval Ammunition Storage Detachment, Vieques, Puerto Rico,
Aerial Photographic Analysis Findings from 1936 to 1999

UTM coordinates are derived from UTM Zone 20, NAD83.

IDENTIFIER	DESCRIPTION	OBSERVATION DATE	UTM LONGITUDE	UTM LATITUDE
AOC-B	waste water treatment plant	1985, 1999	232637	2006532
AOC-C	ditch	1996	232629	2005882
AOC-D	vehicle	1985	233482	2004999
AOC-G	building	1959	227481	2004841
AOC-G	building removed	1997	227454	2004844
AOC-G	two vertical tanks	1959, 1962, 1973, 1999	227455	2004855
AOC-H	power plant	1959, 1967, 1970, 1985, 1999	233091	2006356
AOC-I	quarry	1959, 1967, 1970, 1985, 1999	234317	2006188
AOC-Q	debris	1959, 1961, 1970, 1985, 1999	235099	2006218
AOC-R	former operations/staging area	1967, 1970	232250	2004335
PI-01	ground scar	1970	227904	2004484
PI-02	probable stain	1970	227884	2003268
PI-03	probable stain	1970	227971	2003350
PI-04	liquid	1970	227896	2003435
PI-05	possible vegetation stress	1970	227968	2003585
PI-06	possible vegetation stress	1970	227964	2003782
PI-07	ground scar and possible debris	1970	233515	2002945
PI-08	ground scar	1985, 1999	232442	2004922
PI-09	maintenance rack	1999	232911	2005889
PI-10	excavation and post building foundation	1985	230106	2004332
PI-11	vegetation stress	1985, 1999	229674	2004732
PI-13	storage pad	1996	232079	2005868
PI-14	vegetation stress and dead trees	1996	233000	2002162
PI-15	ditch	1964	233376	2002164
PI-16	ditch	1964	233423	2002877
PI-17	access road	1964	233188	2002867
PI-18	ground scar or possible debris	1987	229726	2004350
PI-19	ground scar or possible debris	1987	229658	2004363
PI-20	access roads	1967	229794	2004438
PI-21	fenced area	1985	233336	2004458
PI-23	access road	1967	231321	2004978
PI-24	trench	1967	233353	2003527
PI-25	ground scar and possible fill area	1970	233921	2004823
PI-26	light-toned material and possible debris	1967	233919	2004826
PI-27	access road	1967	233958	2004862
PI-28	storage pad	1959, 1962, 1973, 1985	230277	2004962
PI-29	vehicles and open storage	1967	230200	2004981
ROTHR	ROTHR radar site	1999	234076	2002870
SWMU-04	trench	1962, 1964	227872	2003129
SWMU-04	ground scar	1964	227889	2003294
SWMU-04	ground scar or disturbed ground	1970	227909	2003191
SWMU-04	ground scar or disturbed ground	1970	227884	2003118
SWMU-04	ground scar or disturbed ground	1970	227870	2003147
SWMU-04	ground scar or disturbed ground	1970	227924	2003165
SWMU-06	disposal area	1967, 1970, 1985	228955	2005276
SWMU-07	disposal area	1970	231618	2006324
SWMU-14	wash rack	1985	232797	2006844
SWMU-14	wash rack and oil water separator	1999	232852	2006848

Legend

- Background Surface Water/Sediment Sample Locations
- Background Groundwater Sample Locations
- Background Soil Sample Locations
- Photo Identified Site Locations

N

1000 0 1000 2000 3000 Feet

Soil Legend

Quaternary
Qa - Alluvial Deposits, Sand , Silt, Clay, Gravel Flood Plain, Terrace Deposits, and Piedmont Fan Deposits.

Qb - Beach and Dune Deposits, Largely Calcite, Quartz and Volcanic Rocks, and Fragment Sand With Local Magnetite.

Qs - Swamp and Marsh Deposits, Organic Muck, Sandy or Silty, and Peat.

Tertiary
Ti - Marine Sedimentary Rocks, Undivided Cretaceous

KTd - Plutonic Rocks, Largely Grandiorite, and Quartz Diorite, Locally Deeply Weathered

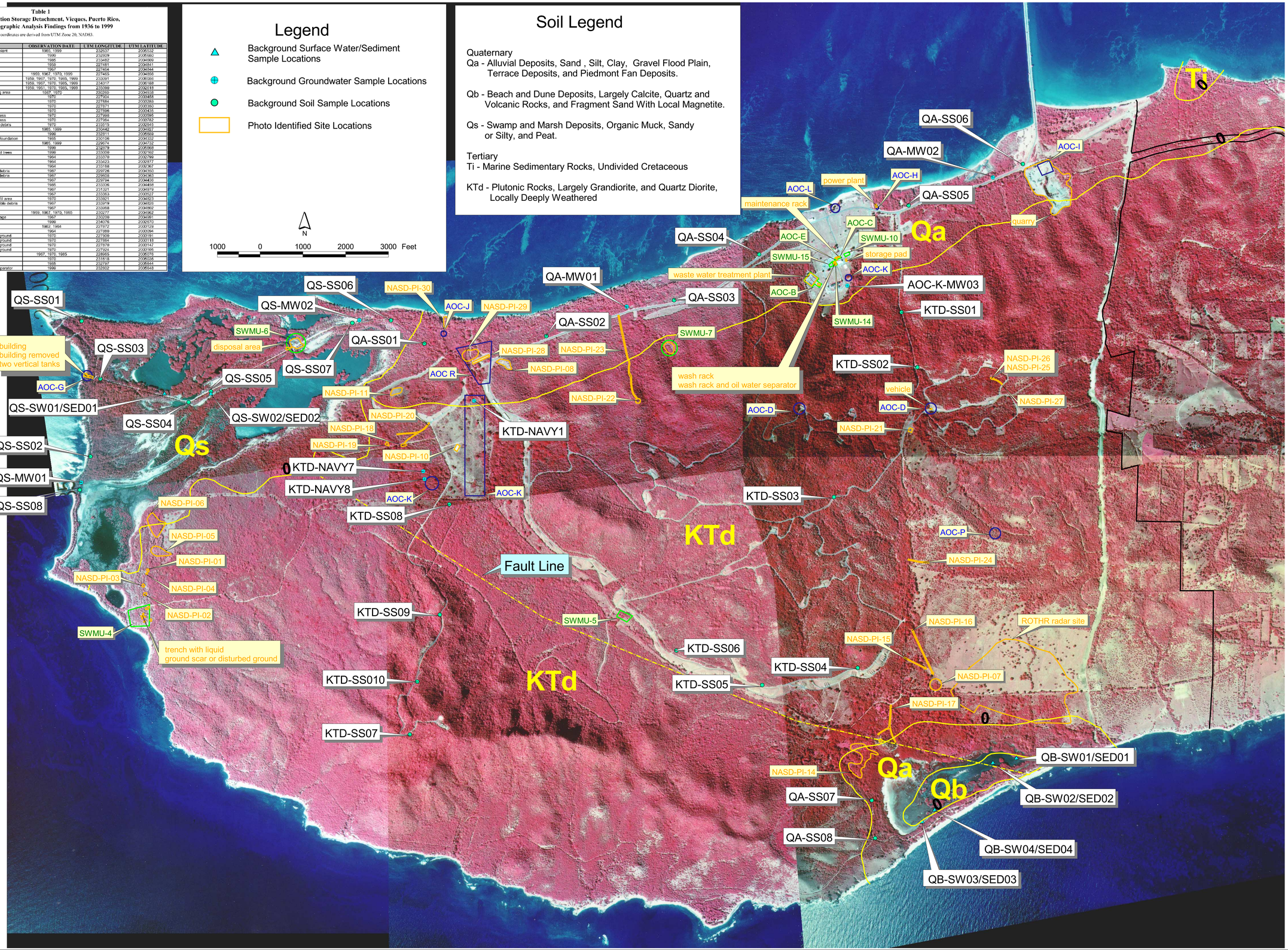


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Figure A: Geological Features of Vieques Around NASD, along with Background Sample Locations, Location of SWMU/AOCs and Photo Identified Anomalies from Environmental Baseline Survey