SAMPLING REPORT
FORMER IRONITE PRODUCTS COMPANY FACILITY

Prepared for

North American Industries
Humboldt, Arizona

May 14, 2009

BROWN AND CALDWELL

Environmental Engineers & Consultants

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Brown and Caldwell Project #: 134427.200

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9/30/09

REGISTERED GEOLOGIST CERTIFICATE NO. 38865 RANDY D. BAUER Date Signed 5-14-09 ARIZONA, U.S.A.
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LIST OF ACRONYMS

ABA	acid base accounting
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AGP	acid-generation potential
ANP	acid-neutralization potential
ASA	American Society of Agronomy
ASTM	American Society for Testing and Materials
AWQS	Aquifer Water Quality Standard
bgs	below ground surface
BMPs	Best Management Practices
COPC	compounds of potential concern
GPL	Groundwater Protection Limit
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
LDC	Laboratory Data Consultants, Inc.
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MSD	matrix spike/matrix spike duplicate
MSHA	Mine Safety and Health Administration
NAI	North American Industries
NOV	Notice of Violation
PA/SI	Preliminary Assessment/Site Inspection
PQL	practical quantitation limits
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RPD	relative percent difference
SPLP	Synthetic Precipitation Leachability Procedure
SRL	Soil Remediation Level
SWPPP	Storm Water Pollution Prevention Plan
SWQS	Surface Water Quality Standard
USEPA	United States Environmental Protection Agency
VRP	Voluntary Remediation Program
YJD	Yellow Jacket Drilling, Inc.

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1. INTRODUCTION

The former Ironite Products Company (Ironite), now dba North American Industries (NAI), retained Brown and Caldwell to perform surface and subsurface soil sampling within and in the vicinity of the NAI property located at the intersection of Iron King Road and Arizona State Highway No. 69 in Humboldt, Arizona (Site). The purpose of the sampling was to evaluate the potential of the mine tailings located on the Site to impact groundwater quality, and to determine the extent of past tailings releases on nearby properties. The investigation was conducted in accordance with the Ironite Environmental Project Work Plan prepared on June 29, 2005, revised on March 5, 2007, and approved by the Arizona Department of Environmental Quality (ADEQ) on March 27, 2007. This document describes the field procedures implemented, the analytical results obtained, a technical evaluation of the results, and our conclusions and recommendations regarding the need for additional investigation and/or remediation activities.

1.1 Background

The NAI property occupies 85 acres of land located at the intersection of Iron King Road and Arizona State Highway No. 69 near Humboldt, Arizona (Figure 1). The Site is generally located within the southwestern portion of Section 15 and the northwestern portion of Section 22, Township 13 North, Range 1 East of the Gila and Salt River Baseline and Meridian. The Site is bounded to the northeast by residential properties, to the northwest and west by a construction debris landfill (Kuhles), to the southeast by a pick and pull vehicle yard with residential properties south of the yard, to the south and southwest by undeveloped State Forest land, and to the east by Highway 69 with mixed commercial and residential properties east of the road.

A large tailings impoundment, which was generated by the processing of ore at the Iron King mine from 1904 through 1969, occupies most of the 85 acres comprising the Site. Until 1942, gold and silver was recovered through a cyanide operation owned by Iron King Mining. From 1942 to 1969, the mine was owned by Shattuck-Denn Mining Company and used primarily to recover zinc and lead. Tailings produced from this mine were discharged into a small dammed wash that originated immediately to the east of the mine. Over time, the tailings filled much of this wash. A major failure occurred in the tailings dam in the late 1960s that reportedly discharged tailings to the wash beyond the present location of Highway 69. The evidence of the failure is still visible on the eastern face of the tailings pile.

In 1974, the former Ironite Products Company, now NAI, purchased the portion of the mine property that contained the tailings and has since developed a process for converting the tailings into a soil supplement that is widely distributed and sold. Processing facilities, warehouses, and an administration building were constructed on the property to support these operations.

The NAI property is classified as an active mine and is subject to regulation by the United States Mine Safety and Health Administration (MSHA). It also operates under an ADEQ-issued air permit and a Storm Water Pollution Prevention Plan (SWPPP).

On October 7, 2002, ADEQ submitted to the United States Environmental Protection Agency (USEPA) a report of a Preliminary Assessment/Site Inspection (PA/SI) that ADEQ had conducted on the Iron King Mine and Tailings PA/SI Site (PA/SI Site). The PA/SI Site is currently comprised of the NAI property, the landfill property to the west owned by Kuhles Capital (Kuhles), and property owned by Mr. Terry Nolan.

The area in which the Iron King mine and ore processing facilities were located remained essentially undeveloped until it was purchased by Kuhles. A large open pit, or glory hole, is located on the north side of the Kuhles property. In January 2002, Kuhles obtained an Aquifer Protection Permit from ADEQ Solid Waste Section to operate a construction debris landfill. Kuhles operates a solid waste disposal facility, presently sorting wastes at the property, sending recyclable materials off site for further processing, and disposing of construction debris into the glory hole. For purposes of this report, reference to the mine area means the portion of the original mine property currently owned by Kuhles. It does not include the NAI property.

According to the PA/SI report, soil samples were collected from the Iron King Mine, the Tailings PA/SI Site, and from other nearby properties. Additionally, samples of groundwater, surface water, and sediments were collected from the Site and from nearby properties. The samples were analyzed for a wide variety of organic and inorganic chemicals. As expected, samples of tailings contained elevated concentrations of certain metals but little, if any, organic chemicals. The same metals were detected, although at much lower concentrations, in soil samples collected from adjacent properties and in samples of sediment collected from the Chaparral Wash and other unnamed washes in the study area. Groundwater samples were found to be generally free of organics and elevated concentrations of metals.

On February 19, 2003, the USEPA mailed copies of the PA/SI report to NAI and to 12 other organizations and individuals. In its cover letter, the USEPA noted that further study was warranted. Following its review of the PA/SI report, NAI agreed that further study was needed, and submitted an application to ADEQ for permission to participate in the Voluntary Remediation Program (VRP). Following ADEQ's approval of the application, NAI met with the VRP staff to discuss the development of a work plan that would identify the scope of investigations and the plans and procedures NAI would use during those investigations.

1.2 Previous Investigations

The Ironite facility was issued a Notice of Violation (NOV) by the ADEQ on March 31, 2003, related to a storm water discharge observed during a site inspection on February 24, 2003. The discharge was observed in a culvert that has been in place since the tailings impoundment was constructed. The culvert allowed storm water to discharge from the tailings area into an unnamed wash, which flows toward Chaparral Gulch.

Ironite initiated several actions to address the ADEQ concerns related to storm water discharge. Ironite prepared and submitted a SWPPP to ADEQ and began to implement and install the proposed Best Management Practices (BMPs). Other actions taken by Ironite included the removal of the culverts that had potential to discharge storm water from the Site and increasing the capacity of some of the on-site storm water retention basins. Further, drainage structures have been installed to divert surface water from the mine area to the Chaparral Gulch to the north and to an unnamed wash to the south, thereby preventing run-on from the mine area. Since the structures were installed, precipitation falling directly onto NAI's property drains to, and is fully contained in, impoundments located on the property.

Chaparral Gulch, a major surface drainage feature north of the NAI property, receives drainage from the mine area and, in response to storm events, discharges into the Agua Fria River about 2 miles southeast of the NAI property. An unnamed wash immediately south of the NAI facility also receives drainage from the mine area and discharges into the Agua Fria River. Before Ironite installed the control measures described above, surface water from the mine area was able to flow onto the tailings pile and commingled with runoff from the NAI property. The runoff then exited the property and crossed Highway 69 where it flowed into another unnamed wash before discharging into the Chaparral Gulch.

In August and September 2004, in response to ADEQ concerns that metals could be leaching from the tailings and impacting the local groundwater, Brown and Caldwell performed a study of the groundwater conditions near the NAI property. The study was comprised of two principal components: (1) a review of information available from the Arizona Department of Water Resources (ADWR) and other sources regarding the hydrogeologic features that affect the flow and quality of groundwater beneath and downgradient of the facility; and (2) the collection and analysis of groundwater samples from 10 wells located at, and in the vicinity of, the NAI property. Brown and Caldwell issued its report of the study on January 14, 2005.

One of the wells investigated was the Kuhles well, a groundwater production well installed within a historical shaft in the mine area. The groundwater level measured at the well by Brown and Caldwell in 2004 was 382 feet below ground surface (bgs). Although the PA/SI report (ADEQ, October 7, 2002) is not clear on this point, it appears that the water level in the well was approximately 168 feet bgs when the samples were collected in 2000. The apparent drawdown is likely associated with the use of the well to produce water for dust control since Kuhles initiated permitted solid waste operations in 2003.

The groundwater study concluded that the NAI property is located in an area where unsaturated Quaternary alluvium overlies bedrock, and a structural highpoint is located at the eastern edge of the property. Based on area water levels, the groundwater flows east to northeast from the NAI property and enters the Agua Fria sub-basin. However, water level data in the area of the Site is limited and the hydrogeologic relationship between the bedrock aquifer and the mine shaft in which the Kuhles well is located is not well understood. It is possible that continued pumping of the Kuhles well may create a cone of depression that extends to the NAI property. This may cause water beneath the property to be artificially drawn to the west.

As part of the groundwater study, on August 10 and 11, 2004, Brown and Caldwell collected groundwater samples from 10 wells located on or near the NAI property. Wells SW09 and SW10, located on NAI's property, are used to produce water for NAI's manufacturing process, dust control, and other non-potable uses. Well SW05 is located on Kuhles' property west of the NAI property. It is located in Mine Shaft No. 7, which served as the Iron King mine's primary mine shaft. Water produced from the well is used for dust control. Two of the seven remaining wells (SW07 and SW08) serve commercial establishments and are not used for drinking water. The remaining five wells (SW01, SW02, SW03, SW04, and SW06) are domestic wells. Three wells (SW01, SW02, and SW03) are used for potable water. The owners of Wells SW04 and SW06 report that their wells are not used for drinking water. On September 29, 2004, a sample of groundwater was collected from a recently completed domestic well (SW11) used for drinking water. The well locations are shown on Figure 2, which also shows the values of selected water quality parameters for each well.

Arsenic was the only metal reported in any of the samples to be in excess of a current Arizona Water Quality Standards (AWQS), and it was detected in only one sample, the sample collected from the Kuhles well (SW05). The reported concentration was 0.87 milligrams per liter (mg/L) as compared to the current AWQS of 0.05 mg/L. Arsenic concentrations in samples from two other wells (SW02 and SW07) were reported to exceed 0.01 mg/L, which is scheduled to become the revised AWQS for arsenic. The only other AWQS exceedance was related to nitrate. Nitrate concentrations in excess of the AWQS of 10 mg/L were detected in the samples collected from the two Ironite wells (SW09 and SW10).

A sample collected from one of the domestic wells (SW03) in August 2004 was reported to contain lead concentrations significantly higher than the AWQS for lead. Although the high concentration was thought to have been the result of a sampling or analytical error, Ironite advised the owner of the finding and obtained permission to collect another sample for analysis. The laboratory reported that the lead concentrations in the second sample were less than the reporting limit of 0.003 mg/L. The reported concentration in the second sample is consistent with the lead concentrations reported in samples from the other wells. The lead concentrations at six of the other wells were also reported to be less than 0.003 mg/L. The lead concentrations at three of the remaining wells (SW09, SW10, and SW11) were only slightly above 0.003 mg/L, and lead concentration at the most highly impacted well (SW05) was only 0.025 mg/L, one-half of the AWQS of 0.05 mg/L.

1.3 Project Objectives

NAI is addressing the prevention of future releases of tailings from the Site through the implementation of work required to comply with an updated air permit and the SWPPP. These activities are governed by the respective ADEQ regulatory programs, and are not described in this report. The purpose of this investigation is to evaluate the impacts of past releases on the environment. Therefore, the primary objectives of this investigation are to:

1. Evaluate the impacts of storm water runoff and dust from the NAI property on adjacent properties; and
2. Determine whether the tailings on the NAI property have impacted groundwater quality and whether controls may be required to reduce or prevent such impacts in the future.

Previous investigations conducted by ADEQ and Brown and Caldwell determined that the metals arsenic, lead, and mercury are the compounds of potential concern (COPCs) both on and off the Site. Additionally, the presence of other priority pollutant metals (antimony, beryllium, cadmium, chromium, copper, nickel, selenium, silver, thallium, and zinc) was assessed at certain locations both on and off the Site.

The concentration of metals within the on-site samples will be compared against their respective non-residential Soil Remediation Levels (SRLs), and the concentration of metals within the off-site samples will be compared to their respective residential SRLs. To determine the potential of the tailings to adversely impact groundwater quality, the concentration of metals within the on-site samples will also be compared against the Arizona minimum Groundwater Protection Levels (GPLs) for each metal. If required, site-specific alternative GPLs will be calculated.

2. COMPREHENSIVE SAMPLING INVESTIGATION

Brown and Caldwell implemented a comprehensive field investigation to accomplish the project objectives identified in Section 1.3. This field investigation included collection and analyses of:

- 57 near-surface (6 to 18 inches) soil samples from 26 on-site sampling locations;
- 23 subsurface soil samples from 6 boring locations throughout the Site;
- 73 near-surface soil samples from 36 off-site sampling locations; and
- 2 surface water samples from two on-site retention ponds.

To evaluate the concentration and distribution of the COPCs within and off the Site, the 153 soil samples collected were analyzed for total arsenic, lead, and mercury. Additionally, 44 of these soil samples were also analyzed for the remaining priority pollutant metals to confirm that none of these metals should be considered COPCs.

To determine the matrix characteristics of the on- and off-site soil materials, 14 of the 153 soil samples collected were tested for pH, organic carbon content, soil texture, and dry bulk density.

To assess the amount of sulfur in the tailings that has been oxidized, the amount of sulfur that is available for oxidation, and the potential of the surrounding soil to neutralize the acid that is produced by the oxidation process, 13 of the 153 soil samples collected were subjected to Acid Base Accounting (ABA) analyses.

To determine the potential of surface water within the two on-site impoundments to adversely impact groundwater, water samples collected from each pond were analyzed for total recoverable arsenic and lead.

The investigation was conducted in three separate events: an initial on-site near-surface soil sampling, followed by the drilling and sampling of six on-site soil borings through the tailings pile, and the collection of surface and near-surface soil samples from off-site locations after obtaining access agreements from property owners. The following sections describe each of the three investigation events.

2.1 On-Site Sampling

On March 19 and 20, 2008, Brown and Caldwell collected a total of 57 soil samples, consisting of 52 primary and 5 duplicate soil samples from 26 sample locations throughout the Site (Figure 3). The soil samples were collected at depths of 6 and 18 inches bgs or until refusal was encountered. A stainless-steel hand auger was used to bore to the desired depth and retrieve the soil material. The material was transferred into laboratory provided 8-ounce glass jars using a stainless-steel trowel. The jars were then properly labeled, placed inside a sealable plastic bag, and stored in an ice chest containing ice until submitted under chain-of-custody protocol to the analytical laboratory.

The on-site sampled material consisted mostly of orange, red, yellow, or dark grey silt-sized tailings; brown, gravelly, native soil/tailings mixture; fill; or native soil. Native soil was encountered at one sampling location (NAI-S11) along the northeast boundary of the facility.

The hand auger and the trowel were decontaminated prior to use and between each sampling location by washing with a phosphate-free detergent and rinsing with deionized water. Once sampling was completed at each location, the augered holes were backfilled using the soil cuttings generated during augering.

2.2 On-Site Drilling of Soil Borings

On March 25 and March 26, 2008, Brown and Caldwell collected a total of 23 subsurface samples, consisting of 21 primary and 2 duplicate samples from 6 soil borings (B-1 through B-6) drilled at the Site (Figure 4). The soil samples were collected at varying depths, according to which boring was being sampled.

The borings were drilled to native soil or bedrock, a depth that varied throughout the Site. The drilling was performed by Yellow Jacket Drilling, Inc. (YJD) using a BK-81 hollow-stem auger drill rig. The total depth, the sampled interval, and the depth at which native soil was encountered in each boring are provided below:

Boring Number	Total Depth (feet bgs)	Sampled Depth (feet bgs)	Depth to Native Soil (feet bgs)
B-1	70	5, 25, 45	60
B-2	45	5, 15, 25, 35	40
B-3	50	5, 15, 25, 35, 45	47
B-4	25	5, 15	15
B-5	55	5, 15, 25, 35, 45	45
B-6	120	85, 105	110

The soil samples were collected using an 18-inch long stainless steel discrete soil sampler lined with three 6-inch long brass sleeves. As the samples were retrieved, the ends of the soil-filled brass sleeves were covered with Teflon® liners and capped with plastic caps. The brass sample sleeves were then properly labeled, placed inside a sealable plastic bag, and stored in an ice chest containing ice until submitted under chain-of-custody protocol to the analytical laboratory.

Drilling and sampling activities were directed by an experienced field geologist who prepared detailed boring logs documenting the field activities. Copies of the completed boring logs are included in Appendix A.

The tailings material ranged in size from very fine grained sand to silt, with a shiny metallic luster. The upper 2 to 5 feet of the tailings are oxidized, having a distinctive orange-red color. In contrast, the tailings beneath the oxidized layer are dark green to dark grey. The density of the material ranged from loose to medium dense, and the moisture content ranged from dry to moist. Saturated zones were not encountered in any of the soil borings. Native soil consisted of a brown, dense to very dense, dry to slightly moist, sandy silt with gravel.

The split-tube sampler and the brass sleeves were decontaminated prior to each use by washing with a phosphate-free detergent and rinsing with de-ionized water. Once sampling was completed at each location, the soil borings were backfilled with grout and cement.

2.3 Off-Site Sampling

During the period of June 4 through June 7, 2008, Brown and Caldwell collected a total of 73 near-surface samples, consisting of 66 primary and 7 duplicate samples from 36 sample locations within 12 off-site parcels (Figure 3). Prior to sampling, NAI obtained signed access agreements from the owners of the 12 parcels sampled. The parcels sampled, the owners of the parcels, and the corresponding sampling locations are presented below:

Parcel Number	Owner	Sampling Locations
402-01-039E	Kuhles Capital L.L.C.	OS-76, OS-77, OS-78
402-08-035	Kuhles Capital L.L.C.	OS-30, OS-75
402-08-037C	Kuhles Capital L.L.C.	OS-29
402-08-051C	William & Nita Hyslip	OS-5, OS-6,
402-08-051F	Delford Hyslip	OS-7,
402-08-051K	Delford Hyslip	OS-1, OS-11, OS-25, OS-26
402-08-052G	William & Nita Hyslip	OS-4
402-08-052K	Bradley Auringer	OS-8, OS-9, OS-21
402-08-052L	Bradley Auringer	OS-10, OS-22, OS-23, OS-24
402-08-064A	JT's Backhoe & Septic L.L.C.	OS-3, OS-60, OS-82
800-05-002W	US Bureau of Land Management	OS-48, OS-50, OS-52, OS-90
800-20-060S	State of Arizona	OS-12, OS-13, OS-14, OS-15, OS-17, OS-18, OS-19, OS-20

Unfortunately, the owner of Parcel 402-08-034A declined access to his property, and the owners of the following parcels could not be located/contacted:

402-08-069W
402-08-071D
402-08-039A
402-08-040A
402-08-039M
402-08-025
402-08-023

Additionally, coordination and access to the Arizona Department of Transportation (ADOT) right-of-way along Highway 69 could not be obtained prior to the scheduled off-site sampling event. The locations of the above off-site parcels are shown on Figure 5.

The soil samples were collected at depths of 6 and 18 inches bgs or until refusal was encountered. A stainless-steel hand auger was used to bore to the desired depth and retrieve the soil material. The material was transferred into laboratory provided 8-ounce glass jars using a stainless-steel trowel. The jars were then properly labeled, placed inside a sealable plastic bag, and stored in an ice chest containing ice until submitted under chain-of-custody protocol to the analytical laboratory.

The on-site sampled material consisted mostly of brown, gravelly, native soil; native soil/tailings mixture; and/or orange, red, yellow, or dark grey silt-sized tailings. Tailings material was encountered within parcels: 402-01-039E, northwest of the Site; 402-08-035 and 402-08-037C, located north of the Site; and 800-20-060S, located south of the Site.

The hand auger and the trowel was decontaminated prior to use and between each sampling location by washing with a phosphate-free detergent and rinsing with deionized water. Once sampling was completed at each location, the augered holes were backfilled using the soil cuttings generated during augering.

2.4 Surface Water Sampling

On March 20, 2008, Brown and Caldwell collected surface water samples from two on-site storm water retention ponds (Figure 4). Sample SW-1 was collected from a retention pond located on the eastern portion of the Site, east of the main tailings pile. The water within this pond was observed to have a reddish color. Sample SW-2 was collected from a small retention pond located on the northeast portion of the Site, north of NAI's office building. The water within this pond was observed to be clear.

Brown and Caldwell used a clean, unpreserved plastic container to collect water from each pond and transfer the liquid into laboratory-provided containers. The containers were then properly labeled, placed inside a sealable plastic bag, and stored in an ice chest containing ice until submitted under chain-of-custody protocol to the analytical laboratory.

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3. ANALYTICAL RESULTS

A total of 153 soil samples and 2 surface water samples were collected and analyzed during this investigation. The following sections describe the results obtained from the analyses of metals, matrix characteristics, ABA, and synthetic precipitation leachability procedure (SPLP) tests.

3.1 Metals Results

The 153 soil samples collected from on- and off-site locations were analyzed for total arsenic, lead, and mercury using USEPA Test Methods 6010B and 7471A. Additionally, 44 of these soil samples were also analyzed for the remaining priority pollutant metals using USEPA Test Method 6010B. A summary of the analytical results for metals detected in the samples collected during the on-site near-surface sampling, on-site drilling, and off-site near-surface sampling are presented in Tables 1, 2, and 3, respectively. The complete analytical laboratory reports are included in Appendix B.

As expected, the concentration of COPCs within the on-site surface and subsurface boring samples (mostly comprised of tailings material) was high. The concentration of arsenic ranged from 9.8 to 13,000 milligrams per kilogram (mg/kg), lead concentrations ranged from less than 5 mg/kg up to 24,000 mg/kg, and the concentration of mercury ranged from less than 0.083 to 160 mg/kg.

A large portion of the mine tailings impoundment is located on off-site parcel 800-20-060S, owned by the State of Arizona, located south of the Site (Figure 5). Similarly, large quantities of tailings materials are present within off-site parcels 402-01-039E, 402-08-035, and 402-08-037C, owned by Kuhles Capital, LLC, located north and northwest of the Site. The samples collected within these off-site parcels, mostly comprised of tailings material, also contained high concentrations of COPCs. Arsenic was detected with concentrations up to 12,000 mg/kg, lead concentration reached 3,100 mg/kg, and mercury concentration reached 21 mg/kg.

However, the concentration of COPCs detected in soil samples collected from the remaining off-site parcels was significantly reduced. The concentration of arsenic detected at the remaining off-site soil sampling locations ranged from 13 to 110 mg/kg. The highest lead concentration detected was 79 mg/kg, significantly lower than the residential SRL of 400 mg/kg. The concentration of mercury within the soil samples collected within the remaining off-site parcels ranged from less than 0.083 up to 0.7 mg/kg, significantly below the residential SRL of 23 mg/kg.

The 8 on-site and 27 off-site near-surface samples analyzed for antimony, beryllium, cadmium, chromium, copper, nickel, selenium, silver, thallium, and zinc generally contained non-detectable to relatively low concentration of these metals, none of which exceeded their respective residential SRLs. However, the concentration of these metals detected in the six on-site boring samples was significantly higher, but none exceeded their applicable non-residential SRLs.

To determine the leachability of the COPCs, five of the on-site near-surface samples containing the higher concentrations of COPCs were subjected to SPLP extraction (SW Method 1312), and the leachate was analyzed for arsenic, lead, and mercury using USEPA Test Method 6010B and 7471A. A summary of the analytical results obtained from the five samples is presented in Table 4. The

complete analytical laboratory report is included in Appendix B. Table 4 provides the total metals concentration in soil, the respective SPLP leachate concentrations, and the corresponding ratio of the total soil concentration to the leachate concentration for each sample. As shown in Table 4, none of the leachate samples contained detectable concentrations of lead and mercury. However, arsenic was detected at concentrations ranging from 0.013 to 3.0 mg/L in the leachate of four of the five samples extracted. The fifth leachate sample did not detect arsenic above the laboratory's detection limit.

In accordance with the guidance provided in ADEQ's *Screening Method to Determine Soil Concentrations Protective of Groundwater Quality*, a site-specific alternative GPL for arsenic was calculated by multiplying the lowest total-to-SPLP concentration ratio (1,200) by the current arsenic AWQS (0.05 mg/L) and by the conversion factor of 292.9, resulting in an alternative GPL value of 17,574 mg/kg. None of the 153 soil samples collected during this investigation contained arsenic at a concentration greater than the site-specific alternative GPL.

3.2 Matrix Characteristics

The 14 soil samples analyzed to determine the matrix characteristics of the on- and off-site soil materials were tested for pH using USEPA Test Method Solid Waste 9045, organic carbon content using American Society for Testing and Materials (ASTM) Test Method D2974, soil texture using ASTM Test Method D422 Sec 10, and dry bulk density using Method of Soil Analysis, American Society of Agronomy (ASA) No. 9 Part 2 Sec 13-3. A summary of the analytical results obtained is presented in Table 5. The complete analytical laboratory report is included in Appendix B.

The pH of the off-site samples was slightly higher than the pH of the on-site tailings samples. The average pH of the on-site samples was 7.1, while the average pH of the off-site samples was 8.3. In general, the on-site tailings contained finer grained materials than the off-site samples. The average composition of the on-site samples was 55.8 percent sand, 35.2 percent silt, and 9 percent clay; whereas, the average composition of the off-site materials was 80.5 percent sand, 13.5 percent silt, and 6 percent clay. No other significant difference between the matrix characteristics of the on- and off-site samples was observed.

3.3 Acid Base Accounting

The 13 soil samples subjected to ABA were analyzed using SVL Analytical Test Method 4061 and 4072. A summary of the analytical results obtained is presented in Table 6. The complete analytical laboratory report is included in Appendix B. The ABA methodology measures the acid-generation potential (AGP) and the acid-neutralization potential (ANP) of the materials. The AGP is directly proportional to the amount of pyritic sulfur (unoxidized) present in the tailings, since the oxidation of pyritic sulfur generates sulfuric acid. The difference between the ANP and the AGP is the ABA, representing the net ANP of the material. The units of ANP, AGP, and ABA are expressed in calcium carbonate ($CaCO_3$) equivalents or parts per thousand; that is, tons of $CaCO_3$ required to neutralize the acid generated by the oxidation of 1,000 tons of tailings containing 1 percent pyritic sulfur.

As shown on Table 6, the ABA of the on-site boring samples is negative, indicating that the AGP of the tailings is greater than their associated ANP. Additionally, the tailings contain approximately between 10 to 17 percent of unoxidized pyritic sulfur, which should they become exposed to oxidation, could generate acid rock drainage. The negative ABA and the large sulfide content of the tailings suggests that the tailings material could have a strong potential to generate acid rock drainage, requiring that storm water runoff from the Site be properly controlled.

The only two on-site samples containing a positive ABA were sample NAI-S14-18, located along the eastern property boundary, and sample NAI-B4-15, collected from on-site boring B-4 at a depth of 15 feet bgs, consisting of native soil. All four of the off-site samples subjected to ABA testing indicated a lack of sulfur and a positive ABA, essentially having no AGP.

3.4 Surface Water Samples

The two surface water samples were analyzed for total recoverable arsenic and lead using USEPA Test Method 200.8. The complete analytical laboratory report is included in Appendix B. The surface water sample (SW-1) collected from the retention pond located on the eastern portion of the Site contained very high concentrations of total arsenic (198 mg/L) and total lead (1.54 mg/L), both exceeding their respective surface water quality standard (SWQS) of 0.2 mg/L and 0.1 mg/L. The surface water sample (SW-2) collected from the retention pond located in the northeast portion of the Site contained significantly lower concentrations of total arsenic (0.0654 mg/L) and total lead (0.0493 mg/L), well below their respective SWQS.

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4. QUALITY ASSURANCE/QUALITY CONTROL

Field quality assurance/quality control (QA/QC) samples collected during the project consisted of duplicate and equipment rinsate blanks. A total of 14 duplicate samples were collected, representing a frequency of one per ten field samples collected. Duplicate samples were collected in the same manner as original samples and analyzed for the same parameters. Additionally, five equipment rinsate blanks were collected, one at the end of each field day. The equipment blanks were collected by pouring distilled water over the previously decontaminated hand auger used to collect the soil samples. The rinsate was collected into laboratory-provided containers, properly capped, labeled, and stored with the soil samples in the ice chest. The equipment rinsate blanks were analyzed for the 13 priority pollutant metals. The analytical results of the duplicates and equipment blanks are included with the respective laboratory reports in Appendix B.

The primary, duplicates, and equipment blank samples were submitted to Columbia Analytical, which prepared and analyzed several types of QA/QC samples, including method blanks, laboratory control samples (LCS), surrogate spike analyses, matrix spike/matrix spike duplicate (MS/MSD) samples, and check standards. Results of these QA/QC samples analyses are included with the analytical laboratories reports provided in Appendix B.

4.1 Data Verification

The verification and validation of data generated during this project was performed in a manner that is consistent with industry standards. Upon receipt of complete and final analytical reports from the laboratory, Brown and Caldwell performed a Level II data review on 100 percent of the soil confirmation sample results.

The following activities were performed:

- Comparison of primary and field duplicate samples analytical results;
- Evaluation of detections in blank samples;
- Evaluation of MS recoveries and MSDs; and
- Evaluation of LCS and laboratory control sample duplicates (LCSDs).

The acceptance criteria (shown in bold below) applied during evaluation of the analytical data and the results of the evaluation are provided in the following sections.

4.1.1 Comparison of Primary and Duplicate Samples

The relative percent difference (RPD) between the primary sample and the corresponding duplicate sample result for each analyte should be less than 35 percent. The analytical results of the 14 duplicate samples and their corresponding primary samples are presented in Table 7. This table also presents the calculated RPD for each set of samples. The RPD values for arsenic exceeded 35 percent in 5 of the 14 sets. However, in these cases the concentration of arsenic in both the primary and duplicates sample were significantly higher than arsenic's residential SRL of 10 mg/kg; therefore, the data is considered acceptable for characterization purposes.

The RPD values for lead exceeded 35 percent in 5 of the 14 sets. Except for the set containing duplicate sample DUP-M, the results of the four remaining sample sets are significantly lower than the residential SRL for lead of 400 mg/kg; therefore, these results are deemed acceptable for characterization purposes.

The primary sample NAI-060S-OS-14-18 and the corresponding duplicate sample DUP-M were collected from an off-site area containing tailings mixed with native soil. It is likely that the high RPD values for arsenic, lead, and mercury between the primary and the duplicate sample results is due to the heterogeneity of the material sampled. For characterization purposes, the higher concentrations detected in the primary sample will be used.

The RPD values for mercury exceeded 35 percent in 2 of the 14 sets. The first set, containing primary sample NAI-B3-25 and duplicate sample DUP-F, were collected from a soil boring drilled within the on-site tailings pile. The mercury results of both samples are significantly lower than the non-residential SRL for mercury of 310 mg/kg; therefore, the data set is deemed acceptable for characterization purposes. The second set samples were collected off site and the mercury results of both samples were significantly lower than the residential SRL for mercury of 23 mg/kg; therefore, this data set is also deemed acceptable for use in characterization purposes.

4.1.2 Evaluation of Detections in Blank Samples

No analytes should be detected in the equipment rinsate or method blanks at concentrations greater than their respective practical quantitation limits (PQLs). Arsenic and lead were detected in the equipment rinsate blank EB-2 with concentrations of 0.013 and 0.015 mg/L, respectively. This equipment blank sample was collected after completion of the second day of on-site near-surface sampling. The detected concentrations are very low, and although they indicate incomplete decontamination of the hand auger, the potential for significant cross-contamination between sampling locations on that day is deemed very low. The remaining four equipment rinsate blanks had no analytes detected. Similarly, no analytes were detected in any of the method blank samples analyzed by Columbia Analytical Services.

4.1.3 Evaluation of MS Recoveries and MS Duplicates

The MS recovery rate should be between the laboratory method control limits. The RPD between the MS and the MSD should be lower than the method control limit. Columbia Analytical Services properly "flagged" any analytical results where the MS recovery rate or the RPD between the MS and the MSD was outside the method control limits. In all cases, the blank spike recovery rate was within acceptable limits, indicating that the RPD between the MS and the MS duplicates are likely caused by matrix interferences.

4.1.4 Evaluation of Laboratory Control Samples

The recovery of the LCS and the RPD between the LCS and the LCSD should not exceed the method control limits. The recovery of the LCS and the RPD between the LCS and the LCSD were not exceeded in any of the samples analyzed by Columbia Analytical Services.

4.2 Data Validation

In accordance with the Quality Assurance Project Plan (QAPP), 10 percent of the analytical data was submitted to Laboratory Data Consultants, Inc. (LDC) to perform Level 4 validation. Following the data validation effort, LDC determined that the analytical data collected during the soil investigation are considered suitable for use in evaluating the nature and extent of contamination at the Site. A copy of the validation report is presented in Appendix C.

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5. CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions of the soil investigation conducted at the Site and based on these findings, makes recommendations for further action.

5.1 Conclusions

Results of the on-site near-surface sampling and on-site drilling investigation indicate that the on-site tailings contain high concentrations of arsenic, lead, and mercury. However, the detected concentrations of other metals within the tailings are all less than their respective non-residential SRLs. Therefore, arsenic, lead, and mercury continue to remain the only COPCs for the Site.

Leachability tests performed on near-surface on-site tailings samples indicate that the lead and mercury within the tailings are essentially non-leachable. Arsenic was determined to be slightly leachable. Brown and Caldwell calculated a site-specific alternative GPL for arsenic of 17,574 mg/kg. None of the 153 soil samples collected during this investigation contained arsenic concentrations greater than the calculated alternative GPL.

The ABA testing indicated that the on-site tailings contain significant amounts of pyritic sulfur, resulting in a large AGP. Future oxidation of the on-site tailings is dependent on several factors including ABA, but the exposure of the tailings to oxygen present in air and/or water could generate acid rock drainage.

However, the metals within the tailings do not appear to have adversely impacted the groundwater beneath the Site, as indicated by the analytical results of groundwater samples collected in 2004 from the two on-site production wells and up to nine wells located in the vicinity of the NAI property. Except for the Kuhles production well, located in one of the former mine shafts, arsenic and lead concentrations detected in groundwater beneath and in the vicinity of the Site were lower than their respective AWQS.

A portion of the mine tailings stockpile is present within a large area (approximately 5 acres) of the northern portion of off-site parcel 800-20-060S (owned by the State of Arizona). Similarly, tailings materials were also observed in several areas of off-site parcels 402-01-039E, 402-08-035, and 402-08-037C. However, the presence of tailings within these three off-site parcels is not due to historic storm water runoff or wind transport from the NAI property, but rather appears to have been purposefully placed in these areas as fill material.

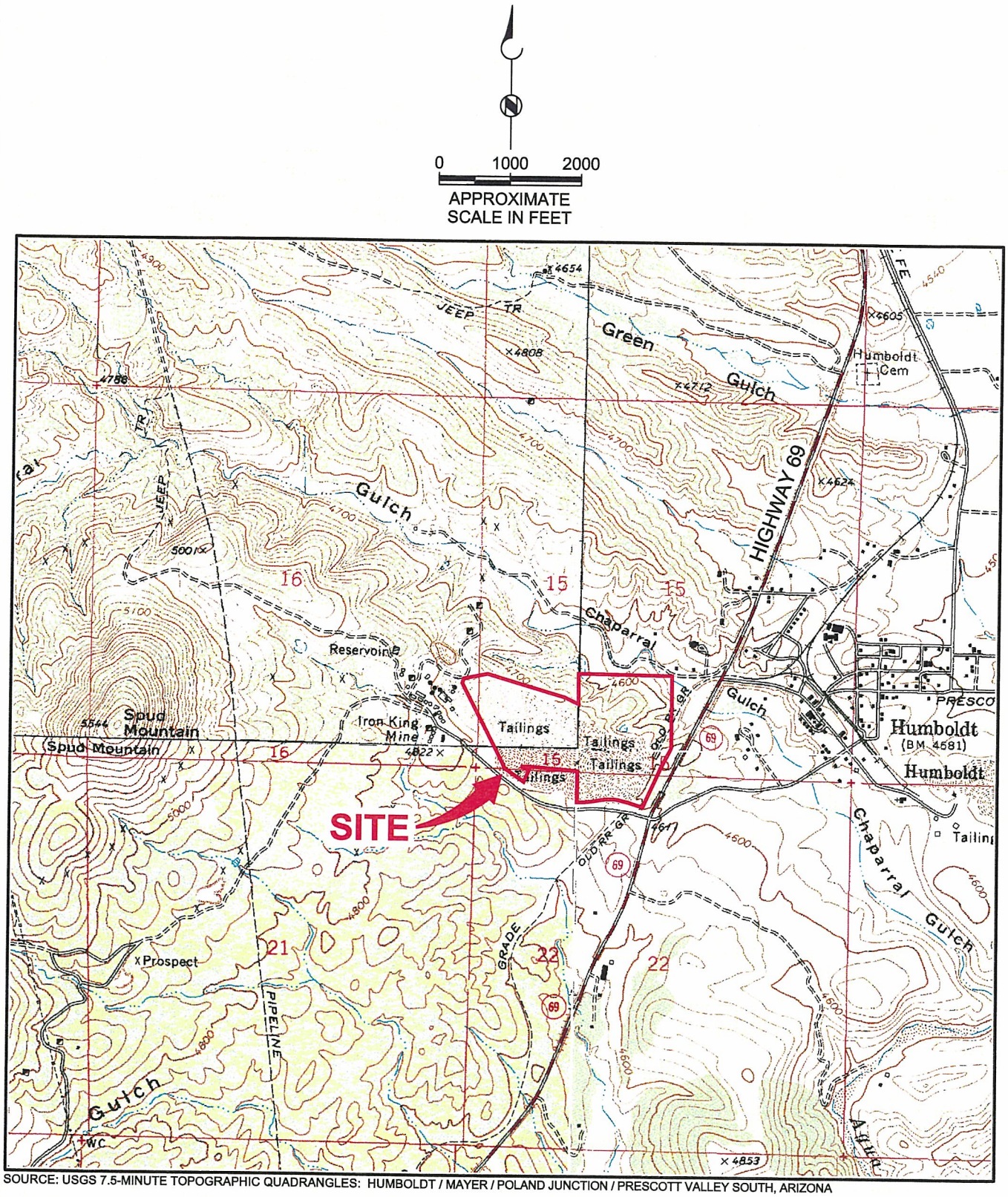
As expected, off-site samples collected from these areas contained high concentrations of arsenic and lead in excess of their respective residential SRLs. With the exception of samples collected from the off-site tailings areas, arsenic is the only COPC detected in the remaining off-site near-surface soil samples with concentrations above its residential SRL of 10 mg/kg. The concentrations of arsenic in these off-site samples ranged from 10 to 110 mg/kg, and averaged approximately 27.5 mg/kg.

5.2 Recommendations

Based on the findings of various sampling events described in this report, Brown and Caldwell recommends the following actions:

1. The surface of the tailings should be stabilized to prevent off-site transport of the fine-grained materials by wind. Interim stabilization could be accomplished by the regular application of dust-suppressant fluids until a permanent mitigation alternative is developed and implemented.
2. NAI should contact the State of Arizona, the owner of Parcel 800-20-060S, to determine the required disposition of the stockpiled tailings materials present on the property.
3. A site-specific risk assessment should be performed to establish appropriate arsenic remediation levels for off-site areas. Based on this cleanup level, off-site areas requiring mitigation can be identified.

Figures



SOURCE: USGS 7.5-MINUTE TOPOGRAPHIC QUADRANGLES: HUMBOLDT / MAYER / POLAND JUNCTION / PRESCOTT VALLEY SOUTH, ARIZONA

Figure 1

VICINITY MAP
NORTH AMERICAN INDUSTRIES
HUMBOLDT SITE

2895 IRONITE AVENUE
HUMBOLDT, ARIZONA 86329

BROWN AND CALDWELL

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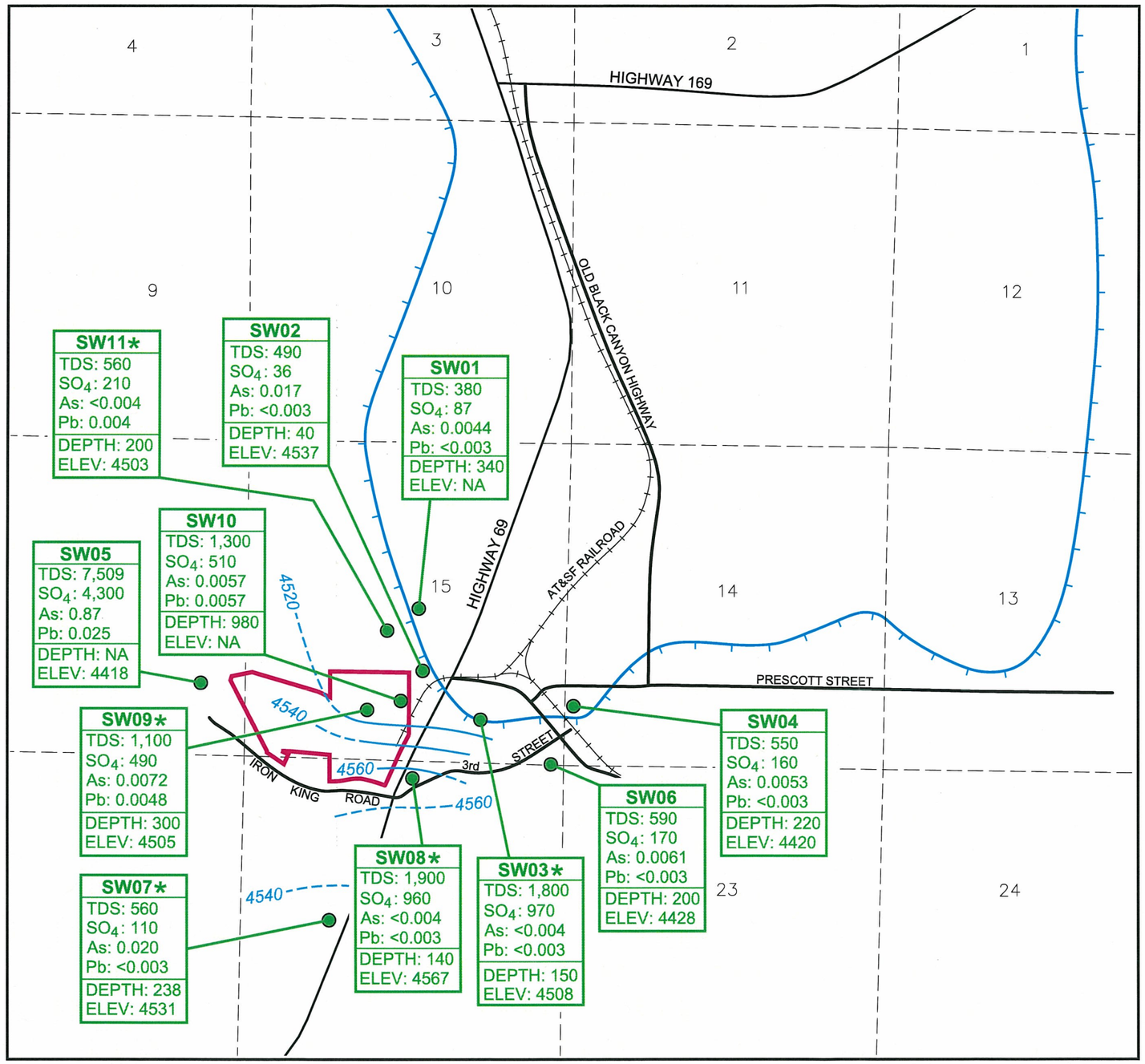

0 1000 2000

APPROXIMATE SCALE IN FEET

EXPLANATION

- IRONITE SITE BOUNDARY
- AGUA FRIA SUB-BASIN BOUNDARY (MODIFIED FROM WILSON, 1988)
- 4520 — ESTIMATED STATIC GROUNDWATER ELEVATION (DASHED WHERE INFERRED)

WELL ID

INDICATES GROUNDWATER ELEVATION DATA UTILIZED TO EVALUATE GROUNDWATER FLOW

SW07 *
TDS: 560 — TOTAL DISSOLVED SOLIDS (mg/L)
SO_4: 110 — SULFATE (mg/L)
As: 0.020 — ARSENIC (mg/L)
Pb: <0.003 — LEAD (mg/L)
DEPTH: 238 — WELL DEPTH (feet)
ELEV: 4531 — ESTIMATED GROUNDWATER ELEVATION (msl)

NA = NOT AVAILABLE

NOTES: WATER LEVELS MEASURED IN AUGUST AND SEPTEMBER 2004.

ALL WATER QUALITY SAMPLES COLLECTED IN AUGUST 2004 EXCEPT SAMPLE FROM WELL SW11 WAS COLLECTED IN SEPTEMBER 2004. ALSO FOR ADDITIONAL LEAD ANALYSIS, WELL SW03 WAS RESAMPLED IN SEPTEMBER 2004.

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Figure 2

GENERALIZED WATER QUALITY MAP NORTH AMERICAN INDUSTRIES

YAVAPAI COUNTY, ARIZONA

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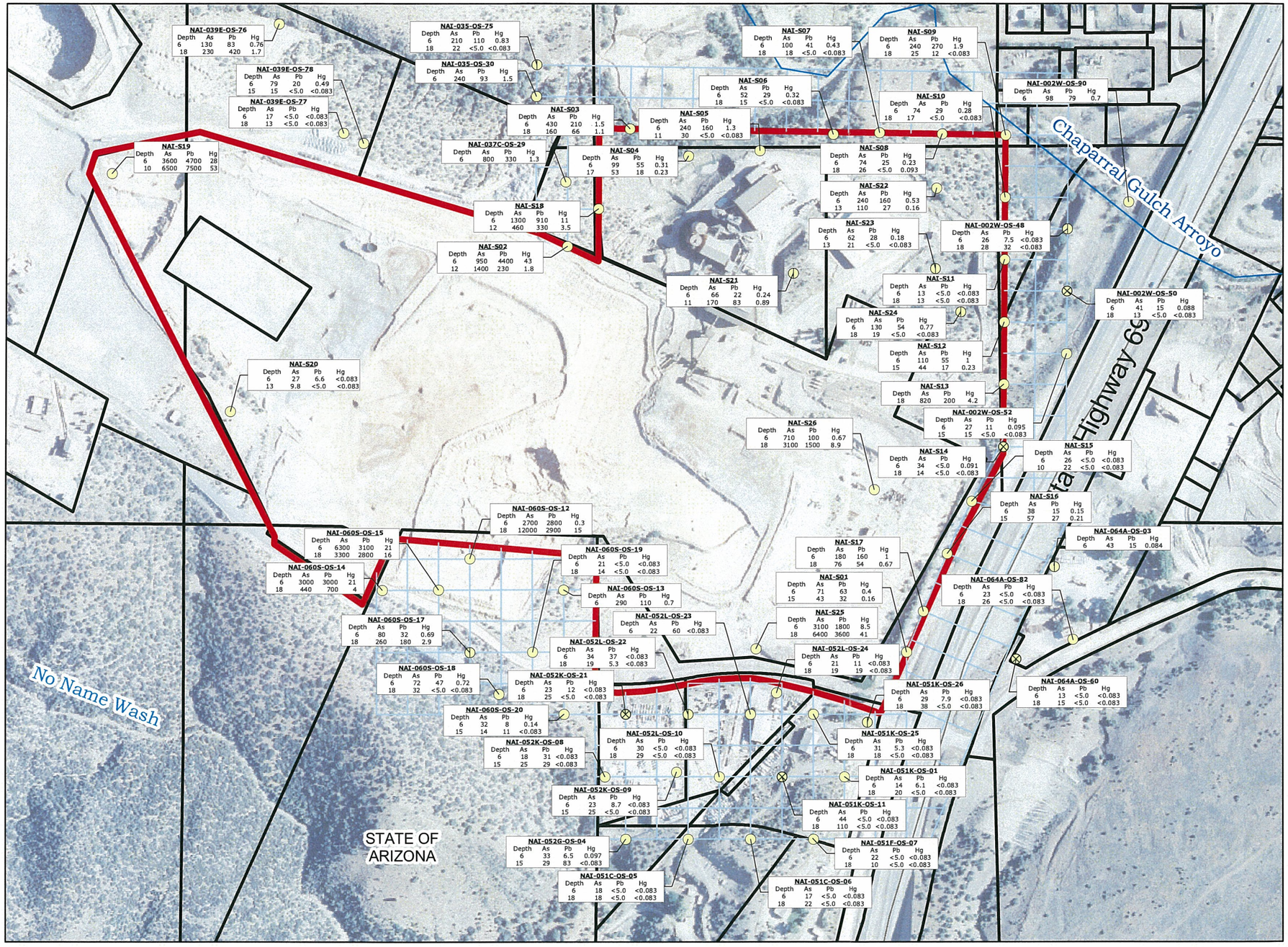

EXPLANATION

- IRONITE PROPERTY BOUNDARY
- SOIL SAMPLE LOCATIONS
- SOIL SAMPLE LOCATIONS WITH FULL SUITE ANALYSIS (SAMPLE DEPTHS IN INCHES)
- SOIL SAMPLE LOCATIONS WITH FULL SUITE ANALYSIS, MATRIX CHARACTERIZATION AND ACID BASE ACCOUNTING (SAMPLE DEPTHS IN INCHES)
- SOIL SAMPLE GRID

ALL RESULTS IN MG/KG

BROWN AND CALDWELL

Figure 3
SURFACE SOIL AND SEDIMENT SAMPLE LOCATIONS
NORTH AMERICAN INDUSTRIES
YAVAPAI COUNTY, ARIZONA

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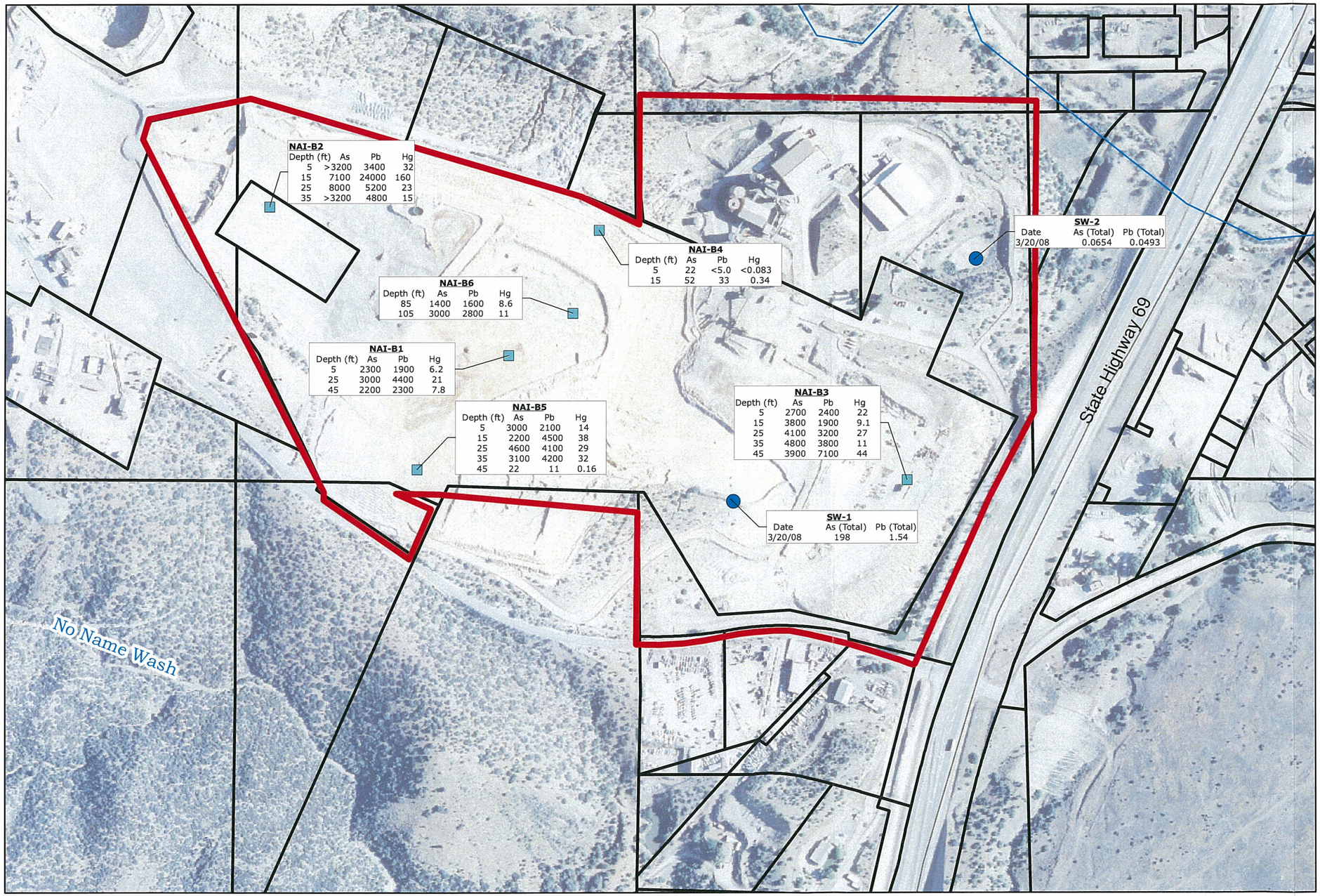

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SCALE IN FEET

EXPLANATION

- IRONITE PROPERTY BOUNDARY
- TAILINGS BORING (RESULTS IN mg/kg)
- SURFACE WATER SAMPLE (RESULTS IN mg/L)

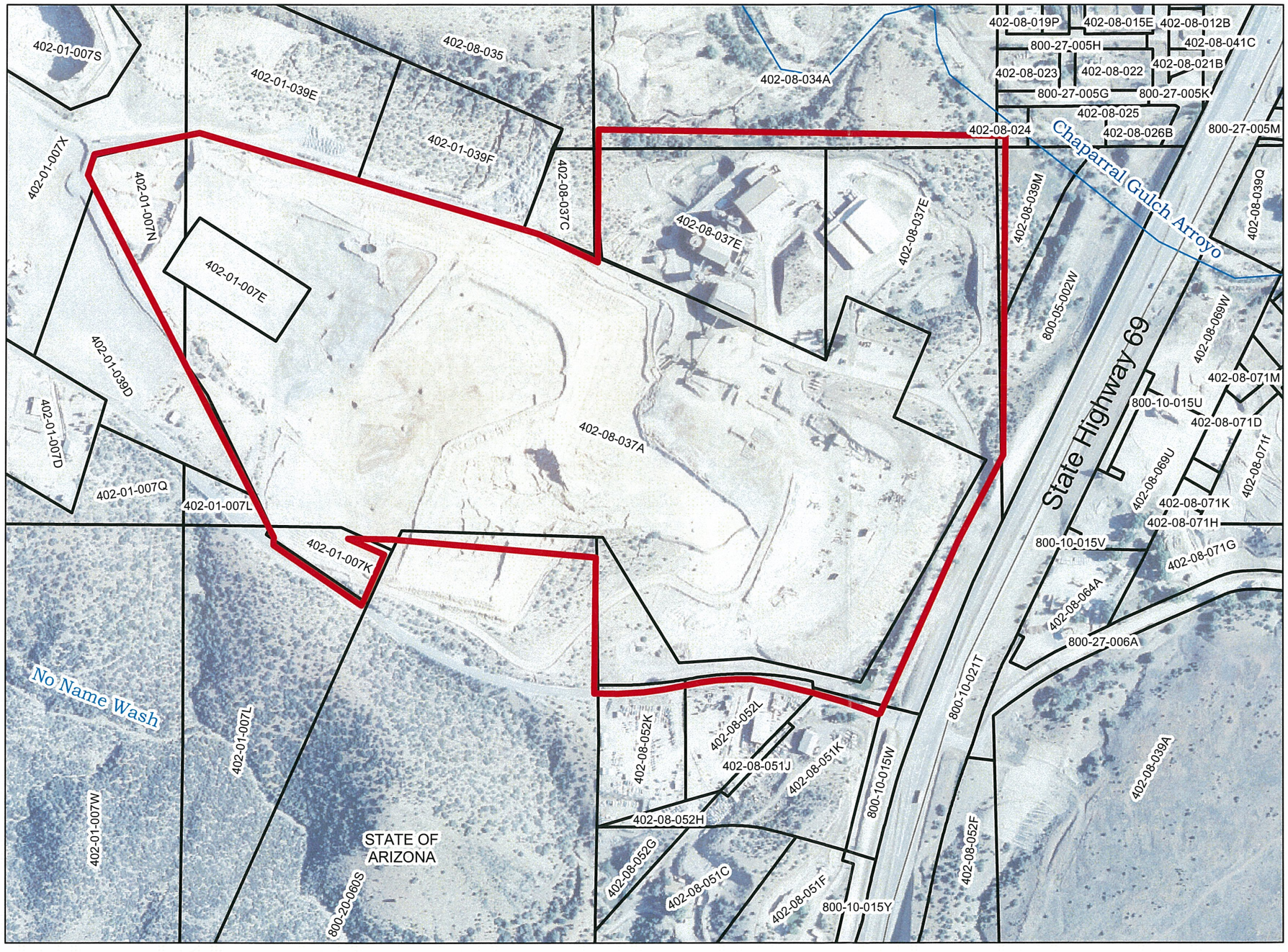
BROWN AND CALDWELL

Figure 4

ON-SITE BORING AND SURFACE WATER SAMPLING LOCATIONS

NORTH AMERICAN INDUSTRIES
YAVAPAI COUNTY, ARIZONA

P:\North American Industries (formerly Ironite)\134427 - NAI-Work Plan Implementation (2008)\GIS\MXDs\134427001B.mxd 5/4/2009



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SCALE IN FEET

EXPLANATION

IRONITE PROPERTY BOUNDARY

BROWN AND CALDWELL

Figure 5
OFF-SITE PARCELS MAP

NORTH AMERICAN INDUSTRIES
YAVAPAI COUNTY, ARIZONA

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Tables

BROWN AND CALDWELL

Table 1. Summary of On-Site Sample Results

Sample	Date	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Antimony (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
NAI-S22-6	3/19/2008	240	160	0.53										
NAI-S22-13	3/19/2008	110	27	0.16										
NAI-S10-6	3/19/2008	74	29	0.28										
NAI-S10-18	3/19/2008	17	<5.0	<0.083										
NAI-S09-6	3/19/2008	240	270	1.9										
NAI-S09-18	3/19/2008	25	12	<0.083										
NAI-S21-6	3/19/2008	66	22	0.24	<5.0	<1.0	<1.0	13	46	12	<5.0	<5.0	<5.0	180
NAI-S21-11	3/19/2008	170	83	0.89	<5.0	<1.0	1.4	11	59	11	<5.0	<5.0	<5.0	390
NAI-S23-6	3/19/2008	62	28	0.18	<5.0	<1.0	<1.0	16	49	13	<5.0	<5.0	<5.0	170
NAI-S23-13	3/19/2008	21	<5.0	<0.083	<5.0	<1.0	<1.0	20	40	13	<5.0	<5.0	<5.0	68
NAI-S24-6	3/19/2008	130	54	0.77	<5.0	<1.0	1.1	14	56	13	<5.0	<5.0	<5.0	330
NAI-S24-18	3/19/2008	19	<5.0	<0.083	<5.0	<1.0	<1.0	20	39	14	<5.0	<5.0	<5.0	64
NAI-S15-6	3/19/2008	26	<5.0	<0.083										
NAI-S15-10	3/19/2008	22	<5.0	<0.083										
NAI-S16-6	3/19/2008	38	15	0.15										
NAI-S16-15	3/19/2008	57	27	0.21										
NAI-S17-6	3/19/2008	180	160	1.0										
NAI-S17-18	3/19/2008	76	54	0.67										
NAI-S1-6	3/19/2008	71	63	0.40										
NAI-S1-15	3/19/2008	43	32	0.16										
NAI-S14-6	3/19/2008	34	<5.0	0.091	<5.0	<1.0	<1.0	11	33	13	<5.0	<5.0	<5.0	91
NAI-S14-18	3/19/2008	14	<5.0	<0.083	<5.0	<1.0	<1.0	10	27	11	<5.0	<5.0	<5.0	50
NAI-S13-6	3/19/2008	530	2,600	26										
NAI-S13-18	3/19/2008	820	200	4.2										
NAI-S12-6	3/19/2008	110	55	1.0										
NAI-S12-15	3/19/2008	44	17	0.23										
DUP-A	3/19/2008	33	9.6	0.23										
NAI-S11-6	3/19/2008	13	<5.0	<0.083										
NAI-S11-18	3/19/2008	13	<5.0	<0.083										
DUP-B	3/19/2008	13	<5.0	<0.083										
NAI-S08-6	3/20/2008	74	25	0.23										
NAI-S08-18	3/20/2008	26	<5.0	0.093										
NAI-S07-6	3/20/2008	100	41	0.43										
NAI-S07-18	3/20/2008	18	<5.0	<0.083										
DUP-C	3/20/2008	20	<5.0	<0.083										

Table 1. Summary of On-Site Sample Results														
Sample	Date	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Antimony (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
NAI-S18-6	3/20/2008	**1,300**	**910**	11										
NAI-S18-12	3/20/2008	**460**	330	3.5										
DUP-D	3/20/2008	**300**	280	4.2										
NAI-S02-6	3/20/2008	**950**	**4,400**	43										
NAI-S02-12	3/20/2008	**1,400**	230	1.8										
NAI-S26-6	3/20/2008	**710**	100	0.67										
NAI-S26-18	3/20/2008	**3,100**	**1,500**	8.9										
NAI-S25-6	3/20/2008	**3,100**	**1,800**	8.5										
NAI-S25-18	3/20/2008	**6,400**	**3,600**	41										
NAI-S20-6	3/20/2008	**27**	6.6	<0.083										
NAI-S20-13	3/20/2008	9.8	<5.0	<0.083										
NAI-S19-6	3/20/2008	**3,600**	**4,700**	28										
NAI-S19-10	3/20/2008	**6,500**	**7,500**	53										
DUP-E	3/20/2008	**4,600**	**7,200**	65										
NAI-S06-6	3/20/2008	**52**	29	0.32										
NAI-S06-18	3/20/2008	**15**	<5.0	<0.083										
NAI-S05-6	3/20/2008	**240**	160	1.3										
NAI-S05-11	3/20/2008	**30**	<5.0	<0.083										
NAI-S04-6	3/20/2008	**99**	55	0.31										
NAI-S04-17	3/20/2008	**53**	18	0.23										
NAI-S03-6	3/20/2008	**430**	210	1.5										
NAI-S03-18	3/20/2008	**160**	66	1.1										
R-SRL (mg/kg)		**10**	**400**	**23**	**31**	**150**	**39**	**120,000**	**3,100**	**1,600**	**390**	**390**	**5.2**	**23,000**
NR-SRL (mg/kg)		**10**	**800**	**310**	**410**	**1,900**	**510**	**1,000,000**	**41,000**	**20,000**	**5,100**	**5,100**	**67**	**310,000**
Minimum GPL (mg/kg)		**290**	**290**	**12**	**35**	**23**	**29**	**590**	**NE**	**590**	**290**	**NE**	**12**	**NE**

Notes:

Bold and shaded values exceed respective NR-SRL

GPL = Groundwater Protection Level

mg/kg = milligrams per kilogram

NE = Not Established

NR-SRL = Non-Residential Soil Remediation Level

R-SRL = Residential Soil Remediation Level

Table 2. Summary of On-Site Boring Sample Results

Sample	Date	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Antimony (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
NAI-B1-5	3/25/2008	**2,300**	**1,900**	6.2										
NAI-B1-25	3/25/2008	**3,000**	**4,400**	21	46	<1.0	50	8.8	370	7.7	54	21	<5.0	18,000
NAI-B1-45	3/25/2008	**2,200**	**2,300**	7.8	27	<1.0	14	8.6	360	6.5	16	15	<5.0	4,100
NAI-B6-85	3/25/2008	**1,400**	**1,600**	8.6										
DUP-G	3/25/2008	**2,100**	**2,200**	11										
NAI-B6-105	3/25/2008	**3,000**	**2,800**	11										
NAI-B2-5	3/26/2008	**>3,200**	**3,400**	32										
NAI-B2-15	3/26/2008	**7,100**	**24,000**	160	360	<1.0	210	<5.0	1,500	7.6	160	98	<5.0	75,000
NAI-B2-25	3/26/2008	**8,000**	**5,200**	23	170	<1.0	74	<5.0	360	13	15	46	<5.0	24,000
NAI-B2-35	3/26/2008	**>3200**	**4,800**	15										
NAI-B3-5	3/26/2008	**2,700**	**2,400**	22										
NAI-B3-15	3/26/2008	**3,800**	**1,900**	9.1	25	<1.0	11	11	140	7.7	15	10	<5.0	2,800
NAI-B3-25	3/26/2008	**4,100**	**3,200**	27	45	<1.0	51	17	340	9.9	27	19	<5.0	18,000
DUP-F	3/26/2008	**13,000**	**2,900**	15										
NAI-B3-35	3/26/2008	**4,800**	**3,800**	11										
NAI-B3-45	3/26/2008	**3,900**	**7,100**	44										
NAI-B4-5	3/26/2008	**22**	<5.0	<0.083										
NAI-B4-15	3/26/2008	**52**	33	0.34	<5.0	<1.0	<1.0	12	31	13	<5.0	<5.0	<5.0	140
NAI-B5-5	3/26/2008	**3,000**	**2,100**	14										
NAI-B5-15	3/26/2008	**2,200**	**4,500**	38	40	<1.0	76	5.6	430	<5.0	51	20	,5.0	26,000
NAI-B5-25	3/26/2008	**4,600**	**4,100**	29	58	<1.0	47	6.6	380	7.6	60	20	<5.0	17,000
NAI-B5-35	3/26/2008	**3,100**	**4,200**	32										
NAI-B5-45	3/26/2008	**22**	11	0.16										
R-SRL (mg/kg)		**10**	**400**	**23**	**31**	**150**	**39**	**120,000**	**3,100**	**1,600**	**390**	**390**	**5.2**	**23,000**
NR-SRL (mg/kg)		**10**	**800**	**310**	**410**	**1,900**	**510**	**1,000,000**	**41,000**	**20,000**	**5,100**	**5,100**	**67**	**310,000**
Minimum GPL (mg/kg)		**290**	**290**	**12**	**35**	**23**	**29**	**590**	**NE**	**590**	**290**	**NE**	**12**	**NE**

Notes:
Bold and shaded values exceed respective NR-SRL
GPL = Groundwater Protection Level
mg/kg = milligrams per kilogram
NE = Not Established
NR-SRL = Non-Residential Soil Remediation Level
R-SRL = Residential Soil Remediation Level

Table 3. Summary of Off-Site Sample Results														
Sample	Date	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Antimony (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
NAI-002W-OS-48-18	6/7/2008	28	32	<0.083	<5.0	<1.0	<1.0	14	460	14	<5.0	<5.0	<5.0	170
DUP-N	6/7/2008	31	22	<0.083	<5.0	<1.0	<1.0	12	520	16	<5.0	<5.0	<5.0	190
NAI-002W-OS-48-6	6/7/2008	26	7.5	<0.083	<5.0	<1.0	<1.0	9.9	120	13	<5.0	<5.0	<5.0	91
NAI-002W-OS-50-18	6/7/2008	13	<5.0	<0.083	<5.0	<1.0	<1.0	9.6	23	15	<5.0	<5.0	<5.0	39
NAI-002W-OS-50-6	6/7/2008	41	15	0.088	<5.0	<1.0	<1.0	12	28	13	<5.0	<5.0	<5.0	97
NAI-002W-OS-52-15	6/7/2008	15	<5.0	<0.083										
NAI-002W-OS-52-6	6/7/2008	27	11	0.095										
NAI-002W-OS-90-6	6/7/2008	98	79	0.7	<5.0	<1.0	<1.0	17	38	14	<5.0	<5.0	<5.0	240
NAI-035-OS-30-6	6/6/2008	240	93	1.5										
NAI-035-OS-75-18	6/6/2008	22	<5.0	<0.083	<5.0	<1.0	<1.0	13	38	13	<5.0	<5.0	<5.0	71
NAI-035-OS-75-6	6/6/2008	210	110	0.83	<5.0	<1.0	1.5	13	53	14	<5.0	<5.0	<5.0	590
NAI-037C-OS-29-6	6/6/2008	800	330	1.3										
NAI-039E-OS-76-18	6/6/2008	230	420	1.7										
NAI-039E-OS-76-6	6/6/2008	130	83	0.76										
NAI-039E-OS-77-18	6/6/2008	13	<5.0	<0.083										
NAI-039E-OS-77-6	6/6/2008	17	<5.0	<0.083										
NAI-039E-OS-78-15	6/6/2008	15	<5.0	<0.083										
NAI-039E-OS-78-6	6/6/2008	79	20	0.49										
NAI-051C-OS-5-18	6/4/2008	18	<5.0	<0.083										
NAI-051C-OS-5-6	6/4/2008	18	<5.0	<0.083										
NAI-051C-OS-6-18	6/5/2008	22	<5.0	<0.083										
DUP-I	6/5/2008	17	<5.0	<0.083	<5.0	<1.0	<1.0	14	38	13	<5.0	<5.0	<5.0	60
NAI-051C-OS-6-6	6/5/2008	17	<5.0	<0.083										
NAI-051F-OS-7-18	6/5/2008	10	<5.0	<0.083										
NAI-051F-OS-7-6	6/5/2008	22	<5.0	<0.083										
NAI-051K-OS-11-18	6/5/2008	110	<5.0	<0.083	<5.0	<1.0	<1.0	11	49	9.3	<5.0	<5.0	<5.0	78
NAI-051K-OS-11-6	6/5/2008	44	<5.0	<0.083	<5.0	<1.0	<1.0	14	44	13	<5.0	<5.0	<5.0	88
NAI-051K-OS-1-18	6/5/2008	20	<5.0	<0.083										
NAI-051K-OS-1-6	6/5/2008	14	6.1	<0.083										
NAI-051K-OS-25-18	6/5/2008	18	<5.0	<0.083										
DUP-J	6/5/2008	15	<5.0	<0.083	<5.0	<1.0	<1.0	9.8	34	12	<5.0	<5.0	<5.0	58
NAI-051K-OS-25-6	6/5/2008	31	5.3	<0.083										
NAI-051K-OS-26-18	6/5/2008	38	<5.0	<0.083	<5.0	<1.0	<1.0	13	33	14	<5.0	<5.0	<5.0	68
NAI-051K-OS-26-6	6/5/2008	29	7.9	<0.083	<5.0	<1.0	<1.0	9.7	36	10	<5.0	<5.0	<5.0	89

Table 3. Summary of Off-Site Sample Results														
Sample	Date	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Antimony (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
NAI-052G-OS-4-15	6/4/2008	29	83	<0.083										
NAI-052G-OS-4-6	6/4/2008	33	6.5	0.097										
NAI-052K-OS-21-18	6/4/2008	25	<5.0	<0.083	<5.0	<1.0	<1.0	14	53	13	<5.0	<5.0	<5.0	79
NAI-052K-OS-21-6	6/4/2008	23	12	<0.083	<5.0	<1.0	<1.0	11	47	11	<5.0	<5.0	<5.0	72
NAI-052K-OS-8-15	6/4/2008	25	29	<0.083										
DUP-H	6/4/2008	20	18	<0.083	<5.0	<1.0	<1.0	12	42	12	<5.0	<5.0	<5.0	65
NAI-052K-OS-8-6	6/4/2008	18	31	<0.083										
NAI-052K-OS-9-15	6/4/2008	25	<5.0	<0.083										
NAI-052K-OS-9-6	6/4/2008	23	8.7	<0.083										
NAI-052L-OS-10-18	6/4/2008	29	<5.0	<0.083										
NAI-052L-OS-10-6	6/4/2008	30	<5.0	<0.083										
NAI-052L-OS-22-18	6/4/2008	19	5.3	<0.083	<5.0	<1.0	<1.0	16	45	13	<5.0	<5.0	<5.0	69
NAI-052L-OS-22-6	6/4/2008	34	37	<0.083	<5.0	<1.0	<1.0	12	65	11	<5.0	<5.0	<5.0	76
NAI-052L-OS-23-6	6/4/2008	22	60	<0.083										
NAI-052L-OS-24-18	6/4/2008	19	19	<0.083										
NAI-052L-OS-24-6	6/4/2008	21	11	<0.083										
NAI-060S-OS-12-18	6/6/2008	12,000	2,900	15										
NAI-060S-OS-12-6	6/6/2008	2,700	2,800	0.3										
NAI-060S-OS-13-6	6/6/2008	290	110	0.7										
NAI-060S-OS-14-18	6/6/2008	440	700	4										
DUP-M	6/6/2008	89	80	1.5	<5.0	<1.0	2.4	9.7	79	10	<5.0	<5.0	<5.0	1,200
NAI-060S-OS-14-6	6/6/2008	3,000	3,000	21										
NAI-060S-OS-15-18	6/6/2008	3,300	2,800	16										
NAI-060S-OS-15-6	6/6/2008	6,300	3,100	21										
NAI-060S-OS-17-18	6/5/2008	260	180	2.9	<5.0	<1.0	<1.0	12	69	8.7	<5.0	<5.0	<5.0	250
NAI-060S-OS-17-6	6/5/2008	80	32	0.69	<5.0	<1.0	<1.0	13	51	11	<5.0	<5.0	<5.0	330
DUP-K	6/5/2008	41	20	<0.083	<5.0	<1.0	<1.0	9.5	54	12	<5.0	<5.0	<5.0	200
NAI-060S-OS-18-18	6/5/2008	32	<5.0	<0.083										
NAI-060S-OS-18-6	6/5/2008	72	47	0.72										
NAI-060S-OS-19-18	6/6/2008	14	<5.0	<0.083										
DUP-L	6/6/2008	19	<5.0	<0.083	<5.0	<1.0	<1.0	13	50	13	<5.0	<5.0	<5.0	74
NAI-060S-OS-19-6	6/6/2008	21	<5.0	<0.083										
NAI-060S-OS-20-15	6/5/2008	14	11	<0.083										
NAI-060S-OS-20-6	6/5/2008	32	8	0.14										
NAI-064A-OS-3-6	6/5/2008	43	15	0.084	<5.0	<1.0	<1.0	14	29	13	<5.0	<5.0	<5.0	78

Table 3. Summary of Off-Site Sample Results

Sample	Date	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Antimony (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
NAI-064A-OS-60-18	6/5/2008	**15**	<5.0	<0.083	<5.0	<1.0	<1.0	15	25	20	<5.0	<5.0	<5.0	34
NAI-064A-OS-60-6	6/5/2008	**13**	<5.0	<0.083	<5.0	<1.0	<1.0	14	23	18	<5.0	<5.0	<5.0	35
NAI-064A-OS-82-18	6/5/2008	**26**	<5.0	<0.083										
NAI-064A-OS-82-6	6/5/2008	**23**	<5.0	<0.083										
R-SRL (mg/kg)		**10**	**400**	**23**	**31**	**150**	**39**	**120,000**	**3,100**	**1,600**	**390**	**390**	**5.2**	**23,000**
NR-SRL (mg/kg)		**10**	**800**	**310**	**410**	**1,900**	**510**	**1,000,000**	**41,000**	**20,000**	**5,100**	**5,100**	**67**	**310,000**
Minimum GPL (mg/kg)		**290**	**290**	**12**	**35**	**23**	**29**	**590**	**NE**	**590**	**290**	**NE**	**12**	**NE**

Notes:

Bold and shaded values exceed respective R-SRL

GPL = Groundwater Protection Level

mg/kg = milligrams per kilogram

NE = Not Established

NR-SRL = Non-Residential Soil Remediation Level

R-SRL = Residential Soil Remediation Level

Table 4. Summary of Leachability Testing Results

Sample	Date	Total Arsenic (mg/kg)	SPLP Arsenic (mg/L)	Ratio of Total Arsenic to SPLP	Total Lead (mg/kg)	SPLP Lead (mg/L)	Ratio of Total Lead to SPLP	Total Mercury (mg/kg)	SPLP Mercury (mg/L)	Ratio of Total Mercury to SPLP
NAI-S02-6	3/20/2008	950	0.024	39,583	4,400	<0.010	NA	43	<0.0020	NA
NAI-S13-6	3/19/2008	530	0.013	40,769	2,600	<0.010	NA	26	<0.0020	NA
NAI-S19-6	3/20/2008	3,600	3	1,200	4,700	<0.010	NA	28	<0.0020	NA
NAI-S19-10	3/20/2008	6,500	1.9	3,421	7,500	<0.010	NA	53	<0.0020	NA
NAI-S25-18	3/20/2008	6,400	<0.010	NA	3,600	<0.010	NA	41	<0.0020	NA

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NA = Not Applicable

SPLP = Synthetic Precipitation Leaching Procedure

Table 5. Summary of Matrix Sample Results									
Sample	Date	Total Organic Carbon (%)	pH (units)	Temperature (Celsius)	Bulk Density (g/cm^3)	Sand (%)	Silt (%)	Clay (%)	Texture Classification
ON-SITE SAMPLES									
NAI-S14-20	3/19/2008	0.34	7.2	23.3	0.96	56	24	20	SANDY CLAY LOAM
NAI-B1-5	3/25/2008	1.9	7.4	23	1.6	74	22	4	SANDY LOAM
NAI-B1-45	3/25/2008	3.2	7.8	22.1	1.577	36	56	8	SILT LOAM
NAI-B2-5	3/26/2008	3.2	7.7	22.3	1.151	36	50	14	LOAM
NAI-B2-25	3/26/2008	4.5	7.4	22.3	1.786	36	56	8	SILT LOAM
NAI-B5-25	3/26/2008	2.3	7.9	22.2	1.38	44	44	12	LOAM
NAI-B5-5	3/26/2008	1.4	7.7	21.8	1.74	58	38	4	SANDY LOAM
NAI-B3-25	3/26/2008	1.9	7.9	21.8	1.821	74	24	2	LOAMY SAND
NAI-B4-5	3/26/2008	0.38	2.7	21.2	1.024	70	16	14	SANDY LOAM
NAI-B3-5	3/26/2008	2.4	7.3	22	1.744	74	22	4	SANDY LOAM
OFF-SITE SAMPLES									
NAI-002W-OS-50-18	6/7/2008	0.37	8.3	23.1	1.404	78	14	8	SANDY LOAM
NAI-052K-OS-21-18	6/4/2008	0.23	8.2	23.2	1.216	74	18	8	SANDY LOAM
NAI-051K-OS-11-18	6/5/2008	0.25	8.2	23.1	1.332	88	10	2	SAND
NAI-064A-OS-60-18	6/5/2008	0.2	8.5	23.1	1.356	82	12	6	LOAMY SAND

g/cm^3 = grams per cubic centimeter

Table 6. Summary of Acid-Base Accounting Results								
Sample	Date	ABA (TCaCO3/kT)	AGP (TCaCO3/kT)	ANP (TCaCO3/kT)	Pyritic Sulfur (%)	Sulfate Sulfur (%)	Total Sulfur (%)	Non-extractable Sulfur (%)
ON-SITE SAMPLES								
NAI-S14-18	3/19/2008	10.5	<0.3	10.5	<0.01	<0.01	<0.01	<0.01
NAI-B1-25	3/25/2008	-228	368	140	11.8	0.7	12.5	0.02
NAI-B2-15	3/26/2008	-400	519	119	16.6	1	17.6	<0.01
NAI-B2-35	3/26/2008	-360	412	52.4	13.2	1.9	15.1	0.01
NAI-B5-35	3/26/2008	-214	356	142	11.4	1.8	13.2	<0.01
NAI-B5-15	3/26/2008	-219	366	147	11.7	1.5	13.2	<0.01
NAI-B4-15	3/26/2008	9.3	4.2	13.5	0.13	0.36	0.49	<0.01
NAI-B3-35	3/26/2008	-177	310	133	9.93	0.97	10.9	<0.01
NAI-B3-15	3/26/2008	-176	311	135	9.96	1.04	11	<0.01
OFF-SITE SAMPLES								
NAI-052K-OS-21-18	6/4/2008	66.7	<0.3	66.7	<0.01	<0.01	<0.01	<0.01
NAI-051K-OS-11-18	6/5/2008	14.1	<0.3	14.1	<0.01	<0.01	<0.01	<0.01
NAI-064A-OS-60-18	6/5/2008	148	<0.3	148	<0.01	<0.01	<0.01	<0.01
NAI-002W-OS-50-18	6/7/2008	128	<0.3	128	<0.01	<0.01	<0.01	<0.01

Notes:

ABA = Net Acid-Base Accounting (ANP-AGP)

AGP = Acid Generation Potential

ANP = Acid Neutralization Potential

TCaCO3/kT = Tons of Calcium Carbonate per 1000 Tons of Material

Table 7. Summary of RPD Results Between Primary and Duplicate Samples

Sample	Date	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Antimony (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
NAI-S12-15	3/19/2008	44	17	0.23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-A	3/19/2008	33	9.6	0.23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RPD	8/25/2008	28.57	**55.64**	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-S11-18	3/19/2008	13	<5.0	<0.083	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-B	3/19/2008	13	<5.0	<0.083	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RPD	8/25/2008	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-S07-18	3/20/2008	18	<5.0	<0.083	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-C	3/20/2008	20	<5.0	<0.083	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RPD	8/25/2008	10.53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-S18-12	3/20/2008	460	330	3.5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-D	3/20/2008	300	280	4.2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RPD	8/25/2008	**42.11**	16.39	18.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-S19-10	3/20/2008	6,500	7,500	53	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-E	3/20/2008	4,600	7,200	65	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RPD	8/25/2008	34.23	4.08	20.34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-B3-25	3/26/2008	4,100	3,200	27	45	<1.0	51	17	340	9.9	27	19	<5.0	18,000
DUP-F	3/26/2008	13,000	2,900	15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RPD	8/25/2008	**104.09**	9.84	**57.14**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-B6-85	3/25/2008	1,400	1,600	8.6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-G	3/25/2008	2,100	2,200	11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RPD	8/25/2008	**40.00**	31.58	24.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-052K-OS-8-15	6/4/2008	25	29	<0.083	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-H	6/4/2008	20	18	<0.083	<5.0	<1.0	<1.0	12	42	12	<5.0	<5.0	<5.0	65
RPD	8/25/2008	22.22	**46.81**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-051C-OS-6-18	6/5/2008	22	<5.0	<0.083	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-I	6/5/2008	17	<5.0	<0.083	<5.0	<1.0	<1.0	14	38	13	<5.0	<5.0	<5.0	60
RPD	8/25/2008	25.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-051K-OS-25-18	6/5/2008	18	<5.0	<0.083	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-J	6/5/2008	15	<5.0	<0.083	<5.0	<1.0	<1.0	9.8	34	12	<5.0	<5.0	<5.0	58
RPD	8/25/2008	18.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-060S-OS-17-6	6/5/2008	80	32	0.69	<5.0	<1.0	<1.0	13	51	11	<5.0	<5.0	<5.0	330
DUP-K	6/5/2008	41	20	<0.083	<5.0	<1.0	<1.0	9.5	54	12	<5.0	<5.0	<5.0	200
RPD	8/25/2008	**64.46**	**46.15**	NA	NA	NA	NA	31.11	5.71	8.70	NA	NA	NA	**49.06**
NAI-060S-OS-19-18	6/6/2008	14	<5.0	<0.083	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-L	6/6/2008	19	<5.0	<0.083	<5.0	<1.0	<1.0	13	50	13	<5.0	<5.0	<5.0	74
RPD	8/25/2008	30.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 7. Summary of RPD Results Between Primary and Duplicate Samples

Sample	Date	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Antimony (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
NAI-060S-OS-14-18	6/6/2008	440	700	4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-M	6/6/2008	89	80	1.5	<5.0	<1.0	2.4	9.7	79	10	<5.0	<5.0	<5.0	1,200
RPD	8/25/2008	**132.70**	**158.97**	**90.91**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NAI-002W-OS-48-18	6/7/2008	28	32	<0.083	<5.0	<1.0	<1.0	14	460	14	<5.0	<5.0	<5.0	170
DUP-N	6/7/2008	31	22	<0.083	<5.0	<1.0	<1.0	12	520	16	<5.0	<5.0	<5.0	190
RPD	8/25/2008	10.17	**37.04**	NA	NA	NA	NA	15.38	12.24	13.33	NA	NA	NA	11.11

mg/kg = milligrams per kilogram

NA = Not Applicable

NS = Not Sampled

*RPD = (Primary Sample - Duplicate Sample)/(1/2 (Primary Sample + Duplicate Sample)) * 100*

Appendices

BROWN AND CALDWELL

A

BROWN AND CALDWELL

APPENDIX A

Soil Boring Logs

BROWN AND CALDWELL

BORING LOG

Project Name: **Ironite** Boring Number: **B-1**

Soil Boring [X] Monitoring Well [ ] Project Number: **134427** Sheet **1** of **2**

Boring Location: **Humboldt, AZ**		Elevation: --	East: / North:
Drilling Contractor: **Yellow Jacket**	Driller: **Gabriel Escamillo**	Date Started: **3/25/08**	Date Finished: **3/25/08**
Drilling Equipment: **Hollow Stem Auger**	Borehole Diameter: **8"**	Completed Depth: (feet) **70.0**	Water Depth: (feet)
Sampling Method: **Split Spoon**		Type and Diameter of Well Casing:	
Drilling Method: **Auger**	Drilling Fluid: **None**	Type and Diameter of Well Screen: **--**	
Backfill Material: **Grout/Cement**		Slot Size:	Filter Material:
Logged By: **S.King**	Checked By: **R.Bauer**	Development Method:	

Depth (feet)	USC Soil Type	Description	Blow Counts	Sample No.	Graphic Log: Sample	Graphic Log: Lithology	Remarks
		Sandy Silt @ 2' - From Cuttings: Sandy silt changed from orange/red to dark grey highly reflective metallic particles. Sand is fine grained. Dry to slightly moist.					Descriptions of drilled cuttings based on ASTM Method D-2488 (the visual-manual procedure), grain-size determinations and nomenclature based on the Unified Soil Classification System.
		Sandy Silt @ 5' - Gold/dark green. Sand is fine grained. Dry to slightly moist. Loose to medium dense. Sulfur odor.	10 13 13	NAI-B1-5			
10		**Sandy Silt** @ 25' - Dark grey/brown. Sand isfine grained. Dry to slightly moist. Very loose to loose density. No odor.					All samples collected were tailings until "native soil" was reached. The dark grey, grey/brown, and gold/green soil samples exhibited a highly reflective metallic appearance.
20							0-70' - Cement/grout seal
		Silt @ 45' - Dark grey. Slightly moist to moist. Loose to medium dense. No odor.	2 6 6	NAI-B1-25			
30							
40							
		No Recovery @ 65' - No recovery. Very dense.	10 14 17	NAI-B1-45			
50							

CHAD IRONITE.GPJ BRN&CALD.GDT 3/16/09

BROWN AND CALDWELL

BORING LOG

Project Name: **Ironite** Boring Number: **B-1**

Soil Boring [X] Monitoring Well [ ] Project Number: **134427** Sheet **2** of **2**

Depth (feet)	USC Soil Type	Description	Blow Counts	Sample No.	Graphic Log: Sample	Graphic Log: Lithology	Remarks
		Sandy Silt	50/5				
		@ 70' - Native soil. Orange/Brown. Sand is very fine grained. Sparce gravel ~1" in size. Slightly moist to dry. Very dense. No odor.					
70			50/5	NAI-B1-70			70' - Bottom of Hole

BROWN AND CALDWELL

BORING LOG

Project Name: **Ironite** Boring Number: **B-2**

Soil Boring [X] Monitoring Well [ ] Project Number: **134427** Sheet 1 of 1

Boring Location: **Humboldt, AZ**		Elevation: --	East: / North:
Drilling Contractor: **Yellow Jacket**	Driller: **Gabriel Escamillo**	Date Started: **3/26/08**	Date Finished: **3/26/08**
Drilling Equipment: **Hollow Stem Auger**	Borehole Diameter: **8"**	Completed Depth: (feet) **45.0**	Water Depth: (feet)
Sampling Method: **Split Spoon**		Type and Diameter of Well Casing:	
Drilling Method: **Auger**	Drilling Fluid: **None**	Type and Diameter of Well Screen: **--**	
Backfill Material: **Grout/Cement**		Slot Size:	Filter Material:
Logged By: **S.King**	Checked By: **R.Bauer**	Development Method:	

Depth (feet)	USC Soil Type	Description	Blow Counts	Sample No.	Graphic Log: Sample	Graphic Log: Lithology	Remarks
		Sandy Silt @ 2' - From Cuttings: Sandy silt changed from orange/red to dark grey. Dry to slightly moist.					Descriptions of drilled cuttings based on ASTM Method D-2488 (the visual-manual procedure), grain-size determinations and nomenclature based on the Unified Soil Classification System.
		Sandy Silt @ 5' - Dark grey. Sand is very fine grained. Slightly moist to dry. Loose density. No odor.	5 5 5	NAI-B-2-5			
10		**Sandy Silt** @ 15' - Dark grey. Sand is very fine grained. With small layers of brown/gold very fine grained sandy silt. Slightly moist to dry. Loose to medium dense. No odor.					All samples collected were tailings until "native soil" was reached. The dark grey, grey/brown, and gold/green soil samples exhibited a highly reflective metallic appearance.
		Sandy Silt @ 25' - Dark grey. Sand is very fine grained. Few small layers of brown/gold very fine grained sandy silt. Slightly moist to dry. Medium dense. No odor.	6 11 16	NAI-B-2-15			
20							0-45' - Cement/grout seal
		Sandy Silt @ 35' - Dark brown/grey. Sand is very fine grained. With small layers of brown/gold very fine grained sandy silt. Slightly moist to dry. Loose to medium dense. No odor.	11 11 19	NAI-B-2-25			
30							
		Sandy Silt @ 45' - Native soil. Brown. Sand is very fine grained. Sparce gravel ~1" in size. Slightly moist to dry. Dense to very dense. No odor.	3 3 4	NAI-B-2-35			
40							
			35 50				45' - Bottom of hole

BROWN AND CALDWELL

BORING LOG

Project Name: **Ironite** Boring Number: **B-3**

Soil Boring [X] Monitoring Well [ ] Project Number: **134427** Sheet 1 of 1

Boring Location: **Humboldt, AZ**		Elevation: --	East: / North:
Drilling Contractor: **Yellow Jacket**	Driller: **Gabriel Escamillo**	Date Started: **3/26/08**	Date Finished: **3/26/08**
Drilling Equipment: **Hollow Stem Auger**	Borehole Diameter: **8"**	Completed Depth: (feet) **50.0**	Water Depth: (feet)
Sampling Method: **Split Spoon**		Type and Diameter of Well Casing:	
Drilling Method: **Auger**	Drilling Fluid: **None**	Type and Diameter of Well Screen: **--**	
Backfill Material: **Grout/Cement**		Slot Size:	Filter Material:
Logged By: **S.King**	Checked By: **R.Bauer**	Development Method:	

Depth (feet)	USC Soil Type	Description	Blow Counts	Sample No.	Graphic Log: Sample	Graphic Log: Lithology
		Sandy Silt @ 2' - From Cuttings: Sandy silt changed from orange/red to dark grey. Dry to slightly moist.				
		Sandy Silt @ 5' - Dark grey. Sand is fine grained. Thin layers of orange/red/brown fine grained sandy silt. Slightly moist to dry. Loose density. No odor.	5 7 7	NAI-B-3-5		
10		**Sandy Silt** @ 15' - Dark grey. Sand is very fine grained. Slightly moist to dry. Loose to medium density. No odor.				
		Sandy Silt @ 25' - Dark grey. Sand is very fine grained. Thin bands of gold/grey very fine grained sandy silt. Slightly moist. Loose to medium density. No odor.	6 12 17	NAI-B-3-15		
20						
		Sandy Silt @ 35' - Dark grey. Very fine grained. Slightly moist to dry. Loose density. No odor.	5 12 17	NAI-B-3-25, DUP-F		
30						
		Sandy Silt @ 45' - Dark grey. Sand is very fine grained. Slightly moist to dry. Loose to medium density. No odor.	6 6 9	NAI-B-3-35		
40						
		No Recovery @ 50' -No Recovery. Refusal due to native soil and rock.	8 17 17	NAI-B-3-45		
50			50/1			

Remarks

Descriptions of drilled cuttings based on ASTM Method D-2488 (the visual-manual procedure), grain-size determinations and nomenclature based on the Unified Soil Classification System.

All samples collected were tailings until "native soil" was reached. The dark grey, grey/brown, and gold/green soil samples exhibited a highly reflective metallic appearance.

0-50' - Cement/grout seal

50' - Total depth of hole.

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BROWN AND CALDWELL

BORING LOG

Project Name: **Ironite** Boring Number: **B-4**

Soil Boring [X] Monitoring Well [ ] Project Number: **134427** Sheet 1 of 1

Boring Location: **Humboldt, AZ**		Elevation: --	East: / North:
Drilling Contractor: **Yellow Jacket**	Driller: **Gabriel Escamillo**	Date Started: **3/26/08**	Date Finished: **3/26/08**
Drilling Equipment: **Hollow Stem Auger**	Borehole Diameter: **8"**	Completed Depth: (feet) **25.0**	Water Depth: (feet)
Sampling Method: **Split Spoon**		Type and Diameter of Well Casing:	
Drilling Method: **Auger**	Drilling Fluid: **None**	Type and Diameter of Well Screen: **--**	
Backfill Material: **Grout/Cement**		Slot Size:	Filter Material:
Logged By: **S.King**	Checked By: **R.Bauer**	Development Method:	

Depth (feet)	USC Soil Type	Description	Blow Counts	Sample No.	Graphic Log: Sample	Graphic Log: Lithology	Remarks
		Sandy Silt @ 5' - Yellow/orange/brown. Subangular gravel from 1/4" to 1". Slightly moist to dry. Loose to medium density. Sulfur odor.					Descriptions of drilled cuttings based on ASTM Method D-2488 (the visual-manual procedure), grain-size determinations and nomenclature based on the Unified Soil Classification System.
		Sandy Silt @ 15' - Native soil. Lt brown. Subangular gravel. Layers of dark grey fine grained sandy silt tailings w/yellow/brown fine grained sandy silt tailings. Slightly moist to dry. Medium dense to very dense. Slight sulfur odor.	7 12 14	NAI-B-4-5			All samples collected were tailings until "native soil" was reached. The dark grey, grey/brown, and gold/green soil samples exhibited a highly reflective metallic appearance.
10							
		Sandy Silt @ 25' - Native soil with gravels. Lt brown. Subangular gravel to 1". Slightly moist to dry. Very dense. No odor. Cuttings were mostly gravel and fine grained sandy silt.	20 50/5	NAI-B-4-15			0-25' - Cement/grout seal
20							
			100/5				25' - Total depth of hole. No lab sample collected because sample was mostly slough.

BROWN AND CALDWELL

BORING LOG

Project Name: **Ironite** Boring Number: **B-5**

Soil Boring [X] Monitoring Well [ ] Project Number: **134427** Sheet 1 of 1

Boring Location: **Humboldt, AZ**		Elevation: --	East: North:
Drilling Contractor: **Yellow Jacket**	Driller: **Gabriel Escamillo**	Date Started: **3/26/08**	Date Finished: **3/26/08**
Drilling Equipment: **Hollow Stem Auger**	Borehole Diameter: **8"**	Completed Depth: (feet) **55.0**	Water Depth: (feet)
Sampling Method: **Split Spoon**		Type and Diameter of Well Casing:	
Drilling Method: **Auger**	Drilling Fluid: **None**	Type and Diameter of Well Screen: **--**	
Backfill Material: **Grout/Cement**		Slot Size:	Filter Material:
Logged By: **S.King**	Checked By: **R.Bauer**	Development Method:	

Depth (feet)	USC Soil Type	Description	Blow Counts	Sample No.	Graphic Log: Sample	Graphic Log: Lithology
		Sandy Silt @ 2' - From Cuttings: Sandy silt changed from orange/red to dark grey. Dry to slightly moist.				
		Sandy Silt @ 5' - Dark grey. Sand is very fine grained. Slightly moist to dry. Loose density. No odor.	5 5 7	NAI-B-5-5		
10		**Sandy Silt** @ 15' - Gold/dark green. Sand is very fine grained. Dry to slightly moist. Loose to medium dense. No odor.				
		Sandy Silt @ 25' - Dark grey. Sand is very fine grained. With thin layers of green/brown/gold very fine grained sandy silt. Slightly moist to dry. Loose to medium dense. No odor.	10 12 20	NAI-B-5-15		
20						
		Sandy Silt @ 35' - Dark grey. Sand is very fine grained. With layers of green/brown/gold very fine grained sandy silt. Slightly moist to moist. Very loose density. No odor.	5 5 15	NAI-B-5-25		
30						
		Sandy Silt @ 45' - Native soil. Brown w/orange and green/gold spots. Sand is fine grained. Sparce gravel ~1" in size. Slightly moist to dry. Medium dense to dense. No odor.	3 3 3	NAI-B-5-35		
40						
		Sandy Silt @ 55' - Native soil. Brown w/orange and green/gold spots. Sand is fine grained. Sparce gravel ~1" in size. Slightly moist to dry. Medium dense to dense. No odor.	13 21 41	NAI-B-5-45		
50						
			50			

Remarks

Descriptions of drilled cuttings based on ASTM Method D-2488 (the visual-manual procedure), grain-size determinations and nomenclature based on the Unified Soil Classification System.

All samples collected were tailings until "native soil" was reached. The dark grey, grey/brown, and gold/green soil samples exhibited a highly reflective metallic appearance.

0-55' - Cement/grout seal

55' - Native soil sample which had roots in it.

55' - Total depth of hole

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BROWN AND CALDWELL

BORING LOG

Project Name: **Ironite** Boring Number: **B-6**

Soil Boring [X] Monitoring Well [ ] Project Number: **134427** Sheet **1** of **2**

Boring Location: **Humboldt, AZ**		Elevation: --	East: / North:
Drilling Contractor: **Yellow Jacket**	Driller: **Gabriel Escamillo**	Date Started: **3/25/08**	Date Finished: **3/26/08**
Drilling Equipment: **Hollow Stem Auger**	Borehole Diameter: **8"**	Completed Depth: (feet) **120.0**	Water Depth: (feet)
Sampling Method: **Split Spoon**		Type and Diameter of Well Casing:	
Drilling Method: **Auger**	Drilling Fluid: **None**	Type and Diameter of Well Screen: **--**	
Backfill Material: **Grout/Cement**		Slot Size:	Filter Material:
Logged By: **S.King**	Checked By: **R.Bauer**	Development Method:	

Depth (feet)	USC Soil Type	Description	Blow Counts	Sample No.	Graphic Log: Sample	Graphic Log: Lithology	Remarks
		Description is the same as B-1 for the first 65 feet.					
10							
20							
30							
40							
50							

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BROWN AND CALDWELL

BORING LOG

Project Name: **Ironite** Boring Number: **B-6**

Soil Boring [X] Monitoring Well [ ] Project Number: **134427** Sheet **2** of **2**

Depth (feet)	USC Soil Type	Description	Blow Counts	Sample No.	Graphic Log: Sample	Graphic Log: Lithology	Remarks
70		**Sandy Silt** @ 65' - Dark grey. Sand is very fine grained. Slightly moist to dry. Medium density. No odor.	12 20 24		X		Descriptions of drilled cuttings based on ASTM Method D-2488 (the visual-manual procedure), grain-size determinations and nomenclature based on the Unified Soil Classification System. All samples collected were tailings until "native soil" was reached. The dark grey, grey/brown, and gold/green soil samples exhibited a highly reflective metallic appearance.
80							0-120' - Cement/grout seal
		Sandy Silt @ 85' - Dark grey. Sand is very fine grained. Slightly moist to dry. Medium density. No odor.	15 15 16	NAI-B6-85, DUP-G			
90							
100							
		Sandy Silt @ 105' - Dark grey. Sand is very fine grained. Slightly moist to dry. Medium density. No odor.	22 22 23	NAI-B6-105			
110		**Sandy Silt** @ 110' - Native soil. Brown fine grained sandy silt w/gravel. Layers of dark grey very fine grained tailings. Slightly moist to dry. Very dense. No odor.	50/5		X		
120		**Sandy Silt** @ 120' - Native soil. Brown fine grained sandy silt w/gravel. Slightly moist to dry. Medium to very dense. No odor.	23 50/5		X		120' - Total depth of hole

CHAD IRONITE.GPJ BRN&CALD.GDT 3/16/09

B

BROWN AND CALDWELL

APPENDIX B

Laboratory Analytical Reports (on CD)

C

BROWN AND CALDWELL

APPENDIX C

Data Validation Report

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Ironite Humbolt

Collection Date: June 6 through June 7, 2008

LDC Report Date: January 26, 2009

Matrix: Soil

Parameters: Metals

Validation Level: Level IV

Laboratory: Columbia Analytical Services, Inc.

Sample Delivery Group (SDG): 08060125

Sample Identification

DUP-N
NAI-035-OS-75-6
NAI-035-OS-75-18
NAI-035-OS-30-6
NAI-037C-OS-29-6
NAI-039E-OS-77-18
NAI-039E-OS-76-6
NAI-039E-OS-76-18
NAI-002W-OS-90-6
NAI-002W-OS-50-6
NAI-002W-OS-50-18
NAI-002W-OS-48-6
NAI-002W-OS-48-18
NAI-002W-OS-52-6
NAI-002W-OS-52-15
NAI-035-OS-30-6MS
NAI-035-OS-30-6MSD
NAI-002W-OS-48-6MS
NAI-002W-OS-48-6MSD
NAI-002W-OS-48-18MS
NAI-002W-OS-48-18MSD

Introduction

This data review covers 21 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Methods 6010B and 7000 for Metals. The metals analyzed were Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the methods stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks.

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P	ADQ
NAI-064A-OS-3-6MS/MSD (DUP-N)	Antimony Arsenic Lead	41 (75-125) 73 (75-125) 69 (75-125)	40 (75-125) - -	- - -	J (all detects) UJ (all non-detects)	A	M2
NAI-064A-OS-3-6MS/MSD (DUP-N)	Copper	135 (75-125)	131 (75-125)	-	J (all detects)	A	M1
NAI-06OS-OS-19-18MS/MSD (NAI-035-OS-75-6 NAI-035-OS-75-18)	Antimony	30 (75-125)	29 (75-125)	-	J (all detects) R (all non-detects)	A	M2

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P	ADQ
NAI-002W-OS-48-18MS/MSD (NAI-002W-OS-90-6 NAI-002W-OS-50-6 NAI-002W-OS-50-18 NAI-002W-OS-48-6 NAI-002W-OS-48-18)	Antimony	33 (75-125)	34 (75-125)	-	J (all detects) UJ (all non-detects)	A	M2
NAI-035-OS-30-6MS/MSD (NAI-035-OS-30-6 NAI-037C-OS-29-6 NAI-039E-OS-77-18 NAI-039E-OS-76-6 NAI-039E-OS-76-18 NAI-002W-OS-90-6 NAI-002W-OS-50-6 NAI-002W-OS-50-18)	Mercury	18 (89-126)	47 (89-126)	-	J (all detects) R (all non-detects)	A	M2

VI. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VIII. Internal Standard (ICP-MS)

ICP-MS was not utilized in this SDG.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

X. ICP Serial Dilution

ICP serial dilution was not performed for this SDG.

XI. Sample Result Verification

All sample result verifications were acceptable.

XII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIII. Field Duplicates

Samples DUP-N and NAI-002W-OS-48-18 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)	Flag	A or P	ADQ
	DUP-N	NAI-002W-OS-48-18					
Arsenic	31	28	10 (≤35)	-	-	-	-
Chromium	12	14	-	2 (≤10)	-	-	-
Copper	520	460	12 (≤35)	-	-	-	-
Lead	22	32	-	10 (≤10)	-	-	-
Nickel	16	14	-	2 (≤10)	-	-	-
Zinc	190	170	11 (≤35)	-	-	-	-

XIV. Field Blanks

Sample EB-5 was identified as an equipment blank. No metals were found in this blank.

Ironite Humbolt
Metals - Data Qualification Summary - SDG 08060125

SDG	Sample	Analyte	Flag	A or P	ADQ	Reason
08060125	DUP-N	Antimony Arsenic Lead	J (all detects) UJ (all non-detects)	A	M2	Matrix spike/Matrix spike duplicates (%R)
08060125	DUP-N	Copper	J (all detects)	A	M1	Matrix spike/Matrix spike duplicates (%R)
08060125	NAI-035-OS-75-6 NAI-035-OS-75-18	Antimony	J (all detects) R (all non-detects)	A	M2	Matrix spike/Matrix spike duplicates (%R)
08060125	NAI-002W-OS-90-6 NAI-002W-OS-50-6 NAI-002W-OS-50-18 NAI-002W-OS-48-6 NAI-002W-OS-48-18	Antimony	J (all detects) UJ (all non-detects)	A	M2	Matrix spike/Matrix spike duplicates (%R)
08060125	NAI-035-OS-30-6 NAI-037C-OS-29-6 NAI-039E-OS-77-18 NAI-039E-OS-76-6 NAI-039E-OS-76-18 NAI-002W-OS-90-6 NAI-002W-OS-50-6 NAI-002W-OS-50-18	Mercury	J (all detects) R (all non-detects)	A	M2	Matrix spike/Matrix spike duplicates (%R)

Ironite Humbolt
Metals - Laboratory Blank Data Qualification Summary - SDG 08060125

No Sample Data Qualified in this SDG

Columbia Analytical Services™

Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-45
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: DUP-N
Collection Date: 6/7/2008
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							*Test Performed By: AZ0133*
Antimony	<5.0	5.0	UJ (M>)	mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Arsenic	**31**	5.0	J ↓	mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Beryllium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Cadmium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Chromium	**12**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Copper	**520**	5.0	J (M1)	mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Lead	**22**	5.0	J (M>)	mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Nickel	**16**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Selenium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Silver	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Thallium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
Zinc	**190**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:28	MDD	630
			PREP METHOD: SW7471A							*Test Performed By: AZ0133*
Mercury	<0.083	0.083		mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	620

MM 01/29/09

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License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-49
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-035-OS-75-6
Collection Date: 6/6/2008 10:15:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							Test Performed By: AZ0133
Antimony	<5.0	5.0	R (M2)	mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Arsenic	**210**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Beryllium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Cadmium	**1.5**	1.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Chromium	**13**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Copper	**53**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Lead	**110**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Nickel	**14**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Selenium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Silver	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Thallium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
Zinc	**590**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:53	MDD	631
			PREP METHOD: SW7471A							Test Performed By: AZ0133
Mercury	**0.83**	0.083		mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	620

LMO 1/7/09

Columbia Analytical Services™

Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-50
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-035-OS-75-18
Collection Date: 6/6/2008 10:19:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
PREP METHOD: SW3050B										*Test Performed By: AZ0133*
Antimony	<5.0	5.0	R (M2)	mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Arsenic	**22**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Beryllium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Cadmium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Chromium	**13**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Copper	**38**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Lead	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Nickel	**13**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Selenium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Silver	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Thallium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
Zinc	**71**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 17:57	MDD	631
PREP METHOD: SW7471A										*Test Performed By: AZ0133*
Mercury	<0.083	0.083		mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	620

6/10/2009

Columbia Analytical Services

Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-51
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-035-OS-30-6
Collection Date: 6/6/2008 10:36:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							*Test Performed By: AZ0133*
Arsenic	**240**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:00	MDD	631
Lead	**93**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:00	MDD	631
			PREP METHOD: SW7471A							*Test Performed By: AZ0133*
Mercury	**1.5**	0.083	J (M2)	mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	621

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License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-52
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-037C-OS-29-6
Collection Date: 6/6/2008 11:11:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							*Test Performed By: AZ0133*
Arsenic	**800**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:04	MDD	631
Lead	**330**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:04	MDD	631
			PREP METHOD: SW7471A							*Test Performed By: AZ0133*
Mercury	**1.3**	0.083	J (M2)	mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	621

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Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-58
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-039E-OS-77-18
Collection Date: 6/6/2008 4:03:00 PM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
PREP METHOD: SW3050B										***Test Performed By: AZ0133***
Arsenic	**13**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:42	MDD	631
Lead	<5.0	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:42	MDD	631
PREP METHOD: SW7471A										***Test Performed By: AZ0133***
Mercury	<0.083	0.083	R (M2)	mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	621

6/10/09

Columbia Analytical Services

Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-59
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-039E-OS-76-6
Collection Date: 6/6/2008 4:33:00 PM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							Test Performed By: AZ0133
Arsenic	130	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:45	MDD	631
Lead	83	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:45	MDD	631
			PREP METHOD: SW7471A							Test Performed By: AZ0133
Mercury	0.76	0.083	J(M2)	mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	621

6/10/2009

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Date Printed 23-Jun-08

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CLIENT:	Brown & Caldwell	**Client Sample ID:**	NAI-039E-OS-76-18
Work Order:	08060125	**Collection Date:**	6/6/2008 4:43:00 PM
Lab ID:	08060125-60	**Matrix:**	Soil
Project Name:	Ironite		
Project Number:	134427.200		

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							*Test Performed By: AZ0133*
Arsenic	**230**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:49	MDD	631
Lead	**420**	5.0		mg/Kg	1.0	SW6010B	6/12/08	6/13/08 18:49	MDD	631
			PREP METHOD: SW7471A							*Test Performed By: AZ0133*
Mercury	**1.7**	0.083	J (M2)	mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	621

HH0/2709

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Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-68
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-002W-OS-90-6
Collection Date: 6/7/2008 10:25:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
PREP METHOD: SW3050B										*Test Performed By: AZ0133*
Antimony	<5.0	5.0	UJ(M2)	mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Arsenic	**98**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Beryllium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Cadmium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Chromium	**17**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Copper	**38**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Lead	**79**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Nickel	**14**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Selenium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Silver	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Thallium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
Zinc	**240**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:36	MDD	650
PREP METHOD: SW7471A										*Test Performed By: AZ0133*
Mercury	**0.70**	0.083	J(M2)	mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	621

MH 6/30/09

Columbia Analytical Services

Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-69
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-002W-OS-50-6
Collection Date: 6/7/2008 10:48:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							Test Performed By: AZ0133
Antimony	<5.0	5.0	UJ(M2)	mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Arsenic	**41**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Beryllium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Cadmium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Chromium	**12**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Copper	**28**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Lead	**15**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Nickel	**13**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Selenium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Silver	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Thallium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
Zinc	**97**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:40	MDD	650
			PREP METHOD: SW7471A							Test Performed By: AZ0133
Mercury	**0.088**	0.083	J(M2)	mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	621

6/30/09

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Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-70
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-002W-OS-50-18
Collection Date: 6/7/2008 10:52:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
PREP METHOD: SW3050B										*Test Performed By: AZ0133*
Antimony	<5.0	5.0	UJ (M2)	mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Arsenic	**13**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Beryllium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Cadmium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Chromium	**9.6**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Copper	**23**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Lead	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Nickel	**15**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Selenium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Silver	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Thallium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
Zinc	**39**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:43	MDD	650
PREP METHOD: SW7471A										*Test Performed By: AZ0133*
Mercury	<0.083	0.083	R (M2)	mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	621

6.24.09

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Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-71
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-002W-OS-48-6
Collection Date: 6/7/2008 11:10:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							*Test Performed By: AZ0133*
Antimony	<5.0	5.0	MJ(M2)	mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Arsenic	**26**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Beryllium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Cadmium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Chromium	**9.9**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Copper	**120**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Lead	**7.5**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Nickel	**13**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Selenium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Silver	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Thallium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
Zinc	**91**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:47	MDD	650
			PREP METHOD: SW7471A							*Test Performed By: AZ0133*
Mercury	<0.083	0.083		mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	622

MJ 6-19-9

Columbia Analytical Services

Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-72
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-002W-OS-48-18
Collection Date: 6/7/2008 11:18:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
			PREP METHOD: SW3050B							*Test Performed By: AZ0133*
Antimony	<5.0	5.0	WJ(M2)	mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Arsenic	**28**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Beryllium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Cadmium	<1.0	1.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Chromium	**14**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Copper	**460**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Lead	**32**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Nickel	**14**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Selenium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Silver	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Thallium	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
Zinc	**170**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 14:51	MDD	650
			PREP METHOD: SW7471A							*Test Performed By: AZ0133*
Mercury	<0.083	0.083		mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	622

6/24/09

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Date Printed 23-Jun-08

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CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-73
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-002W-OS-52-6
Collection Date: 6/7/2008 11:32:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
PREP METHOD: SW3050B										*Test Performed By: AZ0133*
Arsenic	**27**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 15:11	MDD	650
Lead	**11**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 15:11	MDD	650
PREP METHOD: SW7471A										*Test Performed By: AZ0133*
Mercury	**0.095**	0.083		mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	622

1411-1909

Columbia Analytical Services™

Date Printed 23-Jun-08

License No. AZM133/AZ0133

CLIENT: Brown & Caldwell
Work Order: 08060125
Lab ID: 08060125-74
Project Name: Ironite
Project Number: 134427.200

Client Sample ID: NAI-002W-OS-52-15
Collection Date: 6/7/2008 11:41:00 AM
Matrix: Soil

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
PREP METHOD: SW3050B										*Test Performed By: AZ0133*
Arsenic	**15**	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 15:15	MDD	650
Lead	<5.0	5.0		mg/Kg	1.0	SW6010B	6/16/08	6/17/08 15:15	MDD	650
PREP METHOD: SW7471A										*Test Performed By: AZ0133*
Mercury	<0.083	0.083		mg/Kg	1.0	SW7471A	6/11/08	6/12/08	BJL	622

6/10/2009

LDC #: 20102A4
SDG #: 08060125
Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 1-22-09
Page: 1 of 1
Reviewer: MG
2nd Reviewer: W

METHOD: Metals (EPA SW 846 Method 6010B/7000)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 6-6-08 through 6-7-08
II.	Calibration	A	
III.	Blanks	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	SW	MS/MSD
VI.	Duplicate Sample Analysis	N	
VII.	Laboratory Control Samples (LCS)	A	LCS/LCSD
VIII.	Internal Standard (ICP-MS)	N	not utilized
IX.	Furnace Atomic Absorption QC	N	" "
X.	ICP Serial Dilution	N	not performed
XI.	Sample Result Verification	A	
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	SW	D = 1 + 13
XIV.	Field Blanks	ND	EB = EB-5 (this SDG)

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: all soil

1 1	DUP-N	11 3	NAI-002W-OS-50-18	21 3	NAI-002W-OS-48-18MSD	31	
2 2	NAI-035-OS-75-6	12 3	NAI-002W-OS-48-6	22 1	PBS1	32	
3 2	NAI-035-OS-75-18	13 3	NAI-002W-OS-48-18	23 2	PBS2	33	
4 2	NAI-035-OS-30-6	14 3	NAI-002W-OS-52-6	24 3	PBS3	34	
5 2	NAI-037C-OS-29-6	15 3	NAI-002W-OS-52-15	25		35	
6 2	NAI-039E-OS-77-18	16	NAI-035-OS-30-6MS	26		36	
7 2	NAI-039E-OS-76-6	17	NAI-035-OS-30-6MSD	27		37	
8 2	NAI-039E-OS-76-18	18	NAI-002W-OS-48-6MS	28		38	
9 3	NAI-002W-OS-90-6	19	NAI-002W-OS-48-6MSD	29		39	
10 3	NAI-002W-OS-50-6	20 3	NAI-002W-OS-48-18MS	30		40	

Notes:

LDC #: 20102A4
SDG #: 08060125

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
V. Matrix spike/matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VI. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VII. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients > 0.995?			✓	
Do all applicable analysies have duplicate injections? (Level IV only)			✓	
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? (Level IV only)			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	

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VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
VIII. Internal Standards (EPA SW-846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?			✓	
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?		✓		wet weight basis
XI. Overall Assessment of Data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field Duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field Blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

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VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→3, 9→13	S	Al, (Sb), (As), Ba, (Be), (Cd), Ca, (Cr), Co, (Cu), Fe, (Pb), Mg, Mn, (Hg), (Ni), K, (Se), (Ag), Na, (Tl), V, (Zn), Mo, B, Si, CN⁻, ___ ___
4→8, 14, 15	↓	Al, Sb, (As), Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, (Pb), Mg, Mn, (Hg), Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
QC 16→19	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, (Hg), Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
↓ 20, 21	↓	Al, (Sb), (As), Ba, (Be), (Cd), Ca, (Cr), Co, (Cu), Fe, (Pb), Mg, Mn, Hg, (Ni), K, (Se), (Ag), Na, (Tl), V, (Zn), Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
ICP Trace	S	Al, (Sb), (As), Ba, (Be), (Cd), Ca, (Cr), Co, (Cu), Fe, (Pb), Mg, Mn, Hg, (Ni), K, (Se), (Ag), Na, (Tl), V, (Zn), Mo, B, Si, CN⁻, ___ ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻,

Comments: (Mercury by CVAA if performed)

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VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MK
2nd Reviewer:

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	NAI-064A-05-3-6	Soil	Sb	41 (75-125)	40 (75-125)		1	J/UJ/A M2
	MS/MSD		As	73 ( )			↓	↓
	↓		Cu	135 ( )	131 ( )			J dets/A M1
			Pb	69 ( )			↓	J/UJ/A M2
2	NAI-060S-05-19-18		Sb	30 ( )	29 ( )		2, 3	J/R/A M2
	MS/MSD							
3	20/21		Sb	33 (↓)	34 (↓)		9→13	J/UJ/A M2
4	16/17	↓	Hg	18 (89-126)	47 (89-126)		4→11	J/R/A M2

Comments:

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SDG#: 08060125

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: W

METHOD: Metals (EPA Method 6010B/6020/7000)

(Y) N NA Were field duplicate pairs identified in this SDG?
(Y) N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (mg/kg)		(≤35) RPD	(mg/Kg) Difference	(mg/Kg) Limits	Qualifications (Parent Only)
	1	13				
Arsenic	31	28	10			
Chromium	12	14		2	(≤10)	
Copper	520	460	12			
Lead	22	32		10	(≤10)	
Nickel	16	14		2	(≤10)	
Zinc	190	170	11			

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VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: ✓

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found x 100 / True

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
1000 ICV	ICP (Initial calibration)	Cr	980.1	1000.	98.0	not reported	Y
	GFAA (Initial calibration)						
1202 ICV	CVAA (Initial calibration)	Hg	5.3682	5.	107	107	
1736 CCV	ICP (Continuing calibration)	Ni	1057.9	1000.	106	not reported	
	GFAA (Continuing calibration)						
1350 CCV	CVAA (Continuing calibration)	Hg	5.3712	5.	107	107	
	ICP/MS (Initial calibration)						
	ICP/MS (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

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VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: V

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1204 SIC	ICP interference check	Cu	1.4944 (mg/L)	1.5 (mg/L)	99.6	not reported	Y
1429 LCS	Laboratory control sample	Se	53.37 (mg/kg)	50.00 (mg/kg)	107	107	↓
1454 20	Matrix spike	Sb	(SSR-SR) 16.49 (mg/kg)	50.00 (mg/kg)	33	33	↓
1454/1458 20/21	Duplicate	As	73.87 (mg/kg)	79.04 (mg/kg)	* 7	6	↓
—	ICP serial dilution	—	—	—	—	—	—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.
* >10 %D, both in limit, no qual

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VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
(Y) N N/A Are all detection limits below the CRDL?

Detected analyte results for # 3, As were recalculated and verified using the following equation:

$$\text{Concentration} = \frac{(RD)(FV)(Dil)}{(In.\ Vol.)(\%S)}$$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(0.4331\ mg/L)(0.050\ L)}{0.00100\ kg\ \text{wet wt}} = 21.655\ mg/kg$$

Sample ID	Analyte	Reported Concentration (mg/kg)	Calculated Concentration (mg/kg)	Acceptable (Y/N)
3	As	22.	22.	Y
	Cr	13.	13.	
	Cu	38.	38.	
	Ni	13.	13.	
	Zn	71.	71.	
4	As	240.	240	
	Pb	93.	93.	
	Hg	1.5	1.5	